EKA UNIVERSITY OF APPLIED SCIENCES

ECONOMICS AND CULTURE

Volume 21, Issue 1

Riga 2024

Economics and Culture 2024, Volume 21, Issue 1

ISSN 2255-7563 / e-ISSN 2256-0173

Full-text papers are available at https://content.sciendo.com/view/journals/jec/jec-overview.xml

The publication of the journal is financed by the EKA University of Applied Sciences.

Str. Pernavas 62, Riga, LV1009, Latvia

Publisher

SCIENDO

Bogumiła Zuga 32A Str.
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ECONOMICS AND CULTURE 21(1), 2024

DOI: 10.2478/jec-2024-0001

IMPROVING QUALITY OF ADMINISTRATION PROCESS IN HEIs: PROFESSIONAL COMPETENCE PERCEIVED BY ACADEMIC STAFF IN UKRAINE

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Received 10 December 2023; accepted 22 January 2024

Abstract

Research purpose. The research purpose of this paper was to explore the evaluation of skills by academic staff to improve the quality of the administration process in higher education institutions (HEIs) from two perspectives. Firstly, the authors investigated whether there are statistically significant differences between the genders of academic staff in higher education institutions regarding the evaluation of their skills and competencies. Secondly, the study aimed to determine if there are statistically significant differences in competencies perceived between academic staff of STEM sciences and those with academic experience in other sciences in terms of assessing their professional competencies. The purpose was determined by the impact of self-assessment of professional competencies on the improvement of administrative processes.

Design / Methodology / Approach. The survey, using the authors` developed questionnaire, was distributed in Ukraine from 2019 to 2023. 374 respondents were surveyed. To test hypotheses, the authors employed the Mann-Whitney U test for gender-related hypotheses and the Kruskal-Wallis test for hypotheses related to the area of scientific and academic activities.

Findings. Due to the analysis carried out in the present research, the Mann-Whitney non-parametric test showed that there is no statistically significant difference between the gender groups and their professional competencies evaluation, which leads to the rejection of the first hypothesis. The second hypothesis was also rejected, as based on the Kruskal-Wally's test there is no statistically significant difference between the perception of the professional competencies among the academic staff of STEM and other sciences.

Originality / Value / Practical implications. Unlike other studies, this research specifically focuses on the differences between the self-assessment-based perceptions by genders and STEM sciences academic staff compared to representatives of other branches of science at HEIs in Ukraine. The practical value is achieved by the research thus ensuring administrative staff with defined competencies and self-assessment criteria. The research findings then will allow us to link competencies to administration processes and offer training and development opportunities based on identified competency gaps. The feedback mechanism might be established based on the research data and these self-assessment results might be incorporated into the performance evaluation processes, thus improving the quality of the educational process and its administration in HEIs. Practical implications are related to the state and period of the research, due to the present war in Ukraine.

Keywords: professional competencies, administration process, academic staff, HEI, STEM

JEL codes: I21, I23, J24, M12, M54.

Introduction

The academic staff as a human factor, is a key driver on a way of HEI organisational change. As said by Houston et al. (2006) university academic staff do complex work in an increasingly demanding environment. Historically, HEIs divided the role of academic staff into three pillars: teaching, research, and administration, with a primary emphasis on teaching and research. According to the International Standard Classification of Education (ISCED), "academic staff includes personnel whose primary assignment is instruction, research, or public service. This includes staff personnel who hold an academic rank with titles such as professor, associate professor, assistant professor, instructor, lecturer, or the equivalent of any of these academic ranks. The category includes personnel with other titles, (e.g., dean, director, associate dean, assistant dean, chair, or head of department), if their principal activity is instruction or research" (UN ESCWA, 2001). Modern researchers, such as Lay (2019), state that academic staff is the personnel employed for research and teaching by higher education institutions.

The relationship between improving the quality of administration processes in HEIs and the perceived professional competence of academic staff is encompassed in several critical ways. First, the effectiveness of administration processes in educational institutions is primarily based on the competencies, skills, and overall performance of academic staff. The efficiency of the administration process depends on the academic staff's ability to navigate administrative tasks, provide effective communication, and contribute to decision-making impact on the overall strategic development of the organization.

Secondly, by understanding the perceived professional competence of academic staff, as a result of self-assessment, HEIs can optimize their administrative resources, leading to increased efficiency in handling institutional processes. The quality of the administration process in HEIs requires a comprehensive approach to acknowledge the multifaceted nature of professional competence. It involves not only technical skills but also leadership, adaptability, and collaboration – competencies that directly influence administrative effectiveness.

Finally, acknowledging and improving the perceived professional competence of academic staff can contribute to a more conducive work environment. When staff members feel competent and motivated, they become much more motivated and dedicated. The perceived professional competence of academic staff is directly linked to the enhancement of administrative processes within HEIs, playing a vital role in fostering innovation and creating a competitive institutional environment.

The aim of the research is to investigate the perceptions of academic staff regarding their professional competence, particularly in STEM fields, and to address gender differences in these perceptions. Undertaking research on the perceptions of academic staff regarding their professional competence, particularly in STEM fields and in pertinence to gender differences, is crucial for several reasons. Firstly, it underlines the emerging nature of academic roles. Secondly, such research unveils the disparities between gender differences in perceived competence, discovering a need for systemic changes to ensure the representation of women in STEM sciences. It emphasizes a need for continual professional development, ensuring the ability of academic staff to respond to the needs of contemporary market demands.

Literature Review

The Concept of Professional Competence

The significance of teachers' professional competence and innovative activity in higher education is highly relevant at present (Kutsak et al., 2023). By integrating self-assessment of professional competencies with the improvement of administrative processes, HEIs can create a more cohesive and effective environment, promoting both staff development and institutional growth (Bieńkowska et al., 2019). The perceived professional competence of academic staff members is a critical factor of educational efficacy and quality in the constantly changing field of STEM education (Xie et al., 2015). It is becoming more and more important to comprehend how academic staff members evaluate their professional competencies and attitudes towards continual growth as the demands of the modern world continue to transform the educational atmosphere. Competency is composed of multiple competencies

(Mulder, 2014). The determination of academic staff members' attitudes regarding the necessity of routinely improving their professional competence in response to the changing circumstances of the modern world is at the heart of the research being conducted (Huang et al., 2022). When the improvement of professional competencies is aligned with HEI business administration processes it ensures that the institution operates efficiently, achieving staff to streamline operations, optimize resource allocation, and foster innovation and communication process with the stakeholders, thus ultimately enhancing the HEI`s competitiveness and sustainability in the educational market.

The dynamic nature of knowledge and instructional approaches in the field of Science, Technology, Engineering, and Mathematics (STEM) education calls for a persistent dedication to professional development and flexibility. Known as "cross-cutting skills," these abilities cut across academic fields and have the capacity to increase STEM teachers' efficacy (García-Martínez et al. 2019; Nordine & Lee, 2021). This dual emphasis on identifying cross-cutting skills and acknowledging the need for ongoing improvement is in line with larger educational goals seeking to develop competent and flexible teachers able to tackle the difficulties presented by the quickly evolving educational environment.

Importance of Professional Competence in Academic Staff Administration Process

One of the biggest challenges that HEI meets is the improvement of the quality of its educational processes. The process of education can be ensured only in consonance with smooth administration operations. Thus, it is crucial for the administration of the institutions to set new strategies and plans for better management of the current processes (Chalaris et al., 2014). HEIs typically have a variety of administration processes to ensure smooth operation and management. These processes could be divided into those directly related to the education process, such as academic affairs (curriculum development, accreditation, academic policies), human resources (managing faculty recruitment and professional development), research administration (supporting research activities); partly related to the education process (such as student service, and career guidance as a part of it); and related indirectly to the education process (such as admissions, facilities management, and others). These processes may vary depending on the size, type, and structure of the institution, but they are essential for the effective functioning of higher education institutions. Improvement of professional competency within the administration processes is crucial for the overall effectiveness of HEI: competent academic staff can enhance curriculum design to ensure it meets the updating needs of students and stakeholders; those responsible for accreditation processes can navigate them more effectively; supporting faculty members with ongoing improves teaching quality and contributes to a culture of continuous improvement, leading to higher performance and retention rates. As stated by Collinson (2004) and Mashaya et al. (2022), as a cornerstone of the educational process, professional competence among academic staff leads to effective administration in higher education, impacting not only the HEI`s present functioning but also its long-term strategic development and overall impact. Furthermore, dedication to continual professional development is required due to the dynamic nature of educational methodologies and the ever-evolving body of knowledge (Martín-Páez et al., 2019).

Maintaining the relevance and interest of curricula requires academic staff members to be able to adjust to new research findings, technological developments, and shifting paradigms in education. Teachers who keep up with the most recent developments in their disciplines help to create new knowledge, which improves the school's standing in the eyes of the academic community and encourages students to be curious about learning (Griffin et al., 2012). Moreover, the significance of professional competence transcends individual accomplishment and encompasses the wider academic community. Strong professional competence is a prerequisite for interdisciplinary research, collaborative projects, and the capacity to mentor and advise colleagues (Care et al., 2017).

Improvement of Professional Competence by Academic Staff

For teachers to have a sense of the importance and prestige of their work, they must experience satisfaction both from the work itself and from the assessment of their work by the administration, which is expressed, among other things, in wages. Administration should regularly evaluate if the existing knowledge and skills of the teachers are sufficient to perform teaching activities in the current environment. Academic staff should regularly improve their knowledge and skills to ensure the quality of the teaching process, continuous improvement of the competencies of academic staff should be a

standard procedure in Higher Education Institutions. To regularly enhance the competence of academic staff, different motivation measures should be implemented to ensure the academic staff positions remain in demand and competitive in the modern changing circumstances (including the introduction of artificial intelligence, digitization, demand for informal education, rising living costs, and other factors). Over the next 10-20 years, the process of teaching in HEIs will undergo significant transformation (such as the possibility of fully remote or blended formats), changing requirements for knowledge acquisition, and altering teaching methods. This leads to new demands on the professional knowledge, abilities, skills, and qualities of a teaching staff member (Safin et al., 2020). The results of obtained professional competence improvement should be applied in the study process in multiple ways, such as enhancement of teaching methods; change of teaching process itself (by utilizing a new software, etc.), curriculum improvement, experience sharing with colleagues, and recognition of competence enhancement by the administration through financial contribution.

Cross-Cutting Skills in Education

The notion of cross-cutting skills in education has garnered considerable attention (Marzo-Navarro & Berné-Manero, 2022), indicating the acknowledgement of diverse competencies required of academic staff to effectively navigate the intricacies of dynamic educational settings. These abilities, which go beyond discipline-specific knowledge and are known as transversal or transferable skills (Sá & Serpa, 2018), are crucial for encouraging flexibility, critical thinking, and comprehensive professional development. The significance of cross-cutting skills in education has been examined in several studies. The importance of abilities like critical thinking, teamwork, problem-solving, and working with diverse others as essential parts of cross-cutting competencies is highlighted by Andrade (2020).

In their thorough analysis of academic staff adaptability, Collie et al. (2018) found that collaborative problem-solving, technological literacy, and flexibility are critical competencies in the face of changing pedagogical approaches and technological breakthroughs. The introduction of cross-cutting skills enables the administration of HEIs to foster a culture of innovation and allocate resources efficiently ensuring an agile and competitive institutional framework (Gibbs & Coffey, 2004).

Gender Differences in Perceived Professional Competence

The prerequisites to study gender differences in perceived professional competence are explained by their impact on the HEI business administration process by influencing leadership dynamics, diversity initiatives, and organizational culture, potentially fostering decision-making processes. According to Casad et al. (2021), there is an underrepresentation of women in STEM faculty positions at research institutions, which shows the causes and effects of gender inequality in STEM. The proportion of women holding faculty positions has not increased in line with the growing number of women receiving doctorates in STEM fields. The underrepresentation is linked to systemic problems, including bad experiences with stereotypes that favour men, especially in STEM fields. It draws attention to elements contributing to gender differences, such as the cold academic environment in STEM fields, increased expectations for women faculty, and lower social capital. Another study by Schoen et al. (2018) examines the relationship between gender and career advancement by combining social network theory and tokenism, with a special emphasis on the influence of network structures on career prospects.

Research Methodology

The study employed a quantitative research design, and the survey was constructed by the authors using the Google Survey platform. The survey, using the authors` developed questionnaire, was distributed in Ukraine from 2019 to 2023. 374 respondents were surveyed. The target respondents for the study were specifically academic staff (representatives of both STEM and other branches of science) of Higher Education Institutions in Ukraine.

The questionnaire consisted of 37 questions, such as “I am satisfied with my job” and “I agree that my existing knowledge and skills are sufficient to perform teaching activities in the current environment,” among others. Questions were designed as multiple-choice questions and questions with an evaluation scale. A Likert scale ranging from 1 to 5 was used, where 1 indicates complete disagreement and 5 indicates full agreement. The questionnaire also included questions about overall satisfaction with the

teaching process in the current workplace, and working conditions, as well as a request to evaluate the need to improve one's professional skills and competencies in the conditions of today's changing world. The structure of the research is presented in Table 1. Parts A and B of the research paper were utilized, where Part A focused on the respondent's profile, and Part B was used to determine the attitude of academic staff related to competencies and work in Higher Education Institutions (HEI) in general.

Table 1. Research structure (Source: Authors' design)

	Description		
Part of the survey	Types of the questions	Evaluation scale	Codes
A: Respondent's profile	Open/Closed	Multiple-choice	A_1-A_5
B: Attitude (10 statements to rate the attitude of academic staff to the work in the HEI and competencies)	Closed	1-completely disagree; 5 - fully agree	B_1-B_10
C: Professional Competence (7 statements to rate aspects related to increasing professional competence)	Closed	Multiple-choice	C_1-C_7
D: Development (15 statements to rate the development of innovative professional competencies)	Closed	1-completely disagree; 5 - fully agree	D_1-D_15

Table 2 displays the comprehensive descriptive statistics of the respondents, providing an in-depth overview of their profiles for future analysis.

Table 2. Descriptive statistics of the respondents (Source: Authors' design)

Criterion	**Response**	**Number of respondents**	**Percentage (%)**
Gender	Male	149	40%
	Female	225	60%
	Others	0	0%
Age in years	20-29	13	3%
	30-39	29	8%
	40-49	103	28%
	50-59	107	29%
	60-64	43	11%
	60+	79	21%
Experience in years	<10	53	14%
	10-19	73	20%
	>20	248	66%

Area of scientific and academic activity	Natural sciences	50	13%
	Technics and technology	88	24%
	Medical sciences	59	16%
	Agricultural sciences	14	4%
	Social sciences	43	11%
	Humanitarian sciences	120	32%

The data in Table 2 illustrates the diversity of respondents, representing various genders, age groups, experience intervals, and scientific disciplines. Descriptive statistics reveal that 40% of the participants in the study are male, while 60% are female. The largest segment of the sample consists of Higher Education Institution (HEI) staff aged 50-59, comprising 107 individuals, equivalent to 29% of the entire sample. Most respondents (66%) reported experience of 20 years, in total 248 participants.

Regarding the field of scientific and academic activity, Humanities account for the highest proportion with 120 respondents, constituting 32% of the total sample. In contrast, Agricultural Sciences have the smallest representation, with only 14 individuals, equivalent to 4% of the total sample size.

In the analysis, the respondent's profile, gender, and area of scientific and academic activity were considered. To test hypotheses, the authors employed the Mann-Whitney U test for gender-related hypotheses and the Kruskal-Wallis test for hypotheses related to the area of scientific and academic activities.

Results

From the survey, part A as a respondent's profile and part B were used. For the analysis of the responses from Part B of the survey, descriptive statistics in SPSS were employed. The results of this analysis are presented below, providing detailed insights into the data collected.

Analysis of the answers of respondents for the B part of the survey, using frequency analysis, revealed the following trends:

- 72% of the respondents evaluated their perception of the work in HEI as prestigious as "4" and "5";
- 75% of the respondents evaluated their satisfaction with their job in HEI as "4" and "5"
- A significant portion of respondents (28%) expresses dissatisfaction with their salary, with only 18% fully agreeing or agreeing that they are satisfied;
- 83% of the respondents rated their existing skills and knowledge as sufficient to perform teaching activities in the current environment;
- 96% of the respondents chose "4" and "5" where they were asked to agree or disagree with the statement that academic staff should regularly improve knowledge and skills to ensure the quality of teaching.

Based on the analysis of the respondent's profile and the descriptive statistics presented earlier, the authors of the research have identified two main hypotheses. The first hypothesis, which pertains to gender, was subjected to testing using SPSS and the Mann-Whitney U non-parametric test. The second hypothesis, focusing on professional competencies in STEM disciplines, underwent testing through the Independent-Samples Kruskal-Wallis Test

H1 - Male academic staff members tend to evaluate their professional competencies as more than sufficient for carrying out teaching duties in the current educational environment compared to females.

To test the first hypothesis, the authors used the Mann-Whitney non-parametric test. 149 male and 225 female respondents were asked to rate their existing knowledge and skills. The question "I agree that my existing knowledge and skills are sufficient to perform teaching activities in the current environment" was based on a Likert scale, from completely disagree to fully agree.

Mann -Whitney non-parametric test showed that there is no statistically significant difference between the gender groups and their evaluation of existing knowledge and skills, as the SPSS report showed the result of Asymp.Sig. (2-tailed) as <.0.075 (as the standard alpha level is 0.05). Based on the calculated results the first hypothesis is rejected.

H2: Academic staff members in STEM disciplines tend to assess their professional competencies as more sufficient for conducting teaching tasks in the present educational context.

For the test of the second hypothesis, the authors used the Kruscal-Vallis Non-parametric test. The results showed that there is no statistically significant difference between academic staff of different disciplines and their evaluation of competencies, as Asymp.Sig. (2-tailed) is .664, (as the standard alpha level is 0.05). Based on the calculations, the hypothesis is rejected.

Conclusions

The primary objective of this paper was to explore the evaluation of skills by academic staff to improve the quality of the administration process in higher education institutions (HEIs) taking into consideration two approaches. Firstly, the authors investigated whether there are statistically significant differences between the genders of academic staff in higher education institutions regarding the evaluation of their skills and competencies. Secondly, the study aimed to determine if there are statistically significant differences in competencies perceived between academic staff of STEM sciences and those with academic experience in other sciences in terms of assessing their professional competencies. The object of research was determined by the impact of self-assessment of professional competencies on the improvement of administrative processes, thus ensuring HEIs in a more cohesive and efficient environment, fostering both staff development and institutional growth.

The critical role that academic staff members' perceptions of their professional competence play in STEM education is underscored by the dynamic nature of this role in response to changing educational demands and HEIs business administration processes. In line with the complexity of modern education and changing market requirements, the historical trajectory of academic professional competence has changed from a limited focus on subject expertise to a more inclusive understanding. The professional competence of academic staff plays a crucial role in creating and sustaining an engaging learning environment, encouraging scholarly innovation, and promoting effective teaching. This has an impact on individual achievements as well as the larger academic community. The idea of cross-cutting skills, that go beyond discipline-specific knowledge, has gained traction, emphasizing the value of adaptability, flexibility, and critical thinking in academic staff development. Moreover, systemic issues contributing to the underrepresentation of women in STEM fields have been uncovered by examining gender differences in perceived professional competence within academia. Stereotypes and higher standards for female faculty, and a decrease in social capital are some of these difficulties. The necessity of ongoing professional development, adaptability, and an inclusive approach to academic competencies are needed in order to guarantee that teachers can successfully negotiate the challenges of contemporary education and make valuable contributions to a lively academic community. The evolving need to improve academic professional competence, especially in STEM education, intersects with the HEI business administration process through a rising need for a multifaceted approach to institution development, introduction of leadership strategies, and continuous adaptation to changing market requirements. Understanding gender differences in perceived professional competence is vital for fostering a diverse environment, enabling effective talent management, and promoting systematic changes which in turn impacts organizational success and innovation leadership.

The first hypothesis was rejected, contrary to the expectation that male academic staff members would tend to evaluate their professional competencies as more than sufficient for carrying out teaching duties in the current educational environment compared to females. However, after testing the hypothesis with

the Mann-Whitney U test, the results indicated that there are no statistically significant differences between genders.

The second hypothesis was also rejected, as the Kruskal–Wallis test showed that there is no statistically significant difference between academic staff in STEM disciplines and representatives from other disciplines.

In addition to the research hypotheses, trends emerged within the responses of the participants. Seventy-two per cent of the respondents rated their perception of work in HEIs as prestigious ('4' and '5'), and 75% assessed their job satisfaction in HEIs similarly. Dissatisfaction with salary was noted by 28%, with only 18% expressing complete satisfaction. Furthermore, 83% believed their current skills were sufficient for teaching. Additionally, 96% strongly supported the concept of continuous improvement for teaching quality assurance.

The study has limitations, as it was conducted specifically in Ukraine. Future research should involve multicultural cross-study to determine differences within different countries.

Acknowledgement

The present paper was designed according to the EKA University of Applied Sciences Scientific Institution project No 16-20.2 "21st century skills" order. The authors are thankful to the International Scientific Group (partner of EKA Scientific Institution) for support in survey forms dissemination in Ukraine.

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ECONOMICS AND CULTURE 21(1), 2024

DOI: 10.2478/jec-2024-0002

UNLOCKING INNOVATION FROM WITHIN: THE POWER OF TACIT KNOWLEDGE AND CHANGE ADAPTABILITY IN INDONESIAN INTERNAL ORGANISATIONAL INNOVATION PROCESSES

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Received 3 January 2024; accepted 21 May 2024

Abstract

Research purpose. The study examines how tacit knowledge sharing affects internal organisational innovation by exploring change adaptability as a mediator. Hence, it tries to fill this gap and further explain the role played by tacit knowledge sharing in the entire knowledge management process. Given the mediating effect of change adaptability, this study aims to provide new insight into effective management and sharing tacit knowledge among organisations to improve their innovation processes.

Design / Methodology / Approach. This study adopted a quantitative cross-sectional survey design, with Partial Least Squares Structural Equation Modeling (PLS-SEM) as the main statistical technique. Such a method is best applied in this research, where one confirms hypotheses and the relationship between observed and latent variables. The samples were selected based on judgmental non-probability and purposive sampling approaches. The SEM was used in data analysis. It contributed to understanding the relationship of the variables, such as sharing tacit knowledge, change adaptability, and internal organisational innovation.

Findings. The study proved that tacit knowledge sharing is highly significant in internal organisational innovation, mediated by change adaptability. Direct effect: Tacit knowledge sharing directly affects the organisational ability to adapt to change and internal innovativeness, thus underpinning its basis. Change adaptability mediates the effect of tacit knowledge sharing on internal organisational innovation, which influences innovation outcomes. Path coefficient analysis confirms the positive influence of tacit knowledge sharing on adaptability to change and innovation. Indirect Effects: Empirical examination has proved the significant mediating effect of change adaptability in leveraging tacit knowledge for innovation. These results suggest that the strategic value of tacit knowledge and adaptability, which will drive sustainable innovation within organisations and support their integration within strategic frameworks, is fully justified.

Originality / Value / Practical implications. This is a new model used for the first time to suggest novel contributions and usefulness in understanding the relationship among sharing of tacit knowledge, change adaptability, and innovation at the internal level of the organisation. Tacit knowledge sharing, combined with change adaptability, is a model for internal organisational innovation. Therefore, it fills an important gap in the existing literature: the quantification of adaptability in mediating the effect of tacit knowledge on innovation. The results of this study will provide empirical validation of these relationships and further contribute to the knowledge in practice, particularly by emphasising the mediating role of change adaptability, which has been relatively underexplored. Practically, tacit knowledge sharing within adaptive organisational environments is thus an important call towards effective adaptation to change. The level of enhancement of these dimensions as core competencies through strategies could make a difference in the success of businesses. The importance of adaptability has to be emphasised by training programs and management practices that would provide the same skills. Other important avenues include those that work towards cultivating supportive organisational cultures that would facilitate tacit knowledge exchange, support employee interaction and informal knowledge exchange, and

measures to reward innovation efforts. Investment in human resources practices that encourage learning and adaptability will continue to encourage knowledge sharing and innovation, including improving training programs, offering mentorship opportunities, and developing performance management systems that support and reward behaviours around innovation. This study contributes to the literature with a developed framework and empirical examination of the interrelations between tacit knowledge sharing, change adaptability, and innovation. It provides practical strategies that can be of value to the organisation in enhancing innovation capabilities through knowledge management.

Keywords: tacit knowledge sharing; internal organisation innovation, change adaptability, white-collar employee, mediating variable.

JEL codes: M53, M59.

Introduction

The Fourth Industrial Revolution is propelled by various key technologies such as augmented reality, automation, robotics, additive manufacturing, renewable energy, cloud computing, blockchain, sensors, analytics, machine learning, artificial intelligence, and virtual reality. These technologies drive connectivity, analytics, automation, and advanced manufacturing, reshaping global business (McKinsey Explainers, 2022).

In 2024, successful implementation relies heavily on reskilling and upskilling the workforce to meet changing job demands. This includes retraining for new roles (reskilling) and acquiring additional skills for current positions (upskilling). The process involves identifying necessary skills, designing talent development programs, and implementing relevant content (McKinsey Explainers, 2022). Upskilling improves existing skills, while reskilling prepares individuals for new roles. Both approaches are guided by agility, personalisation, and forward-thinking. Agility ensures adaptability to changing circumstances, personalisation tailors learning to individual needs, and forward-thinking anticipates future trends.

Organisational Learning Theory, widely discussed in academic literature, encompasses various facets: the socio-organizational context of acquiring new knowledge, individual-level learning factors, macro-environmental influences on knowledge application, and the effects of innovation on subsequent learning processes (Berta et al., 2015). This theory emphasises how organisations adjust behaviours based on goals and experiences (Greve, 2020), involving a dynamic process of acquiring, sharing, applying, and remembering knowledge to enhance organisational behaviour and maintain competitive advantage (Chen & Zheng, 2022). It also addresses the balance between explorative and exploitative innovations within organisations (Ferreira, 2020) and outlines processes such as intuiting, interpreting, integrating, and institutionalising knowledge at individual, group, and organisational levels (Easterby-Smith et al., 2000). Organisational Learning Theory is instrumental in understanding how organisations attain competitive advantage by integrating learning with high-performance work systems and entrepreneurial orientation (Liu et al., 2019). Furthermore, it explains the development of competitive advantage through the convergence of knowledge-based theory and dynamic capabilities theory (Kreiser, 2011).

Organisational innovation processes are vital for companies to drive internal change and foster a culture of creativity and continuous improvement. These processes involve adopting new technologies, developing products/services, enhancing existing processes, and nurturing employee creativity. (McKinsey Explainers, 2022). An innovation-oriented approach benefits companies by enhancing flexibility in responding to potential changes, seizing opportunities as they arise, and ultimately gaining a competitive edge by developing superior products and services (Cabello, 2022; Kucharska & Rebelo, 2022). Innovation holds significant importance globally as it enables the creation of competitive goods and services, enhances public services' efficiency, and improves social activities (Khan & Khan, 2019; Phung et al., 2021). A significant body of knowledge underscores the importance of studying process innovation, especially in resource-constrained and institutionally weak contexts (Cabello, 2022; Kucharska & Rebelo, 2022). Despite its significance, organisations often overlook the innovative internal organisational process (Dedahanov et al., 2017).

Tacit knowledge sharing plays a crucial role in driving internal innovation within organisations. Ganguly et al. (2019) emphasizes its significance, noting how social capital precedes tacit knowledge sharing and influences an organisation's innovation capability. This importance is reinforced by Kmieciak (2020) and Maurseth & Svensson (2020), who suggest that tacit knowledge sharing has a greater impact on firms' innovation performance than explicit knowledge sharing. Complementing explicit sharing, tacit knowledge sharing is crucial for introducing external innovations and improving internal processes (Kucharska & Erickson, 2023). Its role in enhancing psychological capital and breakthrough innovation is highlighted by R. Hu et al. (2023). Additionally, L. Hu & Randel (2014) note its mediation between cognitive, social capital and team innovation, while Andriani & Nasution (2020), Harjanti & Halim, (2022), Kucharska (2021) stress its significant contribution to the innovation process within companies. Together, these findings underscore the critical role of tacit knowledge sharing in facilitating knowledge transfer, improving team dynamics, and fostering a culture of innovation within organisations.

Tacit knowledge sharing significantly enhances organisational adaptability to change. Holste & Fields (2010) show that affect-based trust drives the willingness to share tacit knowledge, which is crucial for adaptation. Wang et al. (2021) note that individual attitudes like enjoyment and self-efficacy positively influence tacit knowledge sharing. Al-Zoubi et al. (2019) find that sharing tacit knowledge improves employees' adaptability and innovation in changing work environments. Furthermore, L. Hu & Randel (2014) suggest that tacit knowledge sharing mediates the relationship between social capital and team innovation, enhancing teams' adaptability. Enwereuzor (2021) highlights the positive correlation between diversity climate, workplace belongingness, and tacit knowledge sharing, emphasising organisational culture's role in promoting adaptation.

Scholarly works underscore the importance of tacit knowledge sharing in fostering organisational adaptability. Trust, individual attitudes, organisational culture, and social capital are key factors promoting tacit knowledge sharing, which is crucial for adapting to dynamic environments. Kucharska & Erickson (2023) conducted a study in Poland examining the relationship between tacit knowledge and innovation. They focused on understanding how individuals acquire tacit knowledge, particularly through "learning by doing" and "learning by interaction," and how these forms of learning foster knowledge sharing, ultimately supporting innovation in processes and products/services. Additionally, Kucharska & Rebelo (2022) identified knowledge gaps regarding the impact of transformational leadership on internal and external innovation within scientific institutions. They also investigated key factors contributing to innovation, including organisational learning culture, tacit knowledge sharing, and change adaptability, which is essential for successful innovation implementation. Understanding how these factors interact and influence scientific development is crucial.

Adaptability is crucial for fostering internal process innovation within organisations. Firican (2022) emphasises the need to balance standardisation and adaptability effectively to drive internal changes. Internal change agents, as highlighted by Volberda et al. (2014), play a significant role in promoting the adoption of management innovation. However, organisations may face tensions as they navigate competitive and complex environments (Smith et al., 2017). Absorbing external knowledge and leveraging internal resources are essential for driving innovation (Alexander et al., 2020). This dual-channelling perspective enhances overall innovation performance at the process level (Alexander et al., 2020). Cultivating a culture of continual improvement, as emphasised by Cela et al. (2019), is vital for adapting to internal and external changes.

Innovation capacity enables organisations to adapt and promote flexible thinking (Zhang et al., 2022). Organisations drive management innovation by internalising external knowledge and leveraging relationships with external change actors, especially in microenterprises (Chapelon et al., 2018). This internalisation significantly impacts management innovation generation (Chapelon et al., 2018). Organisations that balance internal and external knowledge, empower internal change agents, and foster continual improvement are better positioned to drive innovation and adapt to dynamic environments.

Adaptability is a crucial mediator across diverse contexts, influencing decision-making and processes. In organisational climate change adaptation, perceived risk mediates between environmental attitudes, climate change knowledge, and adaptation importance (Bremer & Linnenluecke, 2016). Among civil

servants, adaptability mediates the link between managerial climate factors and change readiness (Yean et al., 2022). In psychology, it fully or partially mediates connections between personality traits, social support, and psychological well-being (Holliman et al., 2022; Vincent et al., 2024), reflecting its significance in individual reactions to internal and external factors. Prior scholarly works show adaptability is a pivotal mediator in decision-making, organisational change, individual well-being, and healthcare outcomes. Its mediation of various relationships underscores its importance in facilitating adjustments, enhancing resilience, and responding to changing environments.

This study aims to examine the critical but under-researched nexus—the interplay between tacit knowledge and organisational adaptability to change. It clearly sets the framework for its relevance within the wider ambit of organisational learning and innovation, highlighting how these components can leverage competitive advantage and improve organizational processes, specifically in dynamic environments. This gives way to a framework of relevance within the wider ambit of organisational learning and innovation, which underlines how these components can be used for competitive advantage and improvement in organisational processes, specifically in dynamic environments. This context framing shall underline the importance of exploring the dynamics that exist amid tacit knowledge and adaptability in the organisational setting.

This study fills an important gap in the existing literature regarding tacit knowledge sharing and internal organisational innovation while focusing on the mediating role of change adaptability. It extends the debate on how tacit knowledge, once managed, and shared well, fosters innovation within organisations. In a sense, the consideration of adaptability as mediating between tacit knowledge and internal organisational innovativeness is quite novel concerning the mechanisms of innovation within organisational contexts.

The rationale of the study is to empirically examine the complexity of the relationship between tacit knowledge sharing and internal organisational innovation in which change adaptability acts as a pivotal mediator. This objective represents efforts to shed light on how tacit knowledge affects innovation processes and offers unique insights to help organisational strategists and practitioners. Such an in-depth empirical analysis would thus bring out a much more nuanced understanding of the factors associated with organisational innovation.

The current research used a quantitative cross-sectional survey method. This quantitative approach permits the hypothesised relationships in this study to be tested rigorously and affords greater exactness in results regarding tacit knowledge sharing, adaptability to change, and organisational innovation. Therefore, the current research study is capable of having better rigour and validity in the findings.

These research results would, in effect, help provide important knowledge on the dynamics of sharing tacit knowledge and organisational adaptability. First, it confirms that the substantial impact of sharing tacit knowledge contributes to organisational innovation either directly or indirectly through its influence on changes in adaptability. It underlines the strategic importance of effectively managing and sharing tacit knowledge in underpinning organisational capabilities. This, in turn, underscores yet another important role of change adaptability as a critical mediator in amplifying innovative outcomes originating from tacit knowledge sharing. The mediation logic is that while organisational adaptability supports the realisation of innovation through tacit knowledge sharing, it further amplifies the innovative potential which underlies tacit knowledge.

The significance is that the study would have practical implications for organisations interested in creating environments that would naturally foster the sharing of tacit knowledge and being adaptive in their operations. Major recommendations include investments in training that are tailor-made for individuals and the creation of mentorship opportunities, as well as investments in performance management systems that reward and recognise innovative behaviours inspired by tacit knowledge all of which bring the findings together into a single tapestry: theoretical advances and practical understandings of the internal innovation processes of organisations.

Literature Review

Organisational Learning Theory

Organisational learning is crucial in management theory, focusing on how organisations improve over time through absorbing, cultivating, and sharing knowledge. It's essential for maintaining competitiveness, fostering innovation, and navigating change. Practically, organisations facilitate learning through practices like using learning management systems, fostering a culture of growth, and employing strategic methodologies like scenario analysis. However, hurdles such as inertia and balancing exploration with exploitation exist (Crossan et al., 1995; Crossan et al., 1999; Robinson, 2001). The 4I Framework (Crossan et al., 1995; Easterby-Smith et al., 2000; Crossan et al., 1999), offers insight into organisational learning at individual, group, organisational, and inter-organizational levels. At the individual level, Intuiting involves recognising patterns and possibilities not immediately obvious to others. Interpreting occurs as individuals communicate insights, facilitating discussion and reflection. Integrating at the group level synthesises individual interpretations into shared understanding and coordinated action. Institutionalising at the organisational level embeds learned knowledge into systems and culture (Crossan et al., 1995; Easterby-Smith et al., 2000; Crossan et al., 1999).

Internal Organisational Innovation

Internal organisational innovation encompasses fostering creativity, developing ideas, and implementing changes to boost efficiency, effectiveness, and competitiveness. This involves internal R&D, knowledge acquisition, and process innovations, as highlighted by Cassiman & Veugelers (2006) and Damanpour et al. (2009). Factors like communication, leadership, and integrating internal and external knowledge influence organisational creativity and innovation, as noted by Fu (2020) and Gumusluŏlu & Ilsev (2009). External collaborations and networks also significantly contribute to organisational innovation, complementing internal efforts (Haned et al., 2014) and driving radical innovations (Perin et al., 2016). By nurturing creativity, encouraging knowledge sharing, and leveraging resources, organisations enhance their innovative capabilities for sustainable competitive advantage (Kising'U et al., 2016).

Innovation is vital for organisational goals, involving introducing new ideas or methods to improve competitiveness. As defined by Phung et al. (2021), process innovation entails novel or significantly improved production or delivery methods. Kucharska & Rebelo (2022) distinguish between internal and external innovation types, with internal innovation focusing on enhancing organisational performance through elements like management structure and employee involvement. It relies on organisational routines and tacit knowledge, reducing costs and increasing market competitiveness, as suggested by Goel & Nelson (2018). Fazil (2018) identifies five factors influencing the speed of process innovation, including continuous improvement and adaptability to regulations. External innovation aims to renew research for broader societal benefits, demonstrating innovation's diverse scope and impact within and beyond organisational boundaries.

Change Adaptability

Employee adaptability, crucial in dynamic work environments, involves adjusting to changing conditions, whether gradual or rapid. It combines knowledge, skills, and attitudes to anticipate and respond to work-related changes. Adaptability enhances employees' confidence in overcoming challenges and improves their performance and workplace flexibility (Kucharska & Rebelo, 2022; Park & Park, 2019, 2021). Key dimensions include stress management, handling uncertainty, flexibility, resilience, problem-solving abilities, with indicators like ease of adjustment and familiarity with change.

Adaptability yields positive outcomes for individuals, improving skills and career success while benefiting organisations by aiding change management, fostering learning, and meeting customer expectations. Organisational factors promoting adaptability include a clear vision, innovative culture, support, and a learning environment (Kucharska & Rebelo, 2022; Park & Park, 2019, 2021). In the workplace, adaptability involves behaviours for handling unexpected situations and job demands, such as learning new tasks, dealing with uncertainty, and creative problem-solving. This research extends adaptability beyond customer interactions, focusing on how employees adapt to general work demands

like learning new technology or tasks and interpersonal aspects of the job. It also underscores factors like schedule flexibility and career development opportunities (Kim et al., 2022).

Tacit Knowledge Sharing

Tacit knowledge, comprised of insights and experiences not easily articulated or documented, is typically acquired through learning processes like observation, imitation, and modelling (Jones, 2013; Maurseth & Svensson, 2020). This knowledge often requires personal, face-to-face interactions for effective transfer. Sharing tacit knowledge through physical interactions positively impacts team performance, with peer interactions facilitating more effective access to tacit knowledge than formal knowledge management systems (Hatjidis et al., 2019; Olaisen & Revang, 2018). This informal sharing is crucial for organisational tasks like creating new knowledge, developing products, and fostering innovation.

Tacit knowledge serves as a valuable organisational asset, difficult for competitors to replicate. It plays a vital role in change management, enhancing adaptability and innovation. Kucharska & Rebelo (2022) identify its dimensions as fostering innovation, relating to new knowledge, influencing perceptions, and changing the environment. Indicators of tacit knowledge include sharing personal experiences, learning from others, receiving new ideas from colleagues, and participating in discussions about best practices, reflecting its integral role in organisational success and innovation.

The Relationship between Tacit Knowledge Sharing and Change Adaptability

Tacit knowledge, which involves sharing unspoken knowledge, influences change adaptability, defined as employees' ability to adjust to evolving work conditions, whether rapidly or gradually changing. Research reveals that tacit knowledge positively impacts adaptability (Kucharska & Rebelo, 2022). Tacit knowledge is similar to new knowledge and can influence perceptions, leading to changes in thinking and actions, ultimately enhancing the capacity to adapt to organisational changes through altered perceptions (Kucharska & Rebelo, 2022).

In another study, the relationship between tacit knowledge and change adaptability is discussed by Suhana et al. (2020). Organisational learning, which includes tacit knowledge, is found to have a positive link with employee adaptability, a component of change adaptability. Organisational learning helps identify disruptive technologies, fostering employee innovation and improving innovation processes. Employees who adapt to new work requirements show more effective adaptability, demonstrating confidence in handling evolving tasks and conditions (Suhana et al., 2020). Based on these findings, the following hypothesis is proposed:

H1: Tacit knowledge sharing significantly influences change adaptability.

The Relationship between Tacit Knowledge Sharing and Internal Organizational Innovation

Tacit knowledge, which is personal knowledge gained through experience, can drive innovation in companies (Berraies et al., 2020). Knowledge workers with tacit knowledge have a deeper understanding and confidence in their knowledge, evolving from situational solutions to intuitive insights (Kucharska & Erickson, 2023). This confidence and recognition of its relevance lead to better knowledge application and sharing. Self-confidence, influence, and social capital also play roles in knowledge-sharing (Kucharska & Erickson, 2023). When individuals are confident in their knowledge and see its value for the organisation, they are more likely to share it.

Tacit knowledge significantly impacts the innovation process, improving daily work operations from an employee's perspective (Kucharska & Rebelo, 2022). It differentiates between process innovation (methods) and product innovation (results) (Kucharska & Erickson, 2023). Internal organisation innovation in companies refers to innovative work methods that can lead to product or service innovation (Kucharska & Rebelo, 2022). To foster innovation, companies in Indonesia need to develop internally. Therefore, the hypothesis can be drawn that tacit knowledge positively influences internal organisational innovation. Based on previous research findings, the proposed research hypothesis is:

H2: Tacit knowledge sharing significantly influences internal organisational innovation.

The Relationship between Change Adaptability and Internal Organizational Innovation

Smith and Webster (2018) highlight adaptation as a crucial driver of innovation, asserting that innovation requires individuals to actively monitor and modify their thinking and behaviour to enhance existing processes or introduce new concepts. This conscious and deliberate adaptation is a necessary precursor to innovation, making both concepts interdependent. They emphasise that higher self-perceived adaptability motivates individuals to take risks, confidently present their ideas, and act innovatively and convincingly to justify their innovations to others.

Exploring this relationship further, Nguyen et al. (2019) discuss how change adaptability within organisational culture positively affects employee innovation, particularly in Vietnam's technology industry. Similarly, research in the Vietnamese IT industry investigates the relationship between various aspects of organisational culture (including adaptability) and employee innovation (Smith & Webster, 2018). Their study establishes a significant link between adaptability and innovation. These findings lead to the proposal of a hypothesis emphasising the integral role of adaptability in fostering innovation within organisational settings (Smith & Webster, 2018).

H3: Change adaptability significantly influences internal organisational innovation.

The Impact of Tacit Knowledge Sharing on Internal Organizational Innovation with Change Adaptability Serving as a Mediating Variable

Change adaptability can mediate the relationship between tacit knowledge and internal organisational innovations. It means that employees' tacit knowledge can enhance their adaptability, which, in turn, can stimulate internal organisational innovation (Kucharska & Rebelo, 2022).

Previous research has explored the concept of change adaptability as a mediating factor in the relationship between the absorptive capacity of knowledge (similar to tacit knowledge) and innovation in organisations (Martínez-Sánchez et al., 2020). In this study, flexibility in human resources was considered a mediating variable (Martínez-Sánchez et al., 2020). Given these findings, this study proposes the following hypothesis and research framework (see Figure 1):

H4: Tacit knowledge sharing significantly influences internal organisational innovation when mediated by change adaptability.

Research Methodology

Research Design and Approaches

This research involved a cross-sectional survey with a quantitative approach with partial least square structural equation modelling (PLS-SEM) in justifying the novel conceptual framework and proposed hypothesis. In particular, this study confirms that tacit knowledge sharing significantly influences internal organisational innovation when mediated by change adaptability. This study was conducted in Greater Jakarta, Indonesia, the capital city of Indonesia. In addition, the research model in this paper is provided in Figure 1. From the figure, it can be explained that the research model is formed from preliminary papers and relevant underpinning theories.

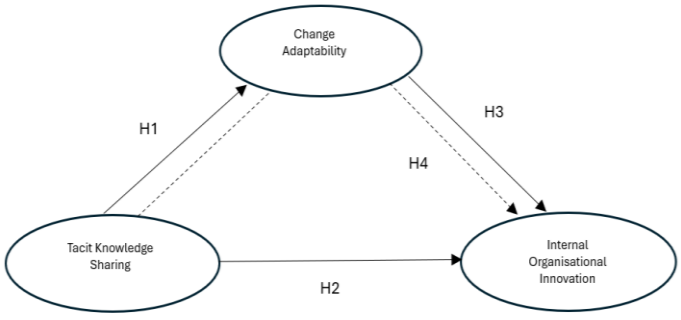

Fig. 1. Research framework (Source: Authors' research)

Data Collection

For this research, a convenience sample of 302 employees in Greater was employed to represent the relationship of tacit knowledge sharing, change adaptability and internal organisational innovation. This sampling method was chosen because the sampling frame is unavailable and due to its relative speed and ease. However, care was taken to avoid bias in acquaintance with the sampling approach. The data collection process was initiated by distributing online questionnaires in Google Forms to respondents using email addresses, LinkedIn, and WhatsApp Groups, with the colleagues being asked to complete the questionnaires voluntarily. At the initial stage, we distributed 350 online questionnaires to the respondents, and we collected back these questionnaires for further analysis. During this process, we removed approximately 48 incomplete questionnaires and outliers, which were determined using the Rasch Model, specifically Person Measure Analysis, with the assistance of WINSTEPS software version 5.2.1.0 (Boone et al., 2014; Sumintono, 2014). At this stage, we had a 94.2 per cent response rate, which is a good response. The study was performed from January until August 2023, and it was followed up two weeks later. The criteria of respondents in this research were employees with at least one year of work experience.

Research Instrument

The research instrument in this study (Table 1) was created by thoroughly reviewing relevant literature and prior research. The questionnaire items, shown in Table 1, are specifically designed to assess tacit knowledge sharing, innovative work behaviour, and transformational leadership, and it is structured into three sections. Tacit knowledge sharing was adapted from Kucharska (2021), while change adaptability was taken from Kucharska & Bedford (2019; 2020). Lastly, internal organisation innovation was adopted from the works of Kucharska (2021). The study will use a questionnaire to gather data and a five-point Likert scale for measurement.

Table 1. Research instrument items (Source: Authors' research)

Construct		Item
Tacit Knowledge Sharing (Kucharska, 2021)	TKS1	I share knowledge from my own experience.
	TKS2	I learn from others' experiences.
	TKS3	Colleagues share new ideas with me.
	TKS4	Colleagues involve me in discussions about best practices.
Change Adaptability (Bedford & Kucharska, 2019, 2020)	C1	I am flexible when faced with change.
	C2	I can adapt to changes.
	C3	I easily embrace changes.
	C4	I am accustomed to changes.
Internal Organisational Innovation (Kucharska, 2021)	II1	We consistently enhance our work processes.
	II2	We excel at handling changes.
	II3	We are enthusiastic about implementing new methods, procedures.
	II4	We are highly receptive to new regulations.

Data Analysis

The data analysis method used is structural equation modelling (SEM). This approach allows researchers to test models that capture the hierarchical nature of constructs, providing a more detailed understanding of the relationships among both observed and latent variables (Ghozali, 2021; Hair et al., 2019; Sarstedt et al., 2014)The analysis will be conducted using SMARTPLS 3.2.9 software. It aims to enhance our understanding of observed and latent variable relationships and contribute to a comprehensive view of the research model.

Common Biased Method

To address common method bias in self-report questionnaires, researchers can utilise the Rasch Model (Boone et al., 2014; Sumintono, 2014). Person Measure Analysis, a specific technique within this framework, helps identify biases in respondents' answers. Acceptable MNSQ (Mean Square) values, typically ranging from 0.5 to 1.5, indicate unbiased responses. By scrutinising MNSQ values within this

range, researchers can assess questionnaire reliability and validity, thereby mitigating the impact of common method bias and enhancing the credibility of the research (Boone et al., 2014; Sumintono, 2014). The study employed the Rasch Model, specifically Person Measure Analysis, with the assistance of WINSTEPS software version 5.2.1.0.

Results

Respondents' Profile

The study examined 302 respondents with several demographic factors, including gender, age range, education level, job level, and length of work. Regarding gender, the respondents were divided into men and women, with 59.9% female and 49.1% male. The age range of respondents was categorised as follows: 19 - 20 years (11.2%), 21 - 30 years (50.6%), 31 - 40 years (33%), 41 - 50 years (4.2%), and more than 50 years (0.9%). Regarding education level, 62.7% held a Bachelor's degree, 17.6% had education levels at high school and equivalent, 14.8% had a Diploma 1-4, and 4.8% had a Master's education and above. Job levels varied among respondents, with 14.8% at the Associate Manager - Manager level, 1.8% at the Director level, 1.5% at the Senior Manager - General Manager level, 36.1% at the Staff - Officer level, 23% as Supervisors, and 22.7% in non-permanent/contract/internship positions. Regarding length of work, 40.3% had worked for less than 5 years, 43.9% for less than 10 years, 13.9% for less than 20 years, and 1.8% for more than 20 years. Most respondents had worked for less than 10 years (43.9%).

Measurement Model Analysis

The data analysis method used is structural equation modelling (SEM). According to the existing literature, an indicator is considered significant if its loading factor surpasses 0.70 (Ghozali, 2021; Sarstedt et al., 2014). Additionally, it is essential to assess the internal consistency reliability of the model using two metrics: composite reliability and Cronbach's alpha. Both metrics should have a value of at least 0.50 to establish reliability, as indicated by the same sources. Moreover, to establish convergent validity, the average variance extracted (AVE) must be considered, with a threshold of 0.50 or higher (Ghozali, 2021; Sarstedt et al., 2014).

Table 2 shows discriminant validity, which involves comparing factors with cross-loading to assess the distinctiveness of the research construct. The test requires a cross-loading value of > 0.70 for each variable (Musyaffi et al., 2022; Ghozali, 2021). The table results indicate that all indicators for each variable in this study have cross-loading values exceeding 0.70 (> 0.70), meeting the criteria for discriminant validity testing (Ghozali, 2021; Sarstedt et al., 2014).

Table 2. Measurement model analysis (Source: Authors' research)

Latent Variable	Item	Loading Factor	Cronbach's Alpha	Composite Reliability	AVE	Remark
		(>0.7)	(>0.6)	(≥0.6)	(≥0.5)	
Tacit Knowledge Sharing	TKS1	0.787	0.781	0.859	0.604	Valid and Reliable
	TKS2	0.729				
	TKS3	0.769				
	TKS4	0.821				
Change Adaptability	CA1	0.805	0.817	0.879	0.645	Valid and Reliable
	CA2	0.791				
	CA3	0.785				
	CA4	0.832				
Internal Organisational Innovation	II1	0.799	0.805	0.873	0.632	Valid and Reliable
	II2	0.756				
	II3	0.811				
	II4	0.812				

Table 2 also shows Composite Reliability measures the reliability of indicators, with a minimum

acceptable value for exploratory research being 0.60 - 0.70. The table reveals that all variables' Composite Reliability test results exceed 0.60 (> 0.60), indicating that all variables meet the Composite Reliability criteria. Cronbach's Alpha assesses the reliability of a construct by measuring internal consistency among indicators. A minimum Cronbach's Alpha value greater than 0.60 (> 0.60) is acceptable for exploratory research. The table shows that the Cronbach's Alpha value for all variables is greater than 0.60 (> 0.60), confirming that all variables meet the requirements for further testing. The construct validity of the study is supported by the results of the Average Variance Extracted (AVE) values, as shown in Table 2. The Average Variance Extracted (AVE) test requires a value greater than 0.50 (> 0.50) to ensure that items adequately cover all aspects of the construct. The table results show that each variable in this study has an AVE value exceeding 0.50 (> 0.50), indicating that all variables meet the AVE criteria (Ghozali, 2021; Musyaffi et al., 2022).

Table 3. The Fornell-Larcker Criterion (Source: Authors' research)

Construct	Change Adaptability	Internal Organisational Innovation	Tacit Knowledge Sharing
Change Adaptability	0.803		
Internal Organisational Innovation	0.692	0.795	
Tacit Knowledge Sharing	0.718	0.749	0.777

The Fornell-Larcker Criterion (Table 3) is a method that compares the square root value of the Average Variance Extracted (AVE) for each construct with the correlations between other constructs in the model. To pass the test, the value should exceed 0.50 (> 0.50) (Ghozali, 2021; Sarstedt et al., 2014). Based on the table above (Table 3), it can be concluded that all variables in this study have Fornell-Larcker Criterion values exceeding 0.50 (> 0.50), indicating that they are all valid according to the Fornell-Larcker Criterion test.

Table 4. The Heterotrait-Monotrait Ratio Values (HTMT) (Source: Authors' research)

Construct	Heterotrait-Monotrait Ratio (HTMT)
Tacit knowledge sharing → Change Adaptability	0.850
Change Adaptability → Internal Organisational Innovation	0.944
Tacit knowledge sharing → Internal Organisational Innovation	0.897

To establish excellent discriminant validity, the Heterotrait-monotrait Ratio (HTMT) value should be less than 0.90 (<0.90) as mentioned in Table 4. Based on the table above, it can be concluded that the results of the Heterotrait-monotrait Ratio (HTMT) test between variables are very good, as they are all less than 0.90 (<0.90). This confirms that they meet the requirements for the Heterotrait-monotrait Ratio (HTMT) test (Ghozali, 2021; Sarstedt et al., 2014).

Structural Model Analysis

The R-square value often represented as R^2, is a statistical measure that indicates the proportion of variance in a dependent variable that is predictable from the independent variables. According to Artanto et al. (2021), The R-square value can be categorised as high if it reaches 0.75, moderate if it reaches 0.5, and low if it reaches 0.25.

Table 5. R-Square (Source: Authors' research)

Construct	R-Square
Change Adaptability	0.516
Internal Organisational Innovation	0.610

Table 5 and Figure 2 show that The R-square value is 0.516. This suggests that the independent variables included in the model can explain approximately 51.6% of the variance in Change Adaptability. This

R-square value means that 51.6% of the variation in the construct Change Adaptability can be explained by the variables that were included in the model (Ghozali, 2021; Sarstedt et al., 2014).

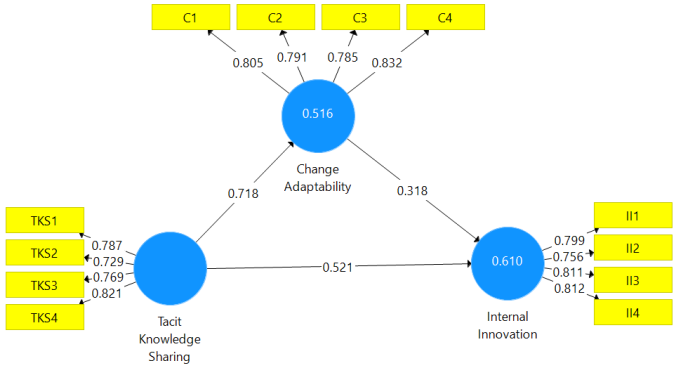

Fig. 2. Path coefficients (Source: Authors' research)

The R-square value is 0.610, indicating that the independent variables in the model explain about 61.0% of the variance in Internal Organisational Innovation. Statistically, these values indicate a moderate to substantial level of explanation of the dependent variables by the predictors, signifying a good fit for the models used to analyse these constructs. For this construct, an R-square value of 0.610 means that 61% of the variation in Internal Organisational Innovation can be explained by the predictors in the model. This implies that the model does a reasonably good job of capturing the influences on this aspect of the organization (Ghozali, 2021; Sarstedt et al., 2014).

Hypothesis Testing

The analysis of the outer loadings, as presented in Table 6, validates all construct indicators within the model. This validation is supported by the T-statistics values, which exceed the critical value of 1.96 and demonstrate statistical significance at the 0.05 level.

Table 6 shows that the results of the path coefficient analysis reveal The Path Test results that show that tacit knowledge sharing significantly influences change adaptability, with a T-statistic of 16.786 (> 1.96) and a P-value of 0.000 (< 0.05). This influence is moderate to strong, accounting for 71.8% of the variance, while 28.2% is attributed to other variables. Hence, H1 is statistically supported. It means that *tacit knowledge sharing significantly influences change adaptability*. It implies that tacit knowledge sharing, which is often informal and not codified, plays a significant role in enabling organisations to adapt and innovate. This aligns with Organizational Learning Theory, which posits that tacit knowledge is crucial to an organization's learning capability. The findings support previous studies by Kucharska & Rebelo (2022) and Suhana et al. (2020) which found a significant impact of tacit knowledge sharing on change adaptability.

Table 6. Path coefficients (Source: Authors' research)

Hypothesis	Original Sample (O)	T Statistics (|O/STDEV|)	P Values	Results
TKS → CA	0.718	16.786	0.000	H1 Accepted
TKS → II	0.521	6.544	0.000	H2 Accepted
CA→ II	0.318	3.625	0.000	H3 Accepted
TKS → CA → II	0.228	3.522	0.000	H4Accepted

Notes: CA: Change Adaptability; II: Internal organisational innovation; TKS: Tacit Knowledge Sharing

Tacit Knowledge Sharing similarly has a significant impact on the internal organisational innovation process, with a T-statistic of 6.544 (> 1.96) and a P-value of 0.000 (< 0.05). This influence is moderate to strong, accounting for 52.1% of the variance, while 64.5% is attributed to other variables. The data analysis can also support H2 statistically, meaning *tacit knowledge sharing significantly influences*

internal organisational innovation. The results can support previous studies by Berraies et al. (2020) and Kucharska & Erickson (2023) that highlight the positive impact of tacit knowledge sharing on internal organisational innovation in various industries.

The robust positive connections outlined in the hypotheses, particularly H1 (Tacit Knowledge Sharing → Adaptability) and H2 (Tacit Knowledge Sharing → Innovative Capabilities), affirm the notion that tacit knowledge exchange within an organization is pivotal for fostering both adaptability and innovation. This underscores the importance of environments that foster tacit knowledge exchange, bolstering organizational capacity to adapt and innovate. These findings align with and enrich existing theories on organizational learning and knowledge management.

Change adaptability significantly affects internal organisational innovation, with a T-statistic of 3.625 (> 1.96) and a P-value of 0.000 (< 0.05). This influence is moderate, explaining 31.8% of the variance, leaving 68.2% explained by other factors. The data analysis can support H3 statistically. It implies that *change adaptability significantly affects internal organisational innovation*. The results align with prior research by Smith & Webster (2018) and Nguyen et al. (2019), emphasizing the significant influence of transformational leadership on innovative work. The significant paths from tacit knowledge sharing to change adaptability and then from change adaptability to internal organizational innovation imply a continuous and iterative learning process within organizations. This reflects the Organizational Learning Theory's emphasis on continuous improvement and adaptation through learning loops, where knowledge is constantly being created, transferred, and utilized. The strong statistical support for these paths underscores the strategic importance of organizational learning capabilities. It highlights how deliberate enhancements in knowledge sharing and adaptability can lead to substantial improvements in innovation, thus providing a competitive edge.

Based on the indirect effect test results in the table above, the result shows that the T statistics exceed 1.96 (3.522 > 1.96), indicating their significance. Additionally, the P values are less than 0.05 (0.000 < 0.05), also indicating significance. Therefore, the results can conclude that the mediator variable in this hypothesis is acceptable and exerts a significant influence. The original sample test result shows a 22.8% influence by the mediator variable, which is moderate, with the remaining 77.2% influenced by other variables not examined in this research. The data analysis can also support H4 statistically. This implies that *there is a significant relationship between tacit knowledge sharing and internal organisational innovation through change adaptability as a mediator*. The fact that change adaptability acts as a mediator in the relationship between tacit knowledge sharing and internal organisational innovation suggests that learning processes (in this case, adaptability) are essential for transforming knowledge into actionable innovative practices. This supports the theory's claim that organisational learning mechanisms are vital for effectively responding to environmental changes. The results align with several studies Kucharska & Rebelo (2022); Martínez-Sánchez et al. (2020). These studies generally find that tacit knowledge sharing positively influences the internal organizational innovation process, with change adaptability mediating this relationship.

The validation of Hypothesis 3 (Change Adaptability → Internal Organisational Innovation) and Hypothesis 4 (Tacit Knowledge Sharing → Change Adaptability → Internal Organisational Innovation) underscores the pivotal role of change adaptability as a mediator between tacit knowledge sharing and internal organizational innovation. This suggests that not only does adaptability directly influence innovation, but it also amplifies the impact of tacit knowledge on innovation outcomes. By illustrating this mediation model, the study enriches existing theoretical frameworks, showing how adaptability is a crucial relationship between knowledge management processes and innovation outcomes.

Discussion

Theoretical Implications

The findings emphasise the importance of organisations considering the direct impact of knowledge sharing on performance outcomes and the pathways through which this influence unfolds. The highlighted pathway via change adaptability calls for a nuanced approach to strategic planning and organisational behaviour models, where nurturing adaptability becomes crucial for maximising the

benefits of tacit knowledge. Furthermore, the results extend current knowledge management theory by quantifying the influence of tacit knowledge sharing on subsequent organisational functions and outcomes. By empirically validating these relationships, the study supports theoretical models advocating integrating knowledge management practices with strategies for organisational adaptability to drive innovation.

The study demonstrates the significant role of tacit knowledge, often informal and uncodified, in enabling organisations to adapt and innovate. This aligns with Organizational Learning Theory, which underscores tacit knowledge as vital to an organisation's learning capability. Moreover, the mediation role of Change Adaptability between Tacit Knowledge Sharing and Internal organisation innovation implies that learning processes, such as adaptability, are pivotal for translating knowledge into actionable innovative practices. This underscores the theory's assertion that organisational learning mechanisms are crucial for effectively responding to environmental changes.

The identified paths, from Tacit Knowledge Sharing to Change Adaptability and subsequently to Internal organisation innovation, suggest a continuous and iterative learning process within organisations. This mirrors Organizational Learning Theory's emphasis on continuous improvement and adaptation through learning loops, where knowledge is perpetually created, transferred, and utilised. The robust statistical support for these pathways underscores the strategic significance of organisational learning capabilities. It underscores how deliberate enhancements in knowledge sharing and adaptability can lead to substantial improvements in innovation, thereby providing a competitive advantage.

These insights reaffirm the foundational tenets of Organizational Learning Theory and extend its application by empirically illustrating how specific types of knowledge-sharing influence organisational dynamics and outcomes. This underscores the importance of fostering an environment where tacit knowledge is freely shared, and adaptability is recognised as a key learning process, directly contributing to innovation and strategic flexibility.

Practical Implications

The research underscores the critical role of tacit knowledge sharing in fostering change adaptability and internal organisational innovation, accounting for 71.8% and 52.1% of the variance, respectively. To prioritise tacit knowledge sharing, organisations should cultivate an environment conducive to informal knowledge exchange, supported by formal and informal learning opportunities, mentorship programs, and collaborative workspaces. Investment in communication tools is essential to facilitate seamless knowledge sharing, and integrating knowledge sharing into performance management systems reinforces its importance.

Change adaptability, mediating the relationship between tacit knowledge sharing and internal organisation innovation, necessitates organisational actions to enhance employees' adaptability skills. Training and development programs should focus on flexibility, resilience, and creative problem-solving, complemented by fostering a culture that values adaptability. Agile organisational structures and processes facilitate adaptability while embedding adaptability into innovation encourages experimentation and continual improvement. Fostering a culture of knowledge sharing is paramount to bolster internal organisational innovation. This entails leadership support, recognition, rewards for knowledge-sharing behaviours, and investment in collaborative tools and spaces. Training programs should equip employees with communication skills and knowledge management techniques, while leadership training should emphasise the facilitation of knowledge sharing. Cross-functional interaction enhances tacit knowledge sharing, fostering creativity and innovation.

Organisations should invest in mechanisms such as mentoring programs, cross-functional teams, and collaborative platforms to facilitate tacit knowledge sharing. Training programs should focus on communication, adaptability, and innovative thinking, while organisational structures should be flexible and less hierarchical. Leveraging technology can aid knowledge sharing while fostering a culture of innovation and adaptability requires proactive management support. Strategic decision-making processes should integrate knowledge sharing, adaptability, and innovation considerations, while performance measurement systems should reflect these priorities.

Conclusions

The study aims to address a research gap by introducing an innovative framework that investigates the influence of tacit knowledge sharing on the Internal Organisational Innovation process, with change adaptability as a mediating factor. Notably, there is a lack of scholarly research examining the role of change adaptability as a mediator between tacit knowledge sharing and the Internal Organisational Innovation process. The research contributes significantly to advancing the field of knowledge management, particularly in the context of tacit knowledge sharing.

The path coefficient analysis reveals significant insights into the influence of tacit knowledge sharing and change adaptability on the Internal Organisational Innovation process. Tacit knowledge sharing significantly influences change adaptability. Furthermore, change adaptability considerably affects the Internal Organisational Innovation process. Similarly, tacit knowledge sharing significantly impacts the Internal Organisational Innovation process. The indirect effect test results further confirm the significant role of the mediator variable. It suggests a significant relationship between tacit knowledge sharing and the Internal Organisational Innovation process, with change adaptability acting as a mediator. The study identifies a significant impact of tacit knowledge sharing on both change adaptability and internal organisational innovation directly. Moreover, change adaptability significantly mediates the relationship between tacit knowledge sharing and organisational innovation. This finding underscores the importance of adaptability in enabling organisations to harness tacit knowledge for innovative outcomes.

Key contributions of the paper include the introduction of a novel framework that integrates tacit knowledge sharing with change adaptability to enhance innovation. The study emphasises the practical implications for organisations, suggesting that fostering an environment that supports tacit knowledge exchange and adaptability is crucial for sustaining innovation. This research fills a notable gap in the literature on knowledge management and change management by providing empirical evidence on the critical roles of tacit knowledge and adaptability in driving internal innovation in organisations.

The study demonstrates the pivotal role of tacit knowledge sharing in enhancing internal organisational innovation, with change adaptability acting as a significant mediator. The research findings reveal that tacit knowledge directly influences change adaptability and innovation within organisations, emphasising the critical function of change adaptability in mediating this relationship. The study fills a gap in tj literature by establishing a clear link between these elements. It provides practical implications for organisations aiming to foster a culture of continuous improvement and adaptability. The implications suggest organisations should prioritise nurturing an environment conducive to tacit knowledge exchange and adaptability to thrive in dynamic conditions. This study offers valuable insights for academic researchers and practitioners, highlighting the importance of integrating tacit knowledge and adaptability into the strategic frameworks of organisations to drive sustainable innovation.

The previous studies show the relationship between the sharing of tacit knowledge, change adaptability, and the development of organizational innovation that this builds upon. Studies by Kmieciak (2020) have shown that the sharing of such tacit knowledge plays an important role in fostering internal organizational innovation over and above explicit knowledge-sharing. Moreover, Berraies et al. (2020) maintained that the innovative capabilities of an organization are very critical to tacit knowledge and, therefore, in the innovation process, it has increased importance.

On the other hand, studies by Smith & Webster (2018) and Nguyen et al. (2019) confirmed the role of adaptability in promoting organizational innovation. Their findings indicated that adaptable individuals and organizational cultures tend to practice innovative behaviour. Thus, this justified the research‘s finding on the mediating role of change adaptability in organizational innovation concerning tacit knowledge sharing.

Additional evidence for this line of mediation hypothesis is from Martínez-Sánchez et al. (2020), who examine the moderating role of human resource flexibility (analogous to change adaptability) on mediators of knowledge absorption and innovation. This has only added more weight to the studies and increased the theoretical base for this paper. As such, by comparing these findings with the previous research, it could be found that Organizational Learning Theory bounds the study as was in the study of

Crossan et al. (1995) and Easterby-Smith et al. (2000). Similar to the past studies, current study found the seminal nature of tacit knowledge in promoting organizational learning and innovation; its informal, non-codified nature enhances flexibility and innovation. Whereas earlier scholars have merely stopped at noting the favourable effects of adaptability on innovation and performance, the study‘s approach gives this subject a much-needed deeper analysis and richness. The more refined view opens more sensitivity to the appreciation of adaptability not as a facilitator but as a very important amplifier within the knowledge-to-innovation process.

The findings also have practical applications and organizational strategies that can be implemented to enable tacit knowledge sharing and adaptability. Recommendations such as mentorship programs, collaboration spaces, and integrated performance management systems, among others, detail for an organization a roadmap for the creation of an innovative environment. Such practical insights go on to build and extend earlier studies to offer action steps for the enhancement of organizational innovation processes. Therefore, this study confirmed previous study findings and further extended these with the mediating role of change adaptability overall. The research of interactionist processes within a qualitative framework offers insight into organizational innovation.

Limitations and Future Research

Research on the impact of tacit knowledge sharing on change adaptability and internal organisational innovation highlights the importance of considering multiple influencing factors. While tacit knowledge sharing is significant, other factors contribute to change adaptability and innovation, accounting for 28.2% and 47.9% variances, respectively. Future research should explore factors like organisational structure, technology, employee engagement, and external environmental influences to stay competitive and innovative. With 68.2% and 77.2% of the variance in internal organisational innovation attributed to factors beyond change adaptability and tacit knowledge sharing, it's crucial to identify and address these additional factors. These may include organisational culture, leadership style, resource allocation, technology infrastructure, and employee engagement. A comprehensive approach considering external factors and market dynamics is essential for understanding and addressing various factors influencing change adaptability and innovation.

Future research could examine whether the relationships among tacit knowledge sharing, change adaptability, and internal organisational innovation hold across different industries or are more pronounced in specific sectors like technology, healthcare, or manufacturing. Exploring the impact of digital transformation initiatives on the relationship between tacit knowledge sharing and innovation, particularly the role of digital tools in facilitating or hindering tacit knowledge flow, would be valuable. Understanding how organisational culture and national culture influence tacit knowledge sharing and its impact on innovation and adaptability would provide insights into the cultural dimensions of knowledge management. Comparative studies across different industrial settings or within multicultural organisations could be fruitful. Investigating the direct and indirect impacts of tacit knowledge sharing on overall organisational performance metrics such as financial outcomes, employee satisfaction, and customer loyalty would offer practical insights for business leaders. Additionally, exploring the impact of emerging technologies like artificial intelligence and machine learning on capturing, disseminating, and utilising tacit knowledge within organisations could provide forward-looking insights into the future of work.

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ECONOMICS AND CULTURE 21(1), 2024

DOI: 10.2478/jec-2024-0003

UNLOCKING EMPLOYEE INNOVATIVE BEHAVIOUR: EXPLORING THE POWER OF TRANSFORMATIONAL LEADERSHIP AND TACIT KNOWLEDGE SHARING AMONG INDONESIAN WHITE-COLLAR WORKERS

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Received 3 January 2024; accepted 21 May 2024

Abstract

Research purpose. The study explores the impact of transformational leadership on innovative employee behaviour, with tacit knowledge sharing as a mediator. This contributes to existing literature on the dynamic interplay between transformational leadership, employee innovation, and tacit knowledge sharing within organisational contexts.

Design / Methodology / Approach. The study used a cross-sectional research design to examine relationships between the variables. 450 questionnaires were distributed among white-collar employees in Greater Jakarta, and a high response rate of 91.2% was achieved. Using the widely accepted Partial Least Squares Structural Equation Modelling technique, the study further analysed the hypothesised relationship among transformational leadership, tacit knowledge sharing, and innovative work behaviour.

Findings. As evident from the study, transformational leadership would play a major role in influencing the level of sharing of tacit knowledge among employees and, therefore, would result in a supportive, innovative environment. It also has a direct effect on the employees to behave in an innovative way by the inculcation of new ideas or changes. Tacit knowledge sharing is positively related to innovative behaviour. Transformational leadership also indirectly affects innovative behaviour via tacit knowledge sharing. The model explaining these linkages was also further evidenced to be effective through the conduction of structural equation modelling. Overall, the results underline transformational leadership as a critical success factor for a knowledge-sharing culture and innovation development within the organisation, either directly or indirectly.

Originality / Value / Practical implications. The research topic area also encompasses the role of tacit knowledge sharing in mediating the relationship of transformational leadership with innovative work behaviour and, hence, reveals the connection between leadership and innovation through knowledge exchange. It places transformational leadership in a discourse of knowledge management and outcomes of innovation, which points to the general importance of intangible assets and specifically to knowledge sharing. The empirical findings supported the idea that transformational leaders provide a climate where sharing tacit knowledge is an important aspect of organisational innovation. This review, therefore, focuses on the knowledge management, innovation, and leadership literature, with the aim of providing a multidisciplinary overview that would be helpful for readers in management, organisational psychology, and business innovation. This is the approach of leadership development by organisational leadership. HR professionals need to focus on strategies supporting the inculcation of a culture of sharing tacit knowledge around innovation. It ought to support measurement approaches for evaluating effectiveness in leader-led efforts to promote innovation and knowledge exchange.

Keywords: tacit knowledge sharing; innovative work behaviour, transformational leadership, white-collar employee, mediating variable

JEL codes: M53, M59

Introduction

A company's success is intricately tied to its people, particularly in the realm of innovation. Effective leadership is pivotal for sustaining and nurturing innovation within a company. Consequently, it is imperative for leaders to interact with their employees consistently. Those with a propensity for innovation often contribute novel ideas and possess the self-assurance to actualise these concepts within the organisational framework. Moreover, such individuals typically engage in critical thinking and actively seek solutions to workplace challenges, thereby augmenting the overall value of their work environment (Hadi et al., 2020).

In a comprehensive study by McKinsey involving 183 companies, the relationship between innovative behaviour and economic profits was explored. The research revealed that companies actively encouraging and harnessing employee innovation can attain economic benefits that are 2.4 times greater than their peers. The significance of employee innovative behaviour extends to enhancing both individual employee performance and the overall economic profit of the company (McKinsey, 2022).

Companies must prioritise cultivating innovative behaviour among their employees in a highly competitive business environment. A key strategy to foster such behaviour involves deliberately developing employee knowledge through both formal and informal means. Knowledge, a cornerstone of innovation, expands understanding and facilitates the exploration of novel ideas. It, in turn, contributes to heightened productivity and enhanced profits for the company (Ganguly et al., 2019).

Leaders play a pivotal role in supporting this endeavour by instilling a learning culture within the organisation, urging employees to acquire and share knowledge actively. A learning culture, when effectively established, can unlock the latent potential for innovative behaviour and personal growth among employees (Kucharska, 2021a, 2021b). Emphasising Tacit Knowledge, derived from socialisation, direct experiences, and colleague interactions, is one practical approach to instilling and reinforcing such a culture (Ganguly et al., 2019).

Tacit Knowledge thrives when individuals and teams willingly and effectively share their known knowledge. The sharing of tacit knowledge among employees can increase their knowledge resources, leading to new ideas, improved innovative behaviour, and enhanced overall performance. Tacit knowledge plays a crucial role in gaining a competitive edge through innovation, benefiting both the company and its human resources. It includes deep insights into business processes and problem-solving, fostering new ideas and creative solutions.

Additionally, tacit knowledge facilitates the transfer of unstructured knowledge that is challenging to learn through formal training (Ganguly et al., 2019). Employee interactions provide opportunities for a "learning by doing" process, promoting subconscious learning. Social interactions leading to sharing tacit knowledge can identify improvements, enhancing the performance process. It also encourages collaboration, communication, trust-building, and the exchange of diverse ideas. Effective communication reduces misunderstandings and enhances coordination within the organization. This knowledge becomes a valuable, difficult-to-imitate competitive advantage for the company. Individual knowledge, including experience and skills, equips companies to tackle market challenges and achieve superior results (Kucharska & Erickson, 2023).

Numerous scholarly studies explore the topic of employee innovative behaviour, focusing on the advantages gained from absorbing tacit knowledge through sharing. Kucharska and Rebelo (2022) conducted a study about innovative work behaviours. The findings suggest that transformational leaders play a crucial role in establishing a culture of learning, as this culture significantly influences the organization's adaptability and the innovative behaviour of its members. Another study by Kucharska (2021b) underscores that transformational leadership aimed at fostering innovative behaviour primarily focuses on nurturing all aspects of intellectual capital. To optimise knowledge conversion into

intellectual capital, it is essential to cultivate a learning culture encompassing both elements: a conducive learning environment and an openness to learning from mistakes.

Kaur Bagga et al. (2023) have made a significant contribution by highlighting the critical insight that transformational leadership and organisational culture substantially impact change management. Consequently, it is crucial for every organisation to cultivate a positive culture that facilitates adaptation to changes. Effective change can only occur when there is a combination of sound leadership practices and an organisational culture that addresses technological gaps. Bunjak et al. (2022) indicate that innovative behaviour among employees in the workplace is significantly influenced. This influence stems from the essential support and motivation transformational leaders provide, which are key factors in enhancing employees' innovative potential. Lei et al. (2020) conducted a study that strongly supports the notion that transformational leadership is an ideal and effective leadership style for fostering the sharing of tacit knowledge among employees and driving innovation within companies. Ganguly et al. (2019) revealed that tacit knowledge could improve the quality of employee knowledge, encouraging employees to produce ideas and ideas that influence employees to innovate.

The study addresses research gaps by examining how transformational leadership influences employee innovative behaviour, with tacit knowledge sharing as a mediating factor. This novel framework seeks to contribute to knowledge management literature, focusing on the dynamics of tacit knowledge sharing, an area often overlooked in previous studies.

This study will bring more insight into how leadership styles encourage innovation through knowledge sharing since existing studies have consistently supported the direct influence of transformational leadership on innovative behaviour. It will include the mediating effect of tacit knowledge sharing in the relationship between transformational leadership and innovative work behaviour, as it will further shed some light on these relationships. Whereas the existing studies consistently support the direct influence of transformational leadership on innovative behaviour, this study uses tacit knowledge sharing as a mediator, thus differing from the findings available in the existing literature.

Even though there is a suggestion that potential mediators may be present, such as organizational culture or employee engagement, the specific role of tacit knowledge sharing has not been elaborated in detail. The study thus fills in this gap by providing empirical evidence on the specific role of tacit knowledge sharing in amplifying the impact of transformational leadership on innovation.

The study applies Partial Least Squares Structural Equation Modelling (PLS-SEM) to ensure robust quantitative analysis, which was lacking in most previous research. The high response rate and meticulous data analysis reinforce the credibility of the findings, bridging a gap in the literature by showing, through a quantitative study, the mediating role of the sharing of tacit knowledge between transformational leadership and innovative work behaviour. By examining the impact of transformational leadership on employee innovative behaviour, the research aims to help organisations cultivate innovative cultures and improve competitiveness. Through a quantitative cross-sectional survey design, the data was collected from white-collar employees in Greater Jakarta, with an impressive response rate of 91.2%.

Altogether, the study makes theoretical and practical contributions to leadership, knowledge management, and organisational innovation by affording insight into the mechanism through which transformational leadership drives innovation through tacit knowledge sharing.

Results indicate that transformational leadership directly affects tacit knowledge sharing and innovative work behaviour. Additionally, tacit knowledge sharing mediates the relationship between transformational leadership and innovative behaviour. These findings emphasise the crucial role of leadership in fostering an environment conducive to innovation and knowledge sharing, offering practical implications for leadership development programs, and enhancing organisational performance and competitiveness.

This research is yet to be refined and improved to achieve its maximum contribution to the scholarly domain. For future studies, in order to track changes over time in transformational leadership, tacit knowledge sharing, and innovative work behaviour, it will be possible to understand stability and causality in these relationships only if a longitudinal design is adopted. Moreover, the exploration of

additional mediating or moderating variables, organizational culture or employee engagement, and external environmental factors like market volatility and technological changes, would be important to bring more depth to the underlying dynamics.

It can, therefore, be expected that conducting research in culturally diverse settings is likely to prove highly informative with regard to the possible nuances of these relationships, particularly those concerning the varying impact of transformational leadership on tacit knowledge sharing across different sets of cultural norms and values regarding authority and collaboration. It is further reasoned that for future research, multilevel modelling should be set to examine how individual, team, and organizational determinants interact to specify in more detail the dynamics of the phenomenon at the various levels of organizational functioning in regard to the shaping of innovative work behaviour.

Literature Review

Innovative Work Behaviour

Innovative Work Behaviour, characterised by creating and utilising new ideas, helps individuals and teams manage stress and tackle complex tasks in organisations (Kaymakci et al., 2022). It involves applying new knowledge and efficiently implementing ideas (Nyoman et al., 2021; Setyowati & Etikariena, 2019). Encouraging this behaviour fosters a culture where employees share and contribute to innovations, ultimately enhancing overall work performance and benefiting organisational development (Srirahayu et al., 2023).

The promotion of Innovative Work Behaviour stimulates employee involvement and activity, leading to improved performance (Maharani et al., 2021). It entails introducing and implementing new process ideas and procedures, significantly benefiting individuals, groups, organisations, and communities (Putri & Etikariena, 2022). Innovation, facilitated by market opportunities and technologies, involves employees throughout the development process, from initiation to execution (Bäckström & Lindberg, 2019; Opland et al., 2022). Moreover, innovative behaviour supports employee creativity, reflecting a supportive work environment encouraging risk-taking. Innovative employees contribute to successful innovation, fostering positive attitudes, enhancing performance, and cultivating better interpersonal relationships (Hadi et al., 2020; Putri & Etikariena, 2022).

Transformational Leadership

Transformational leadership emerged in the 1970s as a revolutionary approach, shifting from traditional leadership frameworks to emphasise charisma and emotional connectivity. This style encourages leaders to inspire followers to highly value their work, align personal goals with organisational objectives, and strive for higher ethical and motivational standards, maintaining consistency in their beliefs, words, and actions. It promotes integrity, thoughtful decision-making, regular self-assessment, and leading by example, contrasting sharply with transactional leadership, which focuses on leader-follower exchanges, as analysed by scholars such as James MacGregor Burns and Bernard Bass (Affandie & Churiyah, 2022; Indana et al., 2023). This leadership model integrates aspects from earlier theories—trait, skill, and style—and is considered more effective than transactional methods in motivating followers, enhancing commitment, and fostering organisational change. It utilises a transformative strategy to increase follower engagement and achieve organisational goals, building on historical leadership Bass (Affandie & Churiyah, 2022; Indana et al., 2023).

Key dimensions of transformational leadership include inspiring vision, intellectual stimulation, inspirational motivation, and idealised influence, which involve presenting a compelling vision for change, promoting critical thinking, offering motivational guidance, and setting exemplary behaviours to influence colleagues towards shared goals. These dimensions are crucial for driving employee development and maximising potential, aiming at both individual and organisational satisfaction. This approach is extensively discussed in the literature by scholars such as Affandie & Churiyah (2022), Indana et al. (2023), Muis & Isyanto (2022), and others like Hami et al. (2020), Madi Odeh et al. (2023), who highlight its impact on leadership practices and organisational outcomes.

Tacit Knowledge Sharing

Tacit knowledge sharing involves passing on practical, experience-based expertise and skills acquired on the job. It occurs through social interactions and relationships. It can take various forms, such as sharing know-how through activities, apprenticeships, or demonstrating expertise (tacit to tacit), and articulating know-how using metaphors, analogies, or stories (tacit to explicit). The benefits of tacit knowledge sharing include enabling individuals and organisations to apply knowledge to solve problems, foster innovation, and make informed decisions. It also helps in building relationships and social capital and contributes to the creation of new organisational knowledge when combined with the knowledge of others (Gubbins & Dooley, 2021; Huie et al., 2020; Işık et al., 2021; Perumal & Sreekumaran Nair, 2022).

Relationship between Transformational Leadership and Tacit Knowledge Sharing

Numerous studies delve into how transformational leadership affects organisational dynamics. Lei et al. (2020) discovered in a study of 339 participants from 120 Vietnamese companies that transformational leadership significantly influences tacit knowledge sharing. This leadership style also impacts innovation capabilities at both individual and organizational levels, with a stronger effect on the latter (Lei et al., 2020). Ardi et al. (2020) found a significant link between digital transformational leadership and knowledge-based empowering interaction in digital companies. They emphasized the connection between transformational leadership and tacit knowledge empowerment. Meanwhile, Dwivedi et al. (2020) reported a positive association between transformational leadership and knowledge sharing among 200 logistics company employees.

Wahyuningtias and Nugroho (2023) demonstrated that transformational leadership fosters knowledge-sharing behaviours among teachers by creating a supportive and inspiring environment. Similarly, Gul et al. (2023) noted that transformational leaders encourage both explicit and tacit knowledge sharing, crucial for project success, by nurturing trust and openness. Mayastinasari and Suseno (2023) highlighted that while transformational leadership boosts knowledge sharing and innovative behaviour in public organisations, the direct impact of tacit knowledge sharing on innovation may vary based on organisational context and job nature. Building on these findings, the proposed research hypothesis is:

H1: Transformational leadership has a significant influence on tacit knowledge sharing.

Relationship between Transformational Leadership and Innovative Work Behaviour

Estherita and Vasantha (2023) explore how transformational leadership impacts innovative work behaviour and employee retention. They find that it inspires creativity and fosters a positive organisational environment that enhances retention. Işık et al. (2021) investigate the role of tacit knowledge sharing in the relationship between team culture and innovative work behaviour in Turkish hotels, revealing tacit knowledge sharing as a significant mediator. Eyamba et al. (2020) found a positive relationship between transformational leadership and innovative work behaviour in TV3 Network Limited, with specific components of transformational leadership showing significant effects. These studies collectively illustrate how transformational leadership motivates creative thinking and nurtures an environment conducive to innovation.

Wahyuningtias and Nugroho (2023) observe that transformational leadership indirectly impacts innovative work behaviour among teachers through the mediation of knowledge-sharing behaviour. Rehmani et al. (2023) find similar results in the IT industry of Pakistan, highlighting transformational leadership's role in enhancing knowledge sharing, which facilitates innovative behaviours. Gul et al. (2023) discuss how transformational leadership affects project success in small and medium enterprises in Pakistan by mediating subordinates' knowledge-sharing and innovative work behaviour. Mayastinasari and Suseno (2023) indicate that in public organisations, transformational leadership directly affects innovative work behaviour, emphasising its importance in fostering innovation, especially in bureaucratic settings. Expanding upon such findings, the suggested research hypothesis is:

H2: Transformational leadership has a significant influence on innovative work behaviour.

Relationship between Tacit Knowledge Sharing and Innovative Work Behaviour

In a recent study by Wang (2023), the relationship between knowledge sharing, thriving at work, and

innovative behaviour among employees was investigated. The research aimed to understand how knowledge sharing influences innovative behaviour, particularly focusing on the role of thriving at work. The results supported a mediation model, indicating that knowledge sharing positively impacted employees' sense of thriving at work, which, in turn, positively influenced their innovative behaviours. This study contributes to the field of knowledge management by highlighting the role of knowledge sharing in fostering innovation and providing practical insights into its relationship with innovative behaviours. Kucharska and Erickson (2023) conducted research in the IT industry with 350 respondents from Poland and 350 from the US, revealing the significant role of tacit knowledge in the innovation process. Tacit knowledge sharing, which is challenging to express and often acquired unconsciously, was shown to have a positive impact on innovation by generating creative and innovative ideas.

Ononye (2022) investigated the public sector, specifically the Ministry of Health in Delta State, Nigeria, with 157 respondents from various departments, finding a significant positive influence of tacit knowledge sharing on employee innovation. Berraies et al. (2020) explored the relationship between distributed leadership, tacit and explicit knowledge sharing, organizational trust, and exploratory and exploitative innovations with 209 respondents from various industries, indicating significant influences between tacit knowledge sharing and both exploitative and exploratory innovations. Ganguly et al. (2019) delved into the relationship between tacit knowledge sharing and innovation capability with 190 respondents from India's automotive, IT, and media industries, revealing a positive relationship between tacit knowledge sharing and innovation ability.

Gul et al. (2023) specifically addressed how tacit knowledge sharing among subordinates facilitates and mediates the relationship between transformational leadership and project success, indicating that innovation in project management heavily depends on the effective sharing of tacit knowledge, leading to better problem-solving and more creative solutions. Mayastinasari and Suseno (2023) researched public organizations, suggesting a nuanced view where tacit knowledge sharing, significantly enhanced by transformational leadership, did not directly affect innovative work behaviour in their study. This raises questions about the conditions under which tacit knowledge sharing influences innovation, possibly hinting at sector-specific barriers or the need for additional facilitative factors within public sector environments. Drawing from the findings of prior studies, the suggested research hypothesis is as follows:

H3: Tacit knowledge sharing has a significant influence on innovative work behaviour.

Relationship between Transformational Leadership and Innovative Work Behaviour with Tacit Knowledge Sharing as a Mediator

Supermane (2019) investigated the correlation between transformational leadership, knowledge management, and teaching and learning innovation among 359 teachers in Malaysia. The study found that knowledge management did not mediate the relationship between transformational leadership and teaching and learning innovation. Lei et al. (2020) examined the link between transformational leadership, tacit knowledge sharing, and frugal innovation in 120 Vietnamese companies with 339 participants, revealing varying effects of transformational leadership on tacit knowledge sharing through frugal innovation. Al-Husseini et al. (2021) studied Iraqi State University academic staff and found that transformational leadership positively influenced innovation, with knowledge sharing mediating 49.3% of the indirect effects. Hassanzadeh Mohassel et al. (2023) explored the relationship between transformational leadership, tacit knowledge sharing, and audit quality with 396 external auditors in Iran, indicating that transformational leadership positively influenced audit results through tacit knowledge sharing as a mediator. In studies by Wahyuningtias and Nugroho (2023) and Rehmani et al. (2023), tacit knowledge sharing emerges as a crucial mediator between transformational leadership and innovative work behaviour. Transformational leadership encourages an environment where tacit knowledge is freely shared, thus facilitating innovative behaviours. This mediation implies that while transformational leaders may not directly induce innovation, they significantly influence it by promoting an atmosphere conducive to tacit knowledge exchange.

These studies show that tacit knowledge sharing is pivotal in fostering innovative work behaviour. When employees share their tacit knowledge, they contribute to a reservoir of unique resources that can

stimulate innovation. The mediating effect demonstrated in these studies underscores the importance of tacit knowledge sharing for realising the innovation potential spurred by transformational leadership. These studies offer empirical evidence supporting the mediating role of tacit knowledge sharing. For instance, Gul et al. (2023) not only demonstrate that tacit knowledge sharing mediates the impact of transformational leadership on project success but also highlights its role in nurturing the innovative behaviours necessary for success. Theoretically, this mediation aligns with the concept that leadership influences organisational outcomes through indirect pathways, including cultural and behavioural changes. By promoting tacit knowledge sharing, transformational leadership alters employee interactions within the organization, thereby enhancing innovative capabilities. Expanding upon these findings, the suggested research hypothesis and framework are as follows (Fig. 1):

H4: There is a significant relationship between transformational leadership and innovative work behaviour with tacit knowledge sharing as a mediator.

Research Methodology

Research Design and Approaches

This research employed a cross-sectional survey using a quantitative research design to test the newly developed conceptual model and the hypothesised relationships using a PLS-SEM approach. More specifically, the study confirms that tacit knowledge sharing becomes highly influential for internal organisational innovation only when such sharing is mediated by change adaptability. In the Greater Jakarta area, Indonesia, the research was conducted. Since this is the country's capital city, it is centrally vital to most businesses. Jakarta, being the hub for most of the country's major economic activities, has a significant number of white-collar workers. The conceptual model is shown in Figure 1, which displays the integration between preliminary articles and the pertinent theoretical bases.

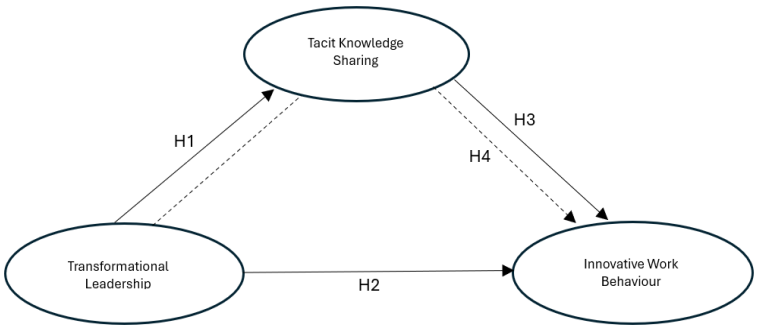

Fig. 1. Research framework (Source: Authors' research)

Data Collection

This study used the convenience sampling procedure. The study contacted 450 employees in Greater Jakarta. The reason for the primary adoption of the technique is that there is no sampling frame, and it also saves time in the process. Still, we bear in mind the shortcomings associated with this process. We try to reach the respondent through email, LinkedIn, and WhatsApp Groups, maintaining that participation is out of free will. An online questionnaire was emailed to 450 respondents. The authors received a total of 428 returned questionnaires and those were considered for statistical analysis. Next, we used the Rasch Model, the Person Measure Analysis, to eliminate about 38 incomplete questionnaires and outliers using the WINSTEPS software version 5.2.1.0 (Boone et al., 2014). This would then make the number of 390 respondents, in which the response rate was at 91.2%, fairly high. The study was conducted over a period of six months, from July to December 2023, with a follow-up being carried out after two weeks. Sample subject items included white-collar employees with more than a year of work experience.

Research Instrument

The research instrument in this study was created by conducting a thorough review of relevant literature and prior research (Table 1). The questionnaire items, shown in Table 1, are specifically designed to assess tacit knowledge sharing, innovative work behaviour, and transformational leadership, and it is structured into three sections. Tacit knowledge sharing was adapted from Kucharska (2021b), while innovative work behaviour was taken from Ismiantri & Prabandini Muyana (2021). Lastly, transformational leadership was adopted from the works of Madi Odeh et al. (2023), Shafi et al. (2020).

Table 1. Research instrument items (Source: Authors' research)

Construct		Item
Tacit Knowledge Sharing (Kucharska, 2021)	TKS1	I share knowledge from my own experiences.
	TKS2	I learn from others' experiences.
	TKS3	Colleagues share new ideas with me.
	TKS4	Colleagues involve me in discussions about best practices.
Innovative Work Behaviour (Ismiantari& Mulyana, 2021)	IWB1	We provide highly competitive innovations to our clients.
	IWB1	Our innovations are well-received by our clients.
	IWB2	We outperform competitors in introducing innovations.
	IWB3	I take pride in our innovations.
	IWB4	We continually enhance our work processes.
	IWB5	We excel at managing change.
	IWB6	We eagerly embrace new methods and procedures.
	IWB7	We are highly receptive to new regulations.
Transformational Leadership (Odeh et al., 2023; Shafi et al., 2020)	TL1	Company management consistently seeks new opportunities.
	TL2	Company management maintains a clear vision of its ultimate goals.
	TL3	Company management effectively motivates the entire staff.
	TL4	Company management serves as the organisation's driving force.
	TL5	Organisations are led by leaders capable of motivating and guiding colleagues.

The study will utilise a questionnaire to gather data. It will use a six-point Likert scale for measurement, providing respondents with a range of response options. The Likert scale is a well-established tool in social science research. Employing a 6-point Likert scale aims to minimise deviations and reduce the likelihood of personal decision-making biases. The inclusion of additional response choices enables respondents to express their opinions more precisely, facilitating a deeper understanding of their attitudes and perceptions concerning tacit knowledge sharing, innovative work behaviour, and transformational leadership.

Data Analysis

The data analysis method used is structural equation modelling (SEM). This approach allows researchers to test models that capture the hierarchical nature of constructs, providing a more detailed understanding of the relationships among both observed and latent variables (Ghozali, 2021; Hair et al., 2019; Sarstedt et al., 2014). The analysis will be conducted using SMARTPLS 3.2.9 software. It aims to enhance our understanding of observed and latent variable relationships and contribute to a comprehensive view of the research model.

The relationship between transformational leadership, tacit knowledge sharing, and innovative work behaviour was also tested with the help of the application of Structural Equation Modelling. In addition, the SEM would further apply testing of the direct and mediated effects based on the theoretical model to be applied. The model indicates that a direct positive relationship exists among transformational leadership, tacit knowledge sharing, and innovative work behaviour. Hypotheses will be formulated for testing the model considering transformational leadership as an independent variable, tacit knowledge sharing as a mediator and dependent variable, and innovative work behaviour as merely dependent (Ghozali, 2021; Hair et al., 2019; Sarstedt et al., 2014).

Data will be collected by distributing surveys to white-collar employees in Greater Jakarta using

multiple items for each construct, measured by a Likert scale. Measurement validity and reliability are measured through item analysis, Cronbach's Alpha, and composite reliability. PLS-SEM is flexible enough to manage complex models properly and is especially suitable in an organisational study because it is also flexible enough to work with small sample sizes and non-normal distribution (Ghozali, 2021; Hair et al., 2019; Sarstedt et al., 2014).

The validity and reliability tests include convergent validity, reliability, and discriminant validity tests for strong construct measurements. The structural model path coefficients, R-squared values, effect sizes, and significance testing through bootstrapping are performed to validate the hypothesised relationships (Ghozali, 2021; Hair et al., 2019; Sarstedt et al., 2014).

Common Biased Method

To mitigate the risk of common method bias in self-report questionnaires, researchers can employ the Rasch Model Analysis (Boone et al., 2014). This approach aims to reduce biased responses and improve data collection accuracy. Specifically, researchers utilise Person Measure Analysis to detect any biases inherent in respondents' answers. By closely examining Mean Square (MNSQ) values, ideally falling between 0.5 and 1.5 (Boone et al., 2014). Therefore, researchers can identify unbiased responses. Ensuring that MNSQ values are within this range enhances the questionnaire's reliability and validity, thereby mitigating the potential impact of common method bias and enhancing the credibility of research findings.

Results

Respondents' Profile

There are 390 respondents. Those were grouped based on gender, age, length of work, and job level. The gender distribution included 53.3% female and 46.7% male respondents. Regarding age, the respondents were distributed across various age groups, with the majority (57.7%) aged 21-30 years. Regarding the length of work, 52.8% had worked less than 5 years, while job levels ranged from Staff - Officers (45.1%) to Directors (1.8%), with various roles in between.

Measurement Model Analysis

The data analysis method used is structural equation modelling (SEM). According to the existing literature, an indicator is considered significant if its loading factor surpasses 0.70, as highlighted by (Ghozali, 2021; Sarstedt et al., 2014).

Table 2. Measurement model analysis (Source: Authors' research)

Latent Variable	Item	Loading Factor	Cronbach's Alpha	Composite Reliability	AVE	Remark
		(>0.7)	(>0.6)	(≥0.6)	(≥0.5)	
Innovative Work Behaviour (IWB)	IWB1	0.755	0.873	0.874	0.567	Valid and Reliable
	IWB2	0.744				
	IWB3	0.729				
	IWB4	0.791				
	IWB5	0.764				
	IWB6	0.741				
	IWB7	0.747				
Tacit Knowledge Sharing (TKS)	TKS1	0.728	0.656	0.659	0.594	Valid and Reliable
	TKS2	0.823				
	TKS3	0.758				
Transformational Leadership (TL)	TL1	0.769	0.846	0.847	0.619	Valid and Reliable
	TL2	0.803				
	TL3	0.800				
	TL4	0.747				
	TL5	0.815				

It is also essential to assess the model's internal consistency reliability using composite reliability and Cronbach's alpha. Both metrics should have a value of at least 0.50 to establish reliability, as indicated by the same sources. Moreover, the average variance extracted (AVE) must be considered to establish convergent validity, with a threshold of 0.50 or higher (Ghozali, 2021; Sarstedt et al., 2014).

Table 2 shows that discriminant validity involves comparing factors with cross-loading to assess the distinctiveness of the research construct. The test requires a cross-loading value of > 0.70 for each variable (Ghozali, 2021; Musyaffi et al., 2022). Table 2 results indicate that all indicators for each variable in this study have cross-loading values exceeding 0.70 (> 0.70), meeting the criteria for discriminant validity testing (Ghozali, 2021; Sarstedt et al., 2014).

The construct validity of the study is supported by the results of the Average Variance Extracted (AVE) values, as shown in Table 2. The Average Variance Extracted (AVE) test requires a value greater than 0.50 (> 0.50) to ensure that items adequately cover all aspects of the construct. The Table 2 results show that each variable in this study has an AVE value exceeding 0.50 (> 0.50), indicating that all variables meet the AVE criteria (Ghozali, 2021; Musyaffi et al., 2022).

Composite Reliability measures the reliability of indicators, with a minimum acceptable value for exploratory research being 0.60 - 0.70. Table 2 reveals that all variables' Composite Reliability test results exceed 0.60 (> 0.60), indicating that all variables meet the Composite Reliability criteria. Cronbach's Alpha assesses the reliability of a construct by measuring internal consistency among indicators. A minimum Cronbach's Alpha value greater than 0.60 (> 0.60) is acceptable for exploratory research. The table shows that the Cronbach's Alpha value for all variables is greater than 0.60 (> 0.60), confirming that all variables meet the requirements for further testing.

Table 3. The Fornell-Larcker Criterion (Source: Authors' research)

Construct	Innovative Work Behaviour (IWB)	Tacit Knowledge Sharing (TKS)	Transformational Leadership (TL)
IWB	0.753		
TKS	0.675	0.771	
TL	0.751	0.591	0.787

The Fornell-Larcker Criterion (Table 3) is a method that compares the square root value of the Average Variance Extracted (AVE) for each construct with the correlations between other constructs in the model. To pass the test, the value should exceed 0.50 (> 0.50) (Ghozali, 2021; Sarstedt et al., 2014). Based on the table above (Table 3), it can be concluded that all variables in this study have Fornell-Larcker Criterion values exceeding 0.50 (> 0.50), indicating that they are all valid according to the Fornell-Larcker Criterion test.

Table 4. The Heterotrait-Monotrait Ratio Values (HTMT) (Source: Authors' research)

Construct	Heterotrait-Monotrait Ratio (HTMT)
TKS → IK	0.887
TL → IK	0.872
TL → TKS	0.792

To establish excellent discriminant validity, the Heterotrait-monotrait Ratio (HTMT) value should be less than 0.90 (<0.90), as mentioned in Table 4 (Ghozali, 2021; Sarstedt et al., 2014). Based on the table above, it can be concluded that the results of the Heterotrait-monotrait Ratio (HTMT) test between variables are very good, as they are all less than 0.90 (<0.90). This confirms that they meet the requirements for the Heterotrait-monotrait Ratio (HTMT) test.

Structural Model Analysis

The R-square value, often represented as R^2, is a statistical measure that indicates the proportion of variance in a dependent variable that is predictable from the independent variables. According to Artanto

et al. (2021), Ghozali (2021), Sarstedt et al. (2014), the R-square value can be categorised as high if it reaches 0.75, moderate if it reaches 0.5, and low if it reaches 0.25. Table 5 provides R-square values for two constructs: Innovative Work Behaviour (IWB) and Tacit Knowledge Sharing (TKS).

Innovative Work Behaviour (IWB) has an R-square value of 0.646. This indicates that approximately 64.6% of the variance in IWB can be explained by the predictors included in the model. This relatively high R-square value suggests that the model effectively explains the variance in IWB. For researchers, this indicates that the variables chosen for the model are relevant and significant predictors of innovative behaviours in a work setting. Practically, organisations can focus on these key predictors to enhance innovative behaviours among employees, potentially leading to improved problem-solving and innovation outcomes.

Table 5. R-Square (Source: Authors' research)

Construct	R-Square
Innovative Work Behaviour (IWB)	0.646
Tacit Knowledge Sharing (TKS)	0.349

Tacit Knowledge Sharing (TKS) has an R-square value of 0.349. This suggests that the predictors in the model account for about 34.9% of the variance in TKS. The lower R-square value for TKS implies that while the model captures some important aspects of tacit knowledge sharing, a significant portion of the variance remains unexplained. This suggests the presence of other factors influencing TKS that are not included in the model. For practical application, organisations may need to explore additional factors that could influence tacit knowledge sharing. Enhancing understanding of these factors could lead to more effective strategies for promoting knowledge sharing among employees.

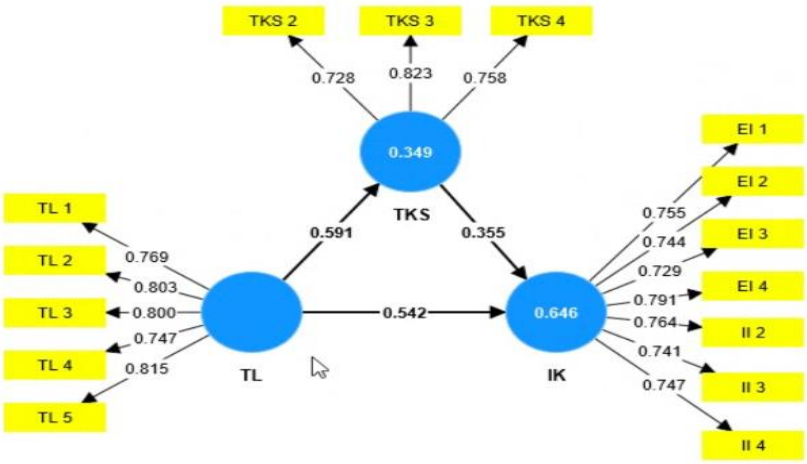

Fig. 2. Path coefficients (Source: Authors' research)

Hypothesis Testing

The analysis of the outer loadings, presented in Table 6, validates all construct indicators within the model. This validation is supported by the T-statistics values, which exceed the critical value of 1.96 and demonstrate statistical significance at 0.05.

Table 6. Path coefficients (Source: Authors' research)

Hypothesis	Original Sample (O)	T Statistics (|O/STDEV|)	P Values	Results
TL → TKS	0.591	11.499	0.000	H1 Accepted

Hypothesis	Original Sample (O)	T Statistics (|O/STDEV|)	P Values	Results
TL → IWB	0.542	11.075	0.000	H2 Accepted
TKS → IWB	0.355	7.125	0.000	H3 Accepted
TL → TKS → IWB	0.209	6.157	0.000	H4Accepted

Notes: IWB: Innovative Work Behaviour; TKS: Tacit Knowledge Sharing; TL: Transformational Leadership

According to Table 6, the results of the path coefficient analysis reveal that The Path Test results show that transformational leadership significantly affects tacit knowledge sharing, with a T-statistic of 11.499 (> 1.96) and a P-value of 0.000 (< 0.05). This effect is moderate to strong, accounting for 59.1% of the variance, while 40.9% is attributed to other variables. H1 is statistically accepted. This indicates a strong and statistically significant relationship between Transformational Leadership (TL) and Tacit Knowledge Sharing (TKS). The findings support previous studies which identified a significant impact of transformational leadership on tacit knowledge-sharing (Ardi et al., 2020; Dwivedi et al., 2020; Gul et al., 2023; Lei et al., 2020; Mayastinasari & Suseno, 2023; Wahyuningtias & Nugroho, 2023).

Transformational Leadership also significantly affects Employee Innovative Behaviour, with a T-statistic of 11.075 (> 1.96) and a P-value of 0.000 (< 0.05). This influence is moderate to strong, explaining 54.2% of the variance, leaving 45.8% explained by other factors. The data analysis can support H2 statistically. It implies that There is a strong and statistically significant relationship between Transformational Leadership (TL) and Innovative Work Behaviour (IWB). The results align with prior research that emphasises the significant influence of transformational leadership on innovative work (Estherita & Vasantha, 2023; Eyamba et al., 2020; Işık et al., 2021; Mayastinasari & Suseno, 2023; Rehmani et al., 2023; Wahyuningtias & Nugroho, 2023).

Tacit Knowledge Sharing similarly has a significant impact on Employee Innovative Behaviour, with a T-statistic of 7.125 (> 1.96) and a P-value of 0.000 (< 0.05). This influence is moderate to strong, accounting for 35.5% of the variance, while 64.5% is attributed to other variables. The data analysis can also support H3 statistically. It implies that There is a statistically significant relationship between Tacit Knowledge Sharing (TKS) and Innovative Work Behaviour (IWB). The results can support multiple previous studies that highlight the positive impact of tacit knowledge-sharing on innovative behaviour in various industries (Berraies et al., 2020; Ganguly et al., 2019; Gul et al., 2023; Kucharska & Erickson, 2023; Mayastinasari & Suseno, 2023; Ononye, 2022; Wang, 2023)

Based on the indirect effect test results in the table above, we observe that the T statistics exceed 1.96 (6.157 > 1.96), indicating their significance. Additionally, the P values are less than 0.05 (0.000 < 0.05), also indicating significance. Therefore, we can conclude that the mediator variable in this hypothesis is acceptable and exerts a significant influence. The original sample test result shows a 20.9% influence by the mediator variable, which is moderate, with the remaining 79.1% influenced by other variables not examined in this research. The data analysis can also support H4 statistically. It implies that There is a statistically significant mediated relationship through Tacit Knowledge Sharing between Transformational Leadership (TL) and Innovative Work Behaviour (IWB). The results align with several studies that have explored the relationship between transformational leadership and various aspects of innovation, including teaching and learning innovation, frugal innovation, and audit quality (Al-Husseini et al., 2021; Gul et al., 2023; Hassanzadeh Mohassel et al., 2023; Lei et al., 2020; Rehmani et al., 2023; Supermane, 2019; Wahyuningtias & Nugroho, 2023). These studies generally find that transformational leadership positively influences innovation, with knowledge sharing often mediating this relationship. The proposed research hypothesis is likely to build upon these findings.

The findings show that all hypotheses were accepted with significant T statistics (greater than the usual critical value of 1.96 for a 95% confidence interval) and P-values of 0.000, indicating strong statistical support for the proposed relationships within the study. The current findings reveal robust direct and mediated effects of transformational leadership (TL) on Innovative Work Behaviour (IWB) through tacit knowledge sharing (TKS), indicating a significant influence of TL on innovation both directly and indirectly. The path coefficients in the study are significant at a high level, supported by high t-statistics and p-values, thus with a lot of statistical support for the observed relationships. Although the study

carried out by Wahyuningtias and Nugroho (2023) could not establish any significant effect of TL over IWB, the current findings oppose this and show a significant direct effect. At the same time, the study of Mayastinasari and Suseno (2023) has also shown a similar direct influence as the current one. However, it pointed out some possible contextual differences affecting these relationships.

Similar to earlier research, this study has also highlighted mediation through TKS. However, the present results stress a strong direct path along with mediation, unlike studies like Rehmani et al. (2023), which stress the mediated path much more. Although the positive influence of TKS on IWB is found to be common in the present results and previous studies, differences exist in the strength of the effect. In the current research, there was only a moderate impact, though the qualitative descriptions given by other studies may mean the influence of TKS is stronger in driving IWB.

Discussion

Theoretical Implications

The hypotheses TL → TKS (H1) and TL → IWB (H2) confirm the central role of transformational leadership in enhancing the dynamics of knowledge in organisations. Transformational leaders have been shown to create knowledge-rich environments through positive impacts on tacit knowledge sharing and innovative knowledge. This aspect supports the theoretical assumption that transformational leadership is effective, especially when innovation and the dissemination of knowledge represent a principal way for the organisation to succeed. Accepting hypothesis TL → TKS → IWB (H4) would show that mediating tacit knowledge sharing is important to the link between transformational leadership and innovative outcomes. This aligns with theoretical assertions that transformational leaders may indirectly contribute to organisational innovation in sharing and applying knowledge.

These results suggest that the transformational leadership theory is broadened to embrace the leader's encouragement of knowledge sharing and innovation, expanding the range of the traditional focus of Inspirational Motivation, Idealized Influence, Individualized Consideration, and Intellectual Stimulation. A key area for influence: Knowledge dynamics need to be embedded. This study's direct and indirect effects indicated that leadership development programs positively relate to a premium on skills and behaviours in inculcating openness, communication, and knowledge sharing. Training transformational leadership on practising and prioritising the environment for sharing tacit knowledge may give rise to innovative capabilities.

Research has vividly shown that a relationship exists between transformational leadership and knowledge sharing and innovation, theoretically placing them as the most fundamental elements that lead to achieving strategic organisational outcomes such as competitive advantage and adaptability. The findings would enrich the understanding of the mechanisms through which transformational leadership influences organisational behaviour and practical measures organisations may undertake to realise the full potential of transformational leadership. From the practical implications, this will go a long way toward helping understand how leadership styles could sit with organisational goals, particularly in a knowledge-intensive setup.

Practical Implications

Organisational investments should be made in leadership development that would result in the cultivation of transformational leadership characteristics. Programs would, therefore, be geared towards training and guiding leaders in inspiration, supportiveness, and intellectual stimulation. In fact, while recruiting, an organisation may be given more preference if it is found to demonstrate these qualities because organisations are aware of their potential to promote knowledge transfer and innovation within the organisation. Therefore, the organisation must develop an environment promoting openness and knowledge sharing. It can be achieved through policies, incentives for sharing and collaboration, internal wikis, brainstorming sessions, and projects across departments. There is, therefore, also a large support from the top, where the transformational leaders' messaging from the top down could help to push forward a cultural shift from a 'hoarding' type of information culture to one based on sharing by underlining the value of sharing and collaboration.

Organisations will also increasingly be aware of the connection between knowledge sharing and

innovation; as such, they will have to construct goals for bettering the knowledge management processes and innovation results within the strategic initiatives. In this regard, resource allocation should prioritise initiatives that provide room for project experimentation and pilot programs that allow people to be innovative in using shared knowledge. Performance metrics can be developed to understand the possibility of whether transformational leadership can be instrumental in raising the rate of knowledge sharing and innovation within an organisation. Examples of the metrics that can be considered include those coming from surveys related to leadership effectiveness, rates of knowledge-sharing incidents, and innovation outputs of projects. The feedback mechanism allowed for the employees' voices regarding their thoughts on the impact of leadership, and the sharing of knowledge will greatly improve the practice of leadership and knowledge management. These should use technological solutions to support knowledge sharing and management. This will make sharing of tacit knowledge easy, hence raising knowledge exchange and innovation capacities, using tools to support collaboration, enterprise social networks, and knowledge bases in the organisation. Organisational success can hence be sustained only by creating environments rich in transformational leadership and sharing knowledge. It can thus sustain organisational results and competitive advantage through continued renewal of innovative activity and effective use of the collective intelligence of its members. Implications of these approaches indicate that it is important to integrate leadership development with knowledge management strategies to add to the organisational capability and improve organisational performance through innovation.

Conclusions

The current study examines the relationship between transformational leadership, tacit knowledge sharing, and innovative work behaviour within an organisational setting. It was found that transformational leadership represents one of the key predictors of a knowledge-sharing culture and innovation that might directly impact organisational performance and adaptability. Transformational leadership is especially important in its ability to inspire and motivate the development of an organisational climate under which tacit knowledge can be shared more freely. Such sharing is likely to encapsulate deeply held skills and unarticulated expertise, which may stimulate considerably innovative behaviour on the part of employees. The study supported the direct effect of transformational leadership on innovative work behaviour with mediation through tacit knowledge sharing. The overall analysis indicates that organisations practicing effective transformational leadership additionally activate the potential of knowledge and the creativity of the people working for them; in this way, their business activities take a more dynamic and competitive form. The research methodology based on quantitative measures and structural equation modelling gives strong evidence for the hypothesised set of relationships by the statistically significant and substantial relationships between these variables.

This study bears great practical implications. It exhorts organisations to embrace leadership development programs primarily geared towards transformational leadership traits to establish an open and cooperative environment, without which tacit knowledge cannot be discussed sufficiently. This kind of strategic leadership and knowledge management would be led by innovation, supporting competitive advantages in highly changing markets. The findings enriched the knowledge present in the literature by detailing insight into how transformational leadership combined with tacit knowledge sharing enhances innovative work behaviour. The findings are important because of the implications made not only to fill the theoretical frameworks related to leadership and innovation potentials but also recommended for practical organisational learning. The dynamics must be researched in a cross-cultural setting or under different organisational structures to establish and further broaden findings.

The present study could be furthered and developed to have real implications in the academic field. In fact, the suggestion for a longitudinal design is extended to future research to trace changes over time in transformational leadership, tacit knowledge sharing, and innovative work behaviour that may help understand the stability and causality of these relationships. This discussion could be taken further by considering other mediating or moderating variables, such as organisational culture and employee engagement, or other external environmental variables, such as market volatility and technological changes. Conducting such research in a culturally diverse environment will ensure grasping some important nuances; specifically, the fact that the effect of transformational leadership on tacit knowledge sharing varies under the influence of different cultural norms and values concerning issues of power and

collaboration. Multilevel modelling could determine the interplay between individual, team, and organisational determinants impacting innovative work behaviour, filling the transformation in leadership and knowledge sharing at different levels within an organisation with more detail.

Despite its insights, the quantitative data may be enriched by qualitative research involving interviews or case studies in giving in-depth insights into the mechanisms by which transformational leadership and tacit knowledge sharing influence innovation. Such research would be more concrete on strategies or challenges, with only survey information. Sector-specific studies of the model in individual industries may draw out sector-specific dynamics, specific problems, opportunities for fostering innovation and possibly changes in the leadership styles that may have to be made. One could delve further into how digital transformation has altered the interface between transactional leadership in innovation and knowledge sharing, and how digital tools allow or prevent the sharing of tacit knowledge. Implementation Research: Implementation challenges and success factors focusing on applying transformational leadership principles could provide practical guidance on translating theoretical benefits into organisational outcomes.

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ECONOMICS AND CULTURE 21(1), 2024

DOI: 10.2478/jec-2024-0004

EXPLORING ENTREPRENEURIAL INTENTION FOR SUSTAINABLE DEVELOPMENT: A STUDY OF UNIVERSITY STUDENTS IN KOLEA, ALGERIA

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Received 3 February 2024; accepted 22 May 2024

Abstract

Research purpose: Entrepreneurship's evolving role now extends beyond economic realms to encompass broader societal and environmental imperatives. Sustainable entrepreneurship emerges as a linchpin in addressing contemporary challenges, offering innovative solutions that harmonize economic resilience with environmental and social objectives. Yet, the determinants underpinning individuals' intentions towards sustainable entrepreneurship, particularly within the Algerian context, remain underexplored. Keeping this into consideration, our research endeavours to identify the motivational factors influencing the decision to engage in sustainable entrepreneurial activities among students at the Kolea University Pole.

Design / Methodology / Approach: Drawing on a quantitative approach, data from 370 student responses were analysed using linear regression analysis.

Findings: The findings reveal the significant influence of both internal and external determinants on entrepreneurial intention for sustainable development among students. Internally, factors such as perceived entrepreneurial feasibility, perceived behavioural control, and attitudes towards sustainability emerged as key drivers of entrepreneurial intention towards sustainability. Students with a strong inclination towards sustainability exhibited a heightened intention to engage in entrepreneurial activities aligned with sustainable development goals. Externally, sociological factors and social networks were found to exert a significant positive influence on sustainable entrepreneurship intention. This underscores the importance of familial, educational, and societal support structures in fostering an entrepreneurial mindset among students, shedding light on the role of information and communication technologies in shaping this intention. Yet, the study also highlights a concerning lack of awareness among students regarding the role of entrepreneurship in addressing environmental challenges underscoring the need for educational interventions aimed at cultivating an environmental ethos among students.

Originality/Value/Practical Implications: This study contributes to the discourse on sustainable entrepreneurship in developing countries, particularly in Algeria, by elucidating the factors influencing entrepreneurial intention among students. The findings underscore the importance of both internal and external determinants in shaping students' entrepreneurial aspirations, with implications for educational policy and practice.

Keywords: sustainable entrepreneurship, entrepreneurial intention, sustainable development, motivational factors, internal factors, external factors, university students, Algeria.

JEL Codes: I23, M13, O15, Q01, Q56.

Introduction

It is increasingly apparent that the imperative for contemporary and future enterprises revolves around the principles of responsibility and sustainability. This necessitates the assimilation of environmental and societal exigencies into the identification of opportunities and the subsequent establishment of novel enterprises (Reyes-Rodríguez & Ulhøi, 2022). Within this framework, there has been a discernible interest in scrutinizing the confluence of entrepreneurship and sustainable development, thereby giving rise to the conceptualization of sustainable entrepreneurship (Romero-Colmenares & Reyes-Rodríguez, 2022).

Entrepreneurs are driven by the prospect of attaining financial gains while establishing novel enterprises or expanding operations within existing businesses. Simultaneously, they play a role in addressing social, environmental, and environmental degradation issues (Bregman, 2020; Muñoz & Cohen, 2018). The crux of any sustainable entrepreneurial undertaking lies in the prospective entrepreneur's intention, representing the probability of their commitment to sustainable entrepreneurship (Bregman, 2020). The prevailing consensus posits that sustainable entrepreneurship facilitates value creation across social, economic, and environmental domains (Tehseen & Haider, 2021; Vuorio et al., 2018). Accordingly, sustainable entrepreneurship intention pertains to the volition of individuals to establish enterprises by conscientiously incorporating social, economic, and environmental dimensions.

Sustainable entrepreneurship intention can be defined as the proclivity of individuals to participate in the systematic procedure of identifying, assessing, and capitalizing on entrepreneurial prospects aimed at diminishing the ecological footprint of businesses. Simultaneously, such endeavours are intended to yield advantages for broader societal well-being and local communities by enhancing their overall quality of life (Bapoo et al., 2022; Tehseen & Haider, 2021).

To ascertain the determinants of sustainable entrepreneurial intent, recent studies have refined and expanded models derived from entrepreneurial events theory or planned behaviour theory, employing their application within the realm of sustainable entrepreneurship (Agu et al., 2021; Peng et al., 2021; Yasir et al., 2021).

By understanding these factors, educational institutions can formulate more efficacious programs aimed at fostering the incorporation of social, economic, and environmental dimensions within the entrepreneurial initiatives of young individuals. This approach consequently facilitates the cultivation of a novel generation of entrepreneurs who exhibit an awareness of their societal and environmental responsibilities.

The comprehension of factors driving engagement in sustainable entrepreneurship, as previously discussed (Reuther et al., 2023), allows governmental decision-makers. The comprehension of sustainable entrepreneurship drivers plays a pivotal role in delineating apt incentives for fostering global sustainable development (Reuther et al., 2023). Policymakers underscore the imperative of heightened proactive measures by educational institutions in shaping the forthcoming cadre of sustainable entrepreneurs (Joensuu-Salo et al., 2022). Variables steering involvement in sustainable entrepreneurship, coupled with determinants governing sustainable business practices, namely, environmental, and social values, entrepreneurial fervour, and market-driven incentives, remain subjects of sustained scholarly interest (Reuther et al., 2023). In pursuit of these objectives, universities are deploying diverse strategies to cultivate sustainable entrepreneurial intent among students and deliver high-calibre entrepreneurship education. The overarching objective is to endow students with indispensable competencies requisite for steering sustainable entrepreneurial enterprises (Tehseen & Haider, 2021). This approach seamlessly aligns with the creation of an environment conducive to sustainable entrepreneurship, concurrently contributing to the attainment of both global and local sustainable development objectives.

In pursuit of contributing to the extant discourse concerning the determinants fostering sustainable entrepreneurship in developing nations, this article aims to delineate both internal (individual) and external (environmental) motivational factors influencing the decision to undertake sustainable development business among students at the University Pole of Kolea. Therein lies the primary inquiry

at hand guiding our investigation: What are the determinants of entrepreneurial intention for sustainable development among students at the University Pole of Kolea?

The selection of this research question arises from the paucity of extant studies delving into the determinants, both internal and external, of entrepreneurial intention aligned with sustainable development (Lopes et al., 2023; Romero-Colmenares & Reyes-Rodríguez, 2022). This lacuna is particularly conspicuous in the Algerian context, despite notable strides in entrepreneurial endeavours dedicated to the pursuit of sustainable development objectives. These endeavours encompass multifaceted initiatives targeting poverty alleviation, demographic change management, health preservation and enhancement, amelioration of human settlements, and integration into environmentally linked decision-making processes. These initiatives leverage legal and financial mechanisms, exemplified by the National Economic Social and Environmental Council (Kharkhache & Zellagui, 2021). Consequently, the investigation of these determinants within the Algerian milieu is deemed pertinent, with a concurrent aim of comparative analysis vis-à-vis antecedent research to discern potential congruities.

The insights gained from our study carry significant implications for various stakeholders ranging from educational institutions to policymakers and practitioners. Through the discernment of determinants influencing entrepreneurial intention for sustainable development among students, policymakers can devise tailored strategies to cultivate an environment conducive to sustainable entrepreneurship within academic settings (El-Gohary et al., 2023). Such initiatives are poised to cultivate a cohort of entrepreneurs characterized not only by financial acumen but also by a commitment to social and environmental responsibility, thereby advancing both local and global sustainable development objectives (Lopes et al., 2023).

The subsequent section entails a comprehensive review of extant literature concerning the determinants of entrepreneurial intention in Favor of sustainable development. Following this, the outcomes of the conducted quantitative analysis will be expounded upon, followed by an in-depth discussion of the results vis-a-vis the scrutinized literature. Ultimately, the article concludes by delineating identified limitations and proposing avenues for prospective research.

Literature Review

The literature has delved into the determinants of sustainable entrepreneurial intention akin to its scrutiny of classical entrepreneurship determinants (Romero-Colmenares & Reyes-Rodríguez, 2022). The objective of investigating the determinants of sustainable entrepreneurship is to discern entrepreneurs categorized as "sustainable" from those classified as "conventional." Thus, it is deemed valuable to delineate the attributes influencing an entrepreneur's inclination towards prioritizing the pursuit of not only economic objectives but also social and environmental goals (Gahlam, 2019).

The entrepreneurial intention for sustainable development is conceptualized as: "A cognitive state indicative of an individual's conviction and commitment to the prospective establishment of a novel commercial enterprise that generates economic, social, and environmental values" (Agu et al., 2021, p.5). The significance of delving into the study of sustainable entrepreneurial intention emanates from the differentiation between a sustainable entrepreneur and a conventional entrepreneur. Whereas a sustainable entrepreneur prioritizes environmental and social considerations, a traditional entrepreneur predominantly emphasizes economic facets (Arru, 2020).

The studies scrutinized in our investigation have categorized the determinants of entrepreneurial intention toward sustainable development into two delineated classifications: internal determinants and environmental determinants.

Internal Determinants

These determinants pertain to the attributes of the entrepreneur per se (Alfalih & Ragmoun, 2020).

Table 1 encapsulates the internal determinants derived from an analysis of the extant literature on this subject.

Table 1. Internal determinants shaping entrepreneurial intentions toward sustainable development (Source: Authors' processing)

Determinants	Author(s)	Description
Altruism	Romero-Colmenares & Reyes-Rodríguez, (2022)	Expressed as an individual's volition to enhance welfare, demonstrated through responsibility for the natural environment and the community.
ATS		Relates to the manner in which a person positively or negatively perceives becoming a sustainable entrepreneur.
Sustainable entrepreneurship education	(Diepolder et al., 2021)	Inculcates students with competencies to assess commercial opportunities in line with environmental and societal demands, fostering sustainable enterprise creation and operational sustainability.
PDSD	(Tehseen & Haider, 2021)	Captures cognitive processes, enthusiasm, and inclination for sustainability entrepreneurship, indicating the intensity of attraction for behavioural success.
PFSD	Tan et al (2021)	Pertains to the degree to which an individual perceives their capability to initiate a sustainable business
PBC	Lopes et al. (2023)	In the TPB, it concerns the subjective perception of one's capability to execute entrepreneurial behaviours, encompassing perceived competence and controllability.
Proactivity	Fatoki (2020)	Reflects individual differences in the propensity for proactive initiatives across diverse activities and situations.
Risk-taking propensity		The perceived likelihood of rewards crucially influences individual engagement before facing the potential consequences of failure.
Perceived creativity	Zhu et al. (2022)	Denotes the manner in which individuals assess their aptitude for producing novel and advantageous ideas.

Notes: ATS = Attitude toward sustainability, PDSD = Perceived desirability towards sustainable development, PFSD = Perceived feasibility towards sustainable development, PBC = Perceived behavioural control.

Our review of the literature has led us to posit the initial hypothesis:

H1: Internal determinants (individual factors) exert a statistically significant positive effect on the entrepreneurial intention for sustainable development among students at the University of Kolea.

External Determinants

These determinants pertain to the entrepreneurial environment, encompassing the individual decision-making of the entrepreneur (Alfalih & Ragmoun, 2020; Gahlam, 2019). Gahlam (2019) identifies five categories of determinants associated with the environment that have the potential to influence sustainable entrepreneurship, utilizing the strategic management tool known as the PESTEL model.

Table 2. Determinants associated with the environment influencing entrepreneurial intention for sustainable development (Source: Adapted from Gahlam, 2019)

Determinants	Description
Economical	In light of sustainable development, nascent opportunities arise from market failures. These opportunities seek to address these failures by considering market determinants and the monetary/cognitive resources available to entrepreneurs as crucial resource-related factors.
Institutional	These determinants can be classified into two categories: legal (encompassing laws related to sustainable development and fiscal regulations, including fiscal incentives for sustainable development) and normative (comprising standards and certifications).
Ecological	The environmental challenges, encompassing environmental degradation.
Sociological	These determinants are associated with the diverse environments frequented by the entrepreneur (family, educational institutions, universities, societal structures, corporations, professions, territories), exerting either a positive or negative influence on the entrepreneurial act.
Technological	These determinants pertain to the effect of innovation on the establishment of sustainable enterprises.

Social Media

The advent of the fourth industrial revolution, encompassing social media, has facilitated market accessibility for entrepreneurs (Barrera-Verdugo & Villarroel-Villarroel, 2022; Kusumawardhany & Dwiarta, 2020;). Social media platforms have permeated cyberspace, constituting a robust business ecosystem and engendering substantial demand for entrepreneurs, characterized by low entry barriers (El-Gohary et al., 2023; Holden & Rada, 2011). Proficiency in basic marketing skills is requisite for website creation and online product showcasing, fostering an entrepreneurial mindset conducive to sustained entrepreneurial intent targeting a global market (Yasir et al., 2021). Commencing a business necessitates a modest budget allocation for augmenting sustainable entrepreneurial intent through the utilization of social media channels and electronic payment systems (El-Gohary et al., 2023; Martínez et al., 2017; Ooi & Nasiru, 2015). Contemporary challenges for nascent entrepreneurs transcend market expansion concerns, focusing instead on navigating competitive pressures exerted by globally recognized brands (Nawi et al., 2019). As a fledgling startup, social media platforms emerge as sophisticated instruments for brand recognition, and the burgeoning demand in the digital realm serves as a catalyst for individuals to embark on endeavours in sustainable entrepreneurship.

Each of the enumerated factors (economic, institutional, sociological, ecological, technological, and social media) constitutes potential influencers on entrepreneurial intention vis-à-vis sustainable development. These determinants wield the capacity for both positive and negative effects on an entrepreneur's proclivity to engage in sustainable entrepreneurial pursuits.

A propitious economic milieu, institutional backing, societal consciousness, ecological considerations, and the assimilation of sustainable technologies collectively serve as motivational forces propelling entrepreneurs towards active involvement in endeavours conducive to sustainable development. In essence, the intricate interplay among these factors orchestrates their combined impact on entrepreneurial intention favouring sustainable development.

Drawing upon these factors, we posit the following hypothesis:

H2: External determinants, specifically those pertaining to the student's environmental milieu, exert a statistically significant positive influence on the entrepreneurial intention for sustainable development among students within the academic domain of the University of Kolea.

Overall, we have meticulously analysed existing literature on the determinants of entrepreneurial intention towards sustainable development. We have synthesized a comprehensive understanding of the factors influencing individuals' inclinations towards sustainable entrepreneurship. As Figure 1 shows, our analysis encompasses both internal determinants, which relate to individual attributes, as well as external determinants, which encompass the broader entrepreneurial environment including economic, institutional, ecological, sociological, technological, and social media factors.

The internal determinants underscore the importance of individual characteristics and attitudes in shaping entrepreneurial intentions towards sustainability, highlighting concepts such as altruism, perceived desirability, and feasibility towards sustainable development, perceived behavioural control, proactivity, risk-taking propensity, and perceived creativity. These factors contribute to an individual's predisposition towards sustainable entrepreneurship, reflecting their personal values, beliefs, and capabilities. On the other hand, the external determinants shed light on the environmental context within which entrepreneurs operate, emphasizing the significant influence of economic conditions, institutional frameworks, ecological challenges, societal norms, technological advancements, and the impact of social media on entrepreneurial intention towards sustainability. These external factors not only shape the opportunities and constraints faced by entrepreneurs but also influence their perceptions and motivations towards engaging in sustainable entrepreneurial activities.

These insights have led us to formulate hypotheses that explore the relationship between these determinants and entrepreneurial intention among students at the University Pole of Kolea in Algeria. By elucidating these hypotheses, we aim to contribute to the advancement of knowledge in the field of sustainable entrepreneurship and provide valuable insights for both researchers and practitioners seeking to foster sustainable development through entrepreneurial endeavours.

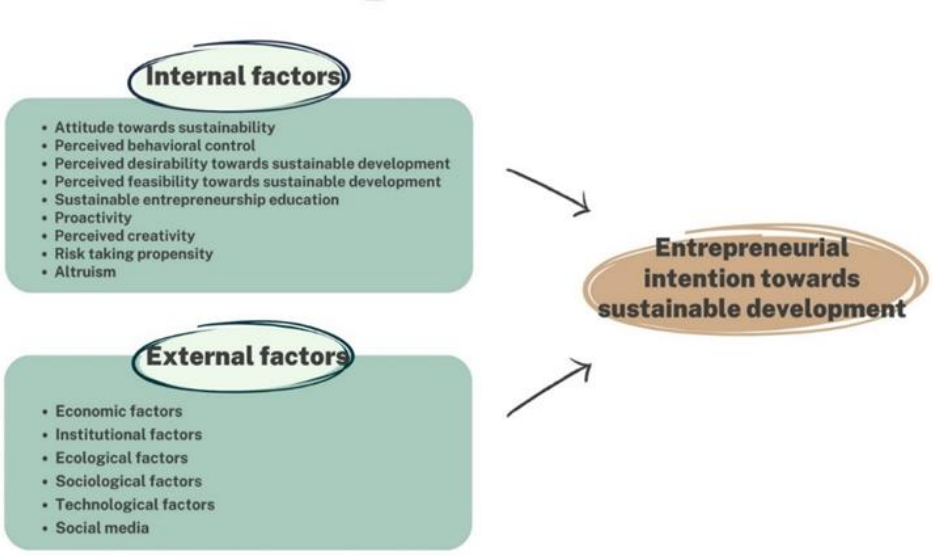

Fig 1. Proposed research model (Source: Developed by authors)

Research Methodology

Data

A survey was administered to the students across the five schools of the University Pole of Kolea through social media platforms (Facebook and Instagram) and the distribution of printed copies. A total of 370 responses were gathered. To ensure sample representativeness, the sample size was determined using Cochran's formula, yielding a sample size of 336 students. This formula is denoted as:

$$N = \frac{Z^2 \times P \times (1 - P)}{E^2} \quad (1)$$

Where:

N: represents the sample size.

Z: This symbolizes the Z-score, which corresponds to the level of confidence desired for the estimate. It's typically derived from the standard normal distribution and represents the number of standard deviations a data point is from the mean (for instance, Z=1.96 for a confidence level of 95%).

P: This stands for the estimated proportion of the population with the characteristic of interest.

E: This denotes the margin of error, indicating the maximum allowable deviation of the estimate from the true population parameter. It signifies the precision of the estimate.

The confidence interval employed in this study is set at 95%, accompanied by an approximate margin of error of 5%. The percentages were derived from calculations made through https://fr.checkmarket.com/calculateur-taille-echantillon/, a website highly endorsed by statisticians. The survey comprehensively investigates factors outlined in the literature review, incorporating both internal and external dimensions. Internal determinants encompass variables such as attitude towards sustainability, perceived behavioural control, perceived desirability regarding sustainable development, perceived feasibility, education in sustainable entrepreneurship, proactivity, perceived creativity, propensity for risk-taking, and altruism. External determinants include economic, institutional, ecological, sociological, technological, and social media factors.

Method

To ascertain the determinants of entrepreneurial intention toward sustainable development among university students at the Kolea University Pole, our literature review guided us to adopt a quantitative methodology. Specifically, we employed inferential analysis through linear regression to examine the relationships between variables. This method proves particularly apt for hypothesis testing and addressing the research question. The quantitative approach facilitates the collection of an extensive dataset, conducive to studying a large sample size (Meghari, 2020). Data are gathered from students via a questionnaire constructed using the Google Forms tool. In accordance with prior research, the gathered data underwent statistical processing utilizing the Excel tool, XLSTAT and the SPSS program (Statistical Package for the Social Sciences: Version 25).

Results

Descriptive Analysis

In this section, we delineate the profiles and attributes of the students who participated in our survey, thereby constituting our sample. This analysis was executed employing the SPSS software.

Table 3. Profile of respondents (Source: Authors' processing using SPSS)

Variables	Classes	Sample distribution	Percentage (%)
Gender	Female	124	33,5%
	Male	246	66,5%
Age	Less than 18	1	0,3%
	18-22	292	78,9%
	23-27	69	18,6%
	28-32	1	0,3%
	33 and above	7	1,9%
Institution	ENSM	77	20,8%
	EHEC	51	13,8%
	ESC	74	20%
	ESGEN	53	14,3%
	ENSSEA	115	31,1%
Study level	Preparatory classes	120	32,4%
	Common core	57	15,4%
	Master 1	87	23,5%
	Master 2	98	26,5%
	Doctoral candidates	8	2,2%
Entrepreneurship education	Yes	94	25,4%
	No	275	74,6%
Familiarity with the phenomenon of sustainable entrepreneurship	Yes	178	48,1%
	No	192	51,9%
Participation in projects related to sustainable entrepreneurship activities	Yes	56	15,1%
	No	314	84,9%

Table 3 points to a discernible pattern that emerges wherein females constitute two-thirds of our sampled population, while males represent merely one-third. The predominant demographic within our sample falls within the age bracket of 18 to 22 years, accounting for a substantial 78.9%, succeeded by the age group of 23 to 27 years, comprising 18.6%. In terms of academic affiliation, the preeminent majority of participants are enrolled at ENSSEA, constituting 31.1%, followed by students from ENSM and ESC, contributing proportions of 20.8% and 20%, respectively.

Upon scrutinizing the tabulated data, it becomes apparent that the prevailing majority of participants belong to preparatory classes, followed by those in Master 2, then Master 1, and ultimately individuals in the common core. Doctoral candidates represent the concluding category within the sample.

Table 4. Sustainable entrepreneurship intention (Source: Authors' processing using SPSS)

Questions	Mean	Standard Deviation	Response Pattern	Relative importance[1]
I have a strong intention to establish a sustainable enterprise	3.80	0.935	Positive (agreed)	3
I have very seriously idea about engaging in sustainable entrepreneurship	3.74	0.942	Positive (agreed)	5
Compared to having a stable job, I am more willing to start a business with sustainable innovations.	3.89	0.958	Positive (agreed)	2
It is very likely that in the foreseeable future, I will start my own sustainable entrepreneurial venture.	3.54	1.020	Positive (agreed)	6
My professional goal is to become an entrepreneur who supports sustainable business practices	3.75	0.995	Positive (agreed)	4
I will do my best to create and manage my own sustainable business	3.91	0.927	Positive (agreed)	1

Based on the mean values derived from responses to questions within this axis, all of which surpass the midpoint of the Likert scale (3), we deduce an inclination towards the affirmative, denoting agreement. Furthermore, the observed low standard deviations suggest a notable homogeneity in the responses.

Table 5. Internal determinants (Source: Authors' processing using SPSS)

Determinants	Mean	Standard Deviation	Response Pattern	Relative importance
Attitude toward sustainability	3.87	0.67	Positive (agreed)	3
Perceived behavioural control	3.32	0.82	Positive (agreed)	7
Perceived desirability towards sustainable development	3.89	0.84	Positive (agreed)	2
Perceived feasibility towards sustainable development	3.22	0.77	Positive (agreed)	8
Sustainable entrepreneurship education	3.135	0.75	Positive (agreed)	9
Proactivity	3.85	0.82	Positive (agreed)	4
Perceived creativity	3.76	0.81	Positive (agreed)	5
Risk-taken propensity	3.59	0.74	Positive (agreed)	6
Altruism	3.99	0.73	Positive (agreed)	1

Within this axis, the mean values of responses predominantly exceed the midpoint of the Likert scale (3), indicative of a prevalent positive inclination toward affirmation. Notably, the observed low standard deviations suggest a limited degree of variability among responses, reflecting a noteworthy homogeneity in participants' perspectives.

[1]Ranking based on the highest mean. In the event of two equal means, priority is given to the question with the smallest standard deviation.

Table 6. External determinants (Source: Authors' processing using SPSS)

Determinants	Mean	Standard Deviation	Response Pattern	Relative importance
Economic factors (Opportunities)	2.57	0.97	Negative (disagreed)	6
Economic factors (Statements)	3.67	0.76	Positive (agreed)	3
Institutional factors	3.24	0.80	Positive (agreed)	5
Ecological factors	2.50	1.04	Negative (agreed)	7
Sociological factors	3.56	0.70	Positive (agreed)	4
Technological factors	3.81	0.77	Positive (agreed)	1
Social media	3.81	0.83	Positive (agreed)	2

The mean values of responses to Economic Factors (statements), Institutional Factors, Sociological Factors, Technological Factors, and Social media are found to surpass 3, suggesting a positive inclination in responses (toward agreement). Conversely, the mean values of responses to Economic Factors (opportunities) and Ecological Factors exhibit a negative tendency, indicative of disagreement. It is noteworthy that all standard deviation values are low, implying a homogeneity in responses, irrespective of their alignment toward agreement or disagreement.

Multidimensional Analysis

Multiple Factor Correspondence Analysis

The outcomes of Multiple Correspondence Analysis (MCA) reveal the following (Fig.2):

- Age cohorts spanning 23 to 27 years, 28 to 32 years, and surpassing 33 years are enrolled in the master's program at ENSM, with some individuals concurrently enrolled in doctoral programs. Predominantly male, these students actively engage in projects and activities associated with sustainable entrepreneurship, indicative of their substantial familiarity with this phenomenon. Their mean agreement levels concerning Sustainable Entrepreneurial Intention, as well as internal and external determinants, consistently exceed a score of 4.
- The demographic bracket encompassing those below 18 to 22 years is predominantly comprised of female students from other institutions within the Pole. Presently enrolled in preparatory and some in common core programs, this cohort exhibits minimal involvement in projects and activities related to sustainable entrepreneurship, reflecting a relative unfamiliarity with the phenomenon. Their mean agreement levels concerning internal and external determinants do not surpass a score of 4, inclusive of both agreement and strong agreement.

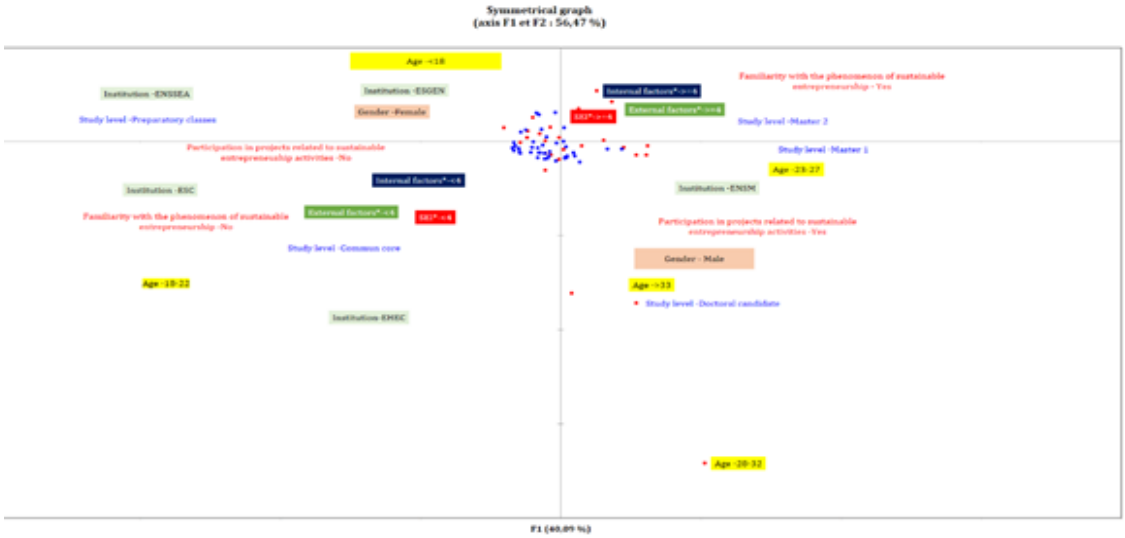

Fig 2. Results of MFCA (Source: Authors' processing using XLSTAT)

Inferential Analysis

Testing the First Hypothesis

H1: Internal determinants exert a statistically significant and positive impact on the entrepreneurial intention for sustainable development among students at the University of Kolea.

Table 7. Regressions results (Source: Authors' processing using SPSS)

Dependent variable	Independent variables	ANOVA F-stat (Sig.)	R	R^2	Regression coefficient B (Sig.)	Significant
Entrepreneurial intention towards sustainable development	Attitude toward sustainability	54.54 (0.000)	0.359	0.129	2.161 (0.000)	Yes
	Perceived behavioural control	97.763 (0.000)	0.458	0.210	2.328 (0.000)	Yes
	Perceived desirability towards sustainable development	180.926 (0.000)	0,576	0,332	1,700	Yes
	Perceived feasibility towards sustainable development	70.298 (0.000)	0.400	0.160	2.474 (0.000)	Yes
	Sustainable entrepreneurship education	32.774 (0.000)	0.389	0.152	0.380 (0.000)	Yes
	Proactivity	50.951 (0.000)	0.349	0.122	0.329 (0.000)	Yes
	Perceived creativity	64.470 (0.000)	0.386	0.149	0.368 (0.000)	Yes
	Risk-taken propensity	89.597 (0.000)	0.442	0.196	0.465 (0.000)	Yes
	Altruism	28.829 (0.000)	0.270	0.073	0.287 (0.000)	Yes
	Internal Determinants(ID)	136,072	0,520	0,270	0,691	YES

Internal determinants (ID) exhibit a statistically significant and positive impact on entrepreneurial intention towards sustainable development at a 5% significance level (Sig = 0.000 < 0.05). The correlation coefficient (R = 0.520) signifies a moderate positive correlation between entrepreneurial intention towards sustainable development and ID. Moreover, the coefficient of determination (R^2 = 0.27) suggests that 27% of the variability in entrepreneurial intention for sustainable development can be elucidated by internal determinants, leaving the remaining 73% ascribed to other factors. The regression coefficient (B = 0.691) denotes that a unitary increase in internal determinants results in a 0.691% elevation in entrepreneurial intention towards sustainable development. These findings underscore a substantial association between internal determinants and entrepreneurial intention towards sustainable development, underscoring the pivotal role of these determinants in comprehending entrepreneurial motivations pertinent to sustainable development.

Testing the Second Hypothesis

H2: Determinants related to the environment exert a statistically significant and positive effect on the entrepreneurial intention for sustainable development among students at the University Pole of Kolea.

Table 8. Regressions results (Source: Authors' processing using SPSS)

Dependent variable	**Independent variables**	**ANOVA F-stat (Sig.)**	**R**	**R^2**	**Regression coefficient B (Sig.)**	**Significant**
Entrepreneurial intention towards sustainable development	Economic factors	9.007 (0.000)	0.262	0.069		
	EF1				0.120 (0.003)	Yes
	EF2				0.200 (0.000)	Yes
	EF3				-0.035 (0.721)	Yes
	Institutional factors	11.244 (0.000)	0.172	0.030	0.166 (0.001)	Yes
	Ecological factors	2.752 (0.000)	0.086	0.007	0.064 (0.000)	Yes
	Sociological factors	31.948 (0.000)	0.283	0.080	0.313 (0.000)	Yes
	Technological factors	36.367 (0.000)	0.300	0.090	0.030 (0.000)	Yes
	Social media	47.297 (0.000)	0.337	0.114	0.313 (0.000)	Yes
	External determinants (ED)	40.481 (0.000)	0.315	0.099	0.498 (0.000)	YES

In the context of our analysis, external determinants exhibit a statistically significant and positively oriented impact on entrepreneurial intention concerning sustainable development at a 5% significance threshold (Sig = 0.000 < 0.05). Within these external determinants, sociological factors and social networks manifest the most robust influence, delineated by a coefficient (β = 0.313), signifying a conspicuously positive sway on entrepreneurial intention towards sustainable development. Upon scrutiny of the correlation between external determinants and entrepreneurial intention for sustainable development, a correlation coefficient (R) of 0.315 is discerned, indicative of a weak yet positive correlation between these two variables. The coefficient of determination (R^2) assumes a value of 0.099, intimating that merely 9.9% of the variance in entrepreneurial intention for sustainable development is explicable by the identified external determinants. The residual 99.1% of the variance is ostensibly ascribed to unaccounted factors beyond the purview of our model. Interpreting the regression coefficient (B = 0.498), an augmentation of one unit in external determinants corresponds to a concomitant increase of 0.498% in entrepreneurial intention towards sustainable development.

Discussion

Romero-Colmenares & Reyes-Rodríguez (2022) underscored the imperative for a comprehensive inquiry into entrepreneurial intention within specific entrepreneurial types. Nevertheless, despite a wealth of research on sustainable entrepreneurship (Arru, 2020), understanding regarding the determinants of entrepreneurial intention in sustainable entrepreneurship remains circumscribed (Tehseen & Haider, 2021).

Internal Factors

Concerning individual determinants (internal factors), our results evince that sustainability orientation, identified as the first determinant of entrepreneurial intention according to the Theory of Planned Behaviour, exerts a statistically significant positive impact on entrepreneurial intention for sustainable development. This signifies that heightened favourability in attitudes towards establishing an enterprise conducive to advancing societal and ecological objectives corresponds with a commensurate increase in the intention to assume the role of a sustainable entrepreneur (Lopes et al., 2023).

The outcomes of our investigation align with antecedent studies conducted by Abdelwahed (2022), Agu et al. (2021), Lopes et al. (2023), Ndofirepi (2023), Romero-Colmenares & Reyes-Rodríguez (2022), Sher et al. (2020), Yasir et al. (2022). Instances where the attitude towards sustainability lacks statistical significance are infrequent. Noteworthy exceptions were identified during the COVID-19 pandemic in Vietnam, as elucidated by Nguyen et al. (2021), and in Indonesia, as explicated by Prabowo et al. (2022). In the latter scenario, when the nexus between the attitude towards sustainability and entrepreneurial intention for sustainable development (SD) is tempered by contextual variables such as infrastructural and relational support, the impact becomes statistically significant albeit with an adverse effect. Hence, contextual factors were observed to mitigate the influence of attitudes on entrepreneurial intention for sustainable development (Lopes et al., 2023).

Perceived behavioural control, a key determinant within the framework of the Theory of Planned Behaviour, exerts a significant and positive influence on the entrepreneurial intention for sustainable development. The findings underscore that students exhibiting the highest likelihood of transitioning into sustainable entrepreneurs possess the requisite competencies and aptitudes, a trend supported by extant literature (Fatoki, 2020; Joensuu-Salo et al., 2022; Lopes et al., 2023; Romero-Colmenares & Reyes-Rodríguez, 2022; Yasir et al., 2021). Interestingly, this stands in contrast to outcomes observed in studies conducted in Liechtenstein, Austria, and Finland (Vuorio et al., 2018).

Consistent with Shapero and Sokol's (1982) Entrepreneurial Event Model, our study reveals that perceived entrepreneurial desirability and feasibility are salient determinants of entrepreneurial intention. These factors exhibit a statistically significant and positive impact on the entrepreneurial intention specifically directed towards sustainable development.

Our findings align with prior investigations involving student cohorts across diverse nations (Abdelwahed, 2022; Sher et al., 2020; Vuorio et al., 2018). Furthermore, the presence of mentors, guidance, and role models contributes to the development of perceived feasibility, instilling greater confidence in the belief that a certain potential exists, and that the implementation of entrepreneurial ideas is entirely attainable (Tan et al., 2021).

Education in sustainable entrepreneurship significantly and positively influences, according to our findings, entrepreneurial intent towards sustainable development. Broadly, our results suggest that individuals who have undergone training in sustainable entrepreneurship through pedagogically sound approaches exhibit heightened interest in establishing enterprises aligned with sustainable development goals (Diepolder et al., 2021; Foucrier & Wiek, 2019; Romero-Colmenares & Reyes-Rodríguez, 2022; Sharma et al., 2020).

These findings underscore the paramount importance of specific knowledge acquisition within academic settings, facilitated through tangible experiences and education tailored towards sustainability considerations. Furthermore, it is imperative to acknowledge the substantial influence of the institutional context, encompassing policies governing university programs, institutional culture, and strategies implemented to incentivize students towards engagement in sustainable entrepreneurial endeavours

(Agu et al., 2021; Kummitha & Kummitha, 2021; Romero-Colmenares & Reyes-Rodríguez, 2022; Sharma et al., 2020). This emphasis serves to fortify the positive impact of education aimed at cultivating an entrepreneurial mindset and sustainable ethos, thereby fostering potential entrepreneurial initiatives in response to environmental and societal imperatives (Diepolder et al., 2021; Fatoki, 2020; Kummitha & Kummitha, 2021).

Fatoki (2020) underscores the association between the proactivity trait and the implementation of anticipatory measures for environmental preservation and sustainable engagement. Our results reveal a statistically significant positive correlation between proactivity and entrepreneurial intention in sustainable development. This implies that individuals exhibiting a proactive personality are predisposed to a heightened interest in the establishment of enterprises oriented towards sustainability (Lopes et al., 2023).

Creativity is highly important in the initial phases of the entrepreneurial process, specifically in the genesis of entrepreneurial intent. This stems from the imperative for entrepreneurs to engender novel ideas and discern opportunities aligned with sustainability objectives. The study's findings elucidate that perceived creativity exerts a notably positive impact on entrepreneurial intent concerning sustainable development (SD). Furthermore, Cheng (2019) underscores that creativity serves to augment individuals' intrinsic motivation toward environmental sustainability, thereby implying an intricate association between creativity and the inclination for sustainable entrepreneurship.

The proactive personality and perceived creativity vital in entrepreneurship can indeed be cultivated, as noted by Lopes et al. (2023). Recognized as catalysts for sustainable development, innovation and creativity (Cheng, 2019) should be integrated into the educational journey of students, spanning from foundational to tertiary levels. This necessitates the inclusion of subjects like innovation, entrepreneurship, and business inception early on. Furthermore, fostering idea competitions, brainstorming sessions, and establishing university-based business incubators are recommended. Universities ought to create conducive environments that support and nurture student creativity, recognizing that perceived organizational and emotional support are pivotal in enhancing creativity levels, as evidenced by Anjum et al. (2021) and Laguía et al. (2019).

Despite Fatoki's (2020) findings indicating a lack of significant correlation between risk-taking propensity and entrepreneurial intention for sustainable development (SD) among students, and the observation of an indirect relationship between these variables, our present study reveals a statistically significant and positive influence of risk-taking propensity on entrepreneurial intention for SD. This is substantiated by the research of Hoogendoorn et al. (2019) and Lopes et al. (2023).

Altruism, characterized as a proclivity towards environmental safeguarding and an inclination towards social well-being (Rosário et al., 2022), exerts a statistically significant positive influence on entrepreneurial intention for sustainable development. Prior research has underscored its pronounced importance in sustainability, manifesting positive and statistically significant outcomes in its association with sustainable entrepreneurship (Rosário et al., 2022; Thelken & de Jong, 2020; Vuorio et al., 2018). The present survey's findings corroborate with prior evidence, affirming that this value wields an influence on entrepreneurial intention towards sustainable development. Consequently, one can deduce that the philosophy advocated by universities may contribute to such outcomes, a factor considered pivotal for furthering these intentions (Rosário et al., 2022).

Consistent with the findings of Abdelwahed (2022), Agu et al. (2021), El-Gohary et al. (2023), Joensuu-Salo et al. (2022), Lopes et al. (2023), Ndofirepi (2023), and Romero-Colmenares & Reyes-Rodríguez (2022), our results substantiate our initial hypothesis asserting that internal (individual) determinants exert a statistically significant positive influence on entrepreneurial intention for sustainable development among students at the University of Kolea.

External Factors

Regarding the second category of determinants, namely external determinants associated with the student's environment, our findings reveal a statistically significant and positively oriented general influence, at a 5% level of significance, of economic factors on the entrepreneurial intention for sustainable development.

Students discern the opportunities inherent in the market concerning sustainable development. The discernment of opportunities stemming from market inadequacies in sustainable development is inherently characterized as a 'Pull' factor within the framework of Shapero's perspective (Gahlam, 2019). Nevertheless, it is noteworthy that banking finance does not manifest as a sufficiently compelling incentive for these students to orient themselves toward sustainable entrepreneurship.

According to our empirical findings, institutional factors exhibit a statistically significant and positive influence on entrepreneurial intention towards sustainable development. More precisely, legal frameworks, regulatory standards, certifications, and fiscal incentives conducive to sustainable practices are observed to stimulate students' involvement in the establishment of sustainable enterprises (Gahlam, 2019). This observation aligns with Algeria's concerted endeavours in the realm of entrepreneurship, directed towards the pursuit of sustainable development goals (Kharkhache & Zellagui, 2021).

Paradoxically, our findings suggest that Algerian students lack a comprehensive awareness regarding the pivotal role of entrepreneurship in mitigating environmental challenges. Specifically, our results underscore that ecological factors exhibit negligible impact on entrepreneurial intention geared towards sustainable development.

Nevertheless, our findings indicate that sociological factors exert a statistically significant positive impact on entrepreneurial intention towards sustainable development among students at the campus. This suggests that engaging in sustainable entrepreneurship is positively influenced by familial, educational, societal, and territorial factors, as well as by businesses and professions (Gahlam, 2019; Meek et al., 2010).

Technological factors exhibit a statistically significant and positive impact at the 5% significance level on entrepreneurial intention for sustainable development. This observation reflects the concerted efforts of the Algerian government to enhance investments, support scientific and technological research, facilitate the transfer and adoption of technologies, and integrate scientific and technological advancements into commercial activities (Kharkhache & Zellagui, 2021).

In accordance with our findings, there exists a statistically significant and positive correlation between the utilization of social networks and entrepreneurial intent specifically geared towards sustainable development. Consequently, our recommendation advocates for heightened investments in information and communication technologies, along with the establishment of dedicated creative spaces within the precincts of business schools. Concurrently, students stand to benefit by not only acquiring augmented confidence in their technological proficiencies but also by witnessing an enhancement in their entrepreneurial skills, thereby potentially charting a trajectory towards a future career in entrepreneurship (El-Gohary et al., 2023).

Consistent with the research conducted by Alfalih and Ragmoun (2020), El-Gohary et al. (2023), Gahlam (2019), our empirical results substantiate our second hypothesis. This hypothesis posits that external determinants, those associated with the student's environment, exert a statistically significant positive influence on the entrepreneurial intention for sustainable development among students at the University Pole of Kolea.

Conclusions

This study aimed to elucidate the determinants influencing students' engagement in sustainable development initiatives at the Kolea University campus. The research hypotheses posited that both internal and external determinants significantly impact entrepreneurial intent for sustainable development among students. Through a quantitative study involving 370 students, the analysis differentiated internal factors related to individual students from external factors linked to their environment. The results confirmed that internal determinants, such as perceived entrepreneurial feasibility, perceived behavioural control, and attitude towards sustainability, exerted a substantial positive influence on the entrepreneurial intention for sustainable development among students. Additionally, external determinants, particularly sociological factors, and social networks, were empirically validated as principal contributors to this statistically significant impact on entrepreneurial intention. However, a notable finding was the students' limited awareness of the role of entrepreneurship

in addressing environmental issues, attributed to a lack of tangible engagement with environmental projects. This underscores the need for cultivating an environmental ethos among the student body. The study's uniqueness lies in the nascent state of sustainable entrepreneurship in Algeria, particularly at the Kolea University hub, comprising five institutions specializing in economics and management.

Policy Implication

The implications arising from this investigation carry significant weight for a multitude of stakeholders, encompassing governmental bodies, financial institutions, and educational establishments. The comprehension of factors influencing sustainable entrepreneurship stands as a linchpin for these entities, aiding in the cultivation of an ecosystem conducive to entrepreneurial endeavours and their enduring success. Academic institutions wield considerable influence in advancing sustainable entrepreneurship initiatives. They can spearhead the introduction of specialized curricula dedicated to sustainable entrepreneurship, orchestrate competitions geared towards fostering innovation in sustainability-centric business planning, and forge alliances with business incubators to bolster support mechanisms for nascent entrepreneurial ventures. Moreover, academic institutions hold the mandate to fortify students' resilience and risk tolerance through immersive experiential learning endeavours and structured entrepreneurship education. By orchestrating platforms for seasoned sustainable entrepreneurs to impart experiential wisdom, academia can catalyse the tacit knowledge acquisition process among students, thereby enhancing their acumen in identifying and capitalizing on entrepreneurial opportunities. Furthermore, the integration of sustainable practices within the operational frameworks of educational institutions, exemplified by the advocacy for digital learning resources over conventional materials and the implementation of eco-conscious initiatives, serves as a testament to their commitment towards instilling a culture of sustainability among the student populace. Policymakers are instrumental in sculpting the contours of sustainable entrepreneurship through the formulation of enduring policy frameworks aligned with the principles enshrined in Agenda 2030 and sustainable development goals. They hold the prerogative to incentivize sustainable entrepreneurship through a multipronged approach encompassing financial support mechanisms, institutional scaffolding, and regulatory frameworks calibrated to streamline the establishment and operational processes of sustainable ventures. Policy interventions such as debt alleviation mechanisms tailored for sustainable enterprises and tax incentives aimed at fostering a conducive business environment can serve as catalysts for stimulating entrepreneurial activity within the sustainable domain. The symbiotic collaboration between governmental bodies and academic institutions assumes paramount significance in the establishment of robust incubation ecosystems designed to nurture the next generation of innovative sustainable entrepreneurs. Additionally, cognizance of the pivotal role played by social networks, both within familial and broader societal spheres, underscores the necessity for concerted efforts aimed at imbuing aspiring sustainable entrepreneurs with values emblematic of altruism and self-efficacy, thus fostering an ecosystem conducive to the germination and sustenance of sustainable entrepreneurial endeavours. In summation, the implications delineated herein underscore the imperative for synergistic engagement among diverse stakeholders in fostering sustainable entrepreneurship, thus heralding a paradigm shift towards socioeconomic progress and environmental stewardship.

Limitations

The emergence of sustainable entrepreneurship as a phenomenon in Algeria is of recent origin, thereby resulting in a paucity of research pertaining to this subject within the Algerian context. Additionally, challenges were encountered during the data collection phase for the empirical investigation, owing to a notable reluctance among a significant proportion of students to engage with the provided questionnaires. This phase consequently proved to be temporally extensive, demanding substantial investments in both time and effort.

Recommendations for Future Studies

This study provides a comprehensive exploration of the multifaceted determinants shaping entrepreneurial inclination towards sustainable development among students within the academic setting of the University Pole of Kolea. Prospective investigations may deepen quantitative analyses by selectively scrutinizing either internal or external factors, thereby enhancing conceptual clarity. Future

inquiries could extend the examination of entrepreneurial intent towards sustainable development among students by targeting diverse academic institutions and faculties, particularly encompassing cohorts from various disciplinary backgrounds, notably the natural sciences, to facilitate subsequent comparative assessments with the findings of the present study. Such endeavours would enable the extrapolation of results and facilitate a nuanced comprehension of potential contextual disparities within educational frameworks. Moreover, employing mixed-method approaches integrating quantitative surveys and qualitative interviews would yield a more holistic understanding of the intricacies underpinning students' entrepreneurial intentions towards sustainable development.

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ECONOMICS AND CULTURE 21(1), 2024

DOI: 10.2478/jec-2024-0005

DOES ECONOMIC COMPLEXITY INFLUENCE CARBON EMISSIONS? EVIDENCE FROM NEXT ELEVEN COUNTRIES

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Received 2 February 2024; accepted 7 May 2024

Abstract

Research Purpose: The study examines the effect of economic complexity on carbon dioxide emissions in the Next 11 countries with the view to validate or refute the economic complexity-Kuznets curve (E_cKC) between 1995 and 2019. The Next 11 countries include Bangladesh, Egypt, Indonesia, Iran, Mexico, Nigeria, Pakistan, Philippines, South Korea, Turkey, and Vietnam.

Design/Methodology/Approach: Two econometric methods, correlated Panel standard error (PCSE) and feasible generalized least squares (FGLS) estimating techniques, are used to achieve the objectives of the study.

Findings: The estimates from the FGLS approach are consistent with that of the PCSE approach. The results from both techniques show that economic complexity increases carbon emissions in the Next 11 countries. Also, from the E_cKC, the study invalidates the hypothesis and supports a positive monotonic linear relationship between economic complexity and carbon emissions, which also means the "*pollution haven hypothesis".*

Originality/Value/Practical Implications: The study examines whether the environmental Kuznets curve (EKC) in the Next 11 countries is valid or not. To do this, the current study is different from earlier studies in that it uses economic complexity—that is, the economic complexity-Kuznets Curve (E_CKC)—instead of GDP. This is explained by the fact that environmental issues should involve the development of more advanced commodities rather than just raising an economy's GDP productivity. And most of the countries in the Next 11 countries are currently shifting their economies to produce more complex goods.

Keywords: economic complexity, carbon dioxide emissions, Next 11 countries, PCSE, FGLS.

JEL Classification: C21, O10, O3, O44.

Introduction

One significant obstacle to achieving sustainable development in the modern era is the effects of global climate change. NASA (2023) stated that carbon dioxide is a substantial heat-trapping gas, also called greenhouse gas, that is generated by the exploitation and burning of fossil fuels, such as oil, coal, or natural gas, as well as during wildfires and natural events like volcanic eruptions. Furthermore, in less than 200 years, human activity has increased the amount of carbon dioxide in the atmosphere by 50 per cent. Thus, to reduce carbon dioxide (CO_2) emissions and promote sustainable economic growth globally, the seventh Sustainable Development Goal (SDG 7) intends to provide access to inexpensive, dependable, and clean energy sources (Murshed et al., 2022a).

It is argued that the economy will be affected environmentally when agricultural products are replaced by more sophisticated (complex) products, as this will require the introduction of new technologies and higher levels of capital intensity. This is supported by Incekara (2019) and Can and Gozgor (2017) that economies undergo a transition from being "energy-intensive" to being "technology-intensive". Satrovic and Adedoyin (2022) asserted that whereas more complex countries degrade the environment excessively, lesser complex countries often generate agricultural products and cause less environmental damage. However, the world's most advanced economies have improved their technological capabilities and adopted greener practices (Yilanci & Pata 2020). The most advanced complex economies have less

environmental deterioration as a result of clean production technologies. Therefore, one of the variables influencing environmental quality is thought to be economic complexity. Developed by Hidalgo and Hausmann (2009), "the Economic Complexity Index (ECI) measures the complexity of a nation's production by perceiving trade data as a bipartite network (ubiquity and variety) that connects nations to the goods they export". This suggests that economic complexity is more strictly linked to the quality of production, while economic growth (as mostly measured by gross domestic product, GDP) is related to the quantity of production (Laverde-Rojas et al., 2021). Furthermore, Osinubi and Ajide (2022) reaffirmed that the economic system's capacity and production structure are related to economic complexity. It illustrates how economic agents acquire knowledge through their activities during the production process (Ajide, 2022; Nguyen et al., 2021).

The Next 11 countries are not left out in the effort to meet SDG 13's goal of improving environmental quality. These nations have a strong chance of overtaking the BRICs countries to become the major economies in the world in the twenty-first century, according to Goldman Sachs Investment Bank's analysis following the formation of the BRICs in 2003. According to Yu et al. (2022), the countries are trying to expand their trade partners and boost their exports while they are in a transitional phase. Given this, it is argued that the Next 11 countries with their growing economies will be accompanied by increased energy consumption. Environmental problems will also start to surface as economies become less energy-efficient and more industry-focused to spur economic growth. Nonetheless, a few countries—most notably Nigeria and Mexico—are improving their energy productivity to lessen their impact on the environment (Goldman Sachs, 2015). Carbon emissions rise in tandem with economic expansion and rising energy use. Global efforts to reduce carbon emissions will be crucial because in 2004 the BRIC and Next 11 countries contributed more to carbon emissions than the developed countries. This is hardly surprising given that South Korea, Indonesia, and Iran rank among the top energy-consuming nations worldwide in 2019 (Enerdata, 2023). The implication is that these countries will continue to experience poor environmental quality through their energy sources and use if adequate measures are not put in place (Yu et al., 2022).

Empirical research has demonstrated that environmental deterioration can be exacerbated (Dogan et al., 2019; Neagu & Teodoru, 2019) or decreased (Kirikkaleli et al., 2023; Lee & Olasehinde-Williams, 2022; Yu et al., 2022; Boleti et al., 2021; Can & Gozgor, 2017) by economic complexity. The variant in the results enables us to examine how economic complexity will affect environmental degradation (carbon emissions) in the Next 11 countries. Deviating from extant studies, this present study advances knowledge, especially in the area of economic complexity and environmental deterioration, in two ways. First, given the economic potential of these countries to become the largest economies in the world in the 21st century, it is essential to understand how economic complexity affects carbon emissions in the Next 11 countries as studies in these areas did not specifically focus on the selected countries. The United States Energy Information Administration (EIA, 2012) estimates that the Next 11 countries are responsible for around 10% of the world's carbon emissions, which provides a rationale for this.

In addition, considering each country's share of global carbon emissions, the study examines whether the environmental Kuznets curve (EKC) in the Next 11 countries is valid or not. To do this, the current study is different from earlier studies in that it uses economic complexity—that is, the economic complexity-Kuznets curve (E_cKC)—instead of GDP. This is explained by the fact that environmental issues should involve the development of more advanced commodities rather than just raising an economy's GDP (gross domestic product) productivity. And most of the countries in the Next 11 countries are currently shifting their economies to produce more complex goods. It is expedient to establish whether environmental degradation (carbon emissions) will rise at first and then fall as economic complexity rises. Specifically, this presents the deviation of this study from Yu et al. (2022) who used economic growth to test the economic growth-Kuznet curve (EKC) in the Next 11 countries. However, because of their expanding economies, policymakers and government officials would find the study's findings and conclusions helpful in determining what steps to take to reduce environmental deterioration (carbon emissions). It is on this note that the present study seeks to examine the effect of economic complexity on carbon emissions in the Next 11 countries, with the view to investigating the validity or otherwise of the environmental Kuznets hypothesis. This becomes important because the Next 11 countries are trying to increase their exports and their growing economies would be

accompanied by increased energy consumption that could lead to increased carbon emissions. The study employs both correlated Panel standard error (PCSE) and feasible generalized least squares (FGLS) approaches to achieve the stated objectives. The results from both techniques show that economic complexity increases carbon emissions in the Next 11 countries. Also, from the E_cKC, the study invalidates the hypothesis and supports a positive monotonic linear relationship between economic complexity and carbon emissions, which also means the "*pollution haven hypothesis".*

The remaining part of this paper is structured as follows. The second section, which discusses the previous research on the topic, comes after this section. Section Three describes the study's methodology in detail, whereas Section Four concentrates on the results and a discussion of the findings. Finally, the study's findings and possible recommendations are provided in Section Five.

Literature Review

Overview of Economic Complexity and Carbon Emissions in the Next 11 Countries

Figure 1 shows that the countries are progressively producing more advanced goods, as the ECI indicates a positive trend. To be more precise, the countries have a negative ECI from 1995 to 2011, whereas the next 11 countries have a positive ECI from 2012 onward. This could be one of the reasons why the countries are classified as the next emerging economies. In specifics, as shown in Figure 1, the Next 11 countries have an average ECI between -0.3842 and 0.108 for the years 1995 to 2019, suggesting that these nations are already transitioning to producing complex goods. Figure 2 illustrates how the countries emit large amounts of carbon dioxide into the atmosphere, which is thought to have negative effects on both the economy and public health. The carbon emissions chart illustrates how greenhouse gas emissions in the Next 11 countries have been rising over time. Precisely, these countries' average carbon emissions per capita fall between 2.248 and 3.549 metric tons. This implies that the countries are experiencing a high level of environmental pollution which has to be reduced in line with the Paris Agreement as contained in Yu et al. (2022). However, studies (Paramati et al., 2017; Shahbaz et al., 2016; Yildirim et al., 2014) revealed that the Next 11 countries are now in the course of energy conservation and preserving the environment.

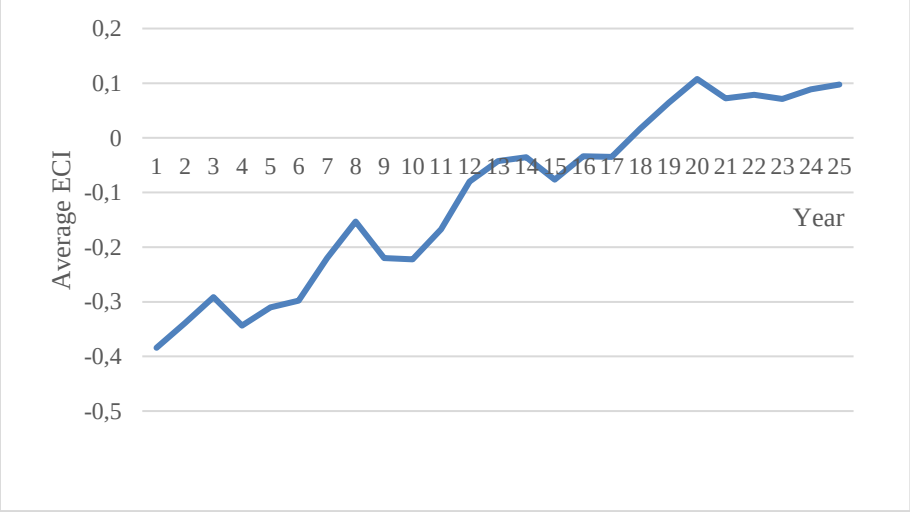

Fig. 1. Average economic complexity (ECI) in Next 11 countries (Source: Author's computations)

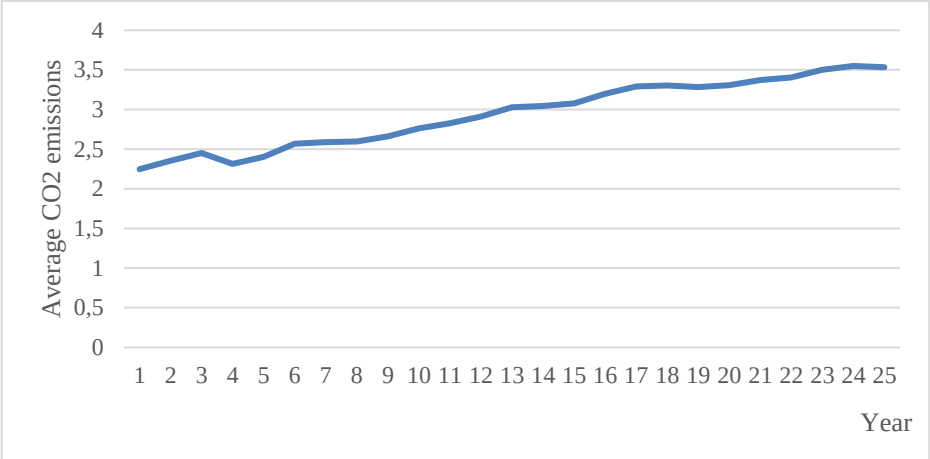

Fig.2. Average carbon dioxide emissions (CO_2) in Next 11 countries (Source: Author's computations)

Empirical Review

The literature is replete with proof that global warming brought on by humans is currently occurring. The topic of economic growth and environmental quality appears frequently in the literature, to determine whether or not the environmental Kuznets hypothesis (EKC) is valid. While some studies (Balsalobre-Lorente et al., 2023; Can & Gozgor, 2017; Kılıç et al., 2023; Kirikkaleli et al., 2023; Neagu, 2019; Satrovic & Adedoyin, 2022) accepted the hypothesis, others which include Gill et al. (2018), Laverde-Rojas et al. (2021), Xu (2018), and Zoundi (2017), rejected the hypothesis. The gross domestic product (GDP) was utilised as a proxy for economic growth in the majority of research that examined the EKC hypothesis. Environmental issues, however, extend beyond a rise in production. For this reason, the problem of economic complexity is raised. The literature has recently begun to pay more attention to this relationship. Amongst the few studies are Balsalobre-Lorente et al. (2023), Kazemzadeh et al. (2022), Murshed et al. (2022b), Satrovic and Adedoyin (2022), and Yu et al. (2022).

Rather than utilising GDP as a measure of economic growth to verify the EKC hypothesis in the BRICS nations, Balsalobre-Lorente employed ECI to examine the EKC hypothesis, with the findings that the E_cKC hypothesis is valid in the selected countries. This means that at the initial stages, carbon emissions rise as the BRICS nations produce more sophisticated commodities, but they subsequently fall as the nations' economies get more complicated (Neagu, 2019). In contrast, Yu et al. (2022) employed GDP for the EKC hypothesis in the Next 11 countries. The analysis validates the U-shaped relationship between economic growth and environmental degradation but rejects the EKC in the Next 11 countries. Economic complexity exacerbates the ecological footprint in low quantiles (10th), becomes insignificant in the 25th quantile, and diminishes the ecological footprint in higher quantiles, according to Kazemzadeh et al. (2022) who used panel quantile regression. Similarly, Boleti et al. (2021) used a world sample (88 developing and developed countries) to establish that economic complexity increases environmental performance in the countries and also rejected the EKC hypothesis. However, the finding shows a monotonic positive relationship between economic growth and carbon emission.

Additionally, Kılıç et al. (2023) showed that in the selected industrialised countries, economic complexity significantly worsens environmental degradation. The African continent has also been quite concerned about the issue of environmental quality. Abdi (2023) concentrated on 41 nations in sub-Saharan Africa to investigate how economic complexity affects environmental quality. The study used pooled mean group (PMG) cointegration analysis to prove that environmental quality is only positively impacted by economic complexity in the long run.

In single-country studies, Laverde-Rojas et al. (2021), employing different techniques, reported a significant positive association between ECI and carbon emissions in Colombia. This contradicts Can and Gozgor (2017) who found that raising a nation's productive sophistication can spur environmental quality in France. This finding suggests that nations with high ECI are likely to invest consistently more in cleaner technologies since they are concerned about their high non-renewable energy consumption.

In Turkey, Kirikkaleli et al. (2023) argued that economic complexity reduces environmental quality with different methods of estimation. Also, Shahbaz et al. (2016) revealed that economic complexity spurs ecological footprint in the United States. Several studies have demonstrated the presence of a feedback effect between economic complexity and ecological footprint or environmental quality in addition to the unidirectional relationship between the two. These studies are Abdi (2023), Saqib et al. (2023), Satrovic and Adedoyin (2022), Shahzad et al. (2021).

In conclusion, the examined studies have shown that the association between economic complexity and carbon dioxide emissions is contradictory. Contributing to the literature, especially in the context of the Next 11 countries, the current study advances our understanding of the subject matter. Based on our knowledge, this study is one of its kind to test the economic complexity-Kuznets hypothesis in the Next 11 countries. Additionally, by using the Correlated Panel Standard Error (PCSE) estimating technique, the study closes a methodological gap and allows us to investigate how economic complexity affects carbon dioxide emissions when cross-sectional dependence, slope heterogeneity, heteroscedasticity, and serial correlation are present. Also, the study employs Feasible Generalised Least Square (FGLS) regression to perform robustness assessments. Based on this, the following hypotheses are tested:

Hypothesis 1: Economic complexity influences carbon emissions in the Next 11 countries.

Hypothesis 2: Environmental Kuznets hypothesis, using economic complexity, holds in the Next 11 countries.

Research Methodology

Data

The study examines the effects of economic complexity on carbon emissions in the Next 11 countries between 1995 and 2019 based on data availability. The countries are Bangladesh, Egypt, Indonesia, Iran, Mexico, Nigeria, Pakistan, Philippines, South Korea, Turkey, and Vietnam. The countries are chosen because of their growing economies accompanied by increased energy consumption, which in turn, can influence environmental degradation. The variables employed include economic complexity index (ECI) obtained from MIT's Observatory of Economic Complexity (https://atlas.media.mit.edu), carbon dioxide (CO_2) emissions (metric tons per capita), GDP per capita (constant 2015 US$), urban population (URP) and renewable energy consumption (% of total final energy consumption, {REN}) gotten from the World Bank's World Development Indicators (https://data.worldbank.org/imdicator). Except for GDP per capita and urban population, which are converted to a logarithmic form to reduce series instability, other variables are utilised in their level form. More importantly, the results of this study are obtained from STATA 15.

Model Specification and Estimation Technique

Following Balsalobre-Lorente et al. (2023) and the economic complexity-Kuznets curve rather than the economic growth-Kuznets curve, equation 1 presents the empirical model that will be used to accomplish the objectives of the study.

$$CO_{2it} = \psi + \lambda_1 ECI_{it} + \lambda_2 ECI_{it}^2 + \lambda_3 LGDP_{it} + X_{it}'\gamma + \pounds_{it} \quad (1)$$

where CO_2 is carbon dioxide emissions, ECI and ECI^2 denote economic complexity and square of economic complexity, LGDP is the log of gross domestic product per capita, "t" represents the study period, "i" indicates the Next 11 countries. X is a vector of control variables, which include urban population (URP) and renewable energy (REN). The inclusion of urban population and renewable energy is guided by the existing literature (Abdi, 2023; Balsalobre-Lorente et al., 2023; Hsu, 2021; Laverde-Rojas et al., 2021; Saqib et al., 2023; Szetela et al., 2022). In simple terms, we expect λ_4 and λ_5 to be positive and negative, respectively, as shown in Equation 2. Thus, equation 1 can be rewritten to include the control variables as shown in equation 2.

$$CO_{2it} = \psi + \lambda_1 ECI_{it} + \lambda_2 ECI_{it}^2 + \lambda_3 LGDP_{it} + \lambda_4 LURP_{it} + \lambda_5 REN_{it} + \pounds_{it} \quad (2)$$

where ψ is the constant term, $\lambda_1 \ldots\ldots \lambda_5$ indicate the coefficients of economic complexity, a square of economic complexity, a log of gross domestic product per capita, a log of urban population, and renewable energy, respectively. $\pounds_{it}$ is the error term. To accept the E_cKC (economic complexity-Kuznets) hypothesis, we expect λ_1 and λ_2 to be significantly positive and negative, respectively (that is, $\lambda_1 > 0, \lambda_2 < 0$, indicating an inverted U-shaped association). The economic complexity turning point of this curve is calculated as $\hat{\pi} = 0.5 \widehat{\lambda_1} / \widehat{\lambda_2}$. Contrarily, we have a U-shaped association if $\lambda_1 < 0, \lambda_2 > 0$. Also, $\lambda_1 < 0, \lambda_2 < 0$ denotes a monotonically decreasing linear association, while $\lambda_1 > 0, \lambda_2 > 0$ denotes a monotonically increasing linear relationship. λ_1 should be negative if the countries are to benefit from economic complexity through reductions in environmental degradation (CO_2 emissions). The turning point ($\hat{\pi}$) is obtained by finding the derivative of equation 2 with respect to economic complexity (ECI).

The study employs the Corrected Panel Standard Error (PCSE) approach and Feasible Generalized Least Squares Regression (FGLS) method for a robustness check on equation 2. This PCSE method is useful because it accounts for cross-sectional dependence, slope heterogeneity, heteroscedasticity, and serial correlation, and it is useful when the number of cross-sections is below the study period, that is N<T. The null hypothesis of cross-sectional independence can be rejected at 1%, 5% or 10% levels of significance. The CSD test is given below in Equation 3.

$$CD = \sqrt{\frac{2T}{N(N-1)}} \left(\sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \hat{\vartheta}_{i,j} \right) \quad (3)$$

Where *N* and *T* denote cross-sections and time. $\hat{\vartheta}_{i,j}$ in association with errors.

Assuming slope homogeneity among the panel data can lead to spurious regression if the panel data is heterogeneous, according to Breitung (2005). To establish the existence of heterogeneity or homogeneity in the model, the study uses Pesaran and Yamagata (2008) approach. Equation 4 states the test statistics for the slope homogeneity.

$$\hat{\Delta} = \sqrt{N} \left(\frac{N^{-1}\hat{S} - k}{\sqrt{2k}} \right)$$
$$\tilde{\Delta} adj = \sqrt{N} \left(\frac{N^{-1}\hat{S} - k}{\sqrt{2k}} \right) \quad (4)$$

Where $\hat{\Delta}$ and $\tilde{\Delta} adj$ indicate standardized dispersion and the biased-adjusted statistics, respectively.

The existence of cross-sectional dependence among the series indicates that the second-generation panel unit root must be employed. The study employs both Im-Pesaran-Shin and CIPS unit root tests to achieve this. The CIPS test is stated in Equation 5 below.

$$CIPS(N,T) = \bar{T} = N^{-1} \sum_{i=1}^{N} t_i(N,T) \quad (5)$$

Where *T* and *N* are time and cross-sections

Next is to perform a cointegration test. The cointegration method used in the study is Westerlund's (2007) method, which is referred to as a second-generation panel cointegration test and can be used in situations where the variables are cross-sectional dependent. The null hypothesis of no cointegration can be rejected at either 1%, 5% or 10% if the statistic value below is greater than the critical value at any of these levels of significance. Lastly, we estimate equation 2 using PCSE and FGLS.

Descriptive Statistics

Table 1 discusses the descriptive statistics and pairwise correlation among the variables. The average values of carbon emissions (CO_2), economic complexity (ECI), economic complexity square (ECI^2), gross domestic product (GDP), urban population (URP), and renewable energy (REN) are given to be 2.943, -0.106, 0.931, 5319.549, 54903828, and 29.663, respectively. The maximum (12.225) and minimum (0.140) values of CO_2 are noted in South Korea (2018) and Bangladesh (1996), respectively. South Korea in 2016 and Nigeria in 2004 have the maximum (2.169) and minimum (-2.337) values of ECI, respectively. This suggests that South Korea of all the Next 11 countries is involved in the production of more sophisticated products and emissions of carbon dioxide, while Nigeria among the Next 11 countries contributes less to the production of advanced goods. Bangladesh is seen to be the country with the least emission of carbon dioxide. Since the average values of the variables fall within the minimum and maximum values, the results demonstrate that the variables are consistent. The standard deviation values show that the variables do not depart from their mean values. Also, Table 2 shows that while carbon emissions have a negative correlation with renewable energy and urban population, they have a positive correlation with economic complexity, GDP per capita, and economic complexity square. There is a significant correlation between all the variables and carbon emissions, except the urban population. Furthermore, since none of the correlation coefficients for the explanatory variables are higher than 0.80, there is no proof of multicollinearity among them.

Table 1. Descriptive statistics and pairwise correlation analysis (Source: Author's computations)

	Descriptive statistics					
Statistics	CO2	ECI	ECI^2	GDP	URP	REN
Mean	2.943	-0.106	0.931	5319.549	54903828	29.663
Maximum	12.225	2.169	5.460	31640.21	1.51E+08	88.680
Minimum	0.140	-2.337	9.88E-07	559.690	16349444	0.440
Std. Dev.	3.040	0.961	1.231	6363.750	26590364	25.337
Observations	275	275	275	275	275	275
	Pairwise Correlation					
	CO_2	ECI	ECI^2	LGDP	LURP	REN
CO_2	1.000					
ECI	0.632***	1.000				
ECI^2	0.330***	-0.065	1.000			
LGDP	0.871***	0.752***	0.299***	1.000		
LURP	-0.0163	0.0673	0.0822	0.178***	1.000	
REN	-0.692***	-0.696***	0.294***	-0.701***	0.014	1.000

*Note: ***p<0.01, **p<0.05*

Results and Discussion

Cross-Sectional Dependence, Panel Unit Root, Cointegration, and Homogeneity Tests

The Pesaran CSD test, as described in Pesaran (2004), is used to determine whether there is cross-sectional dependence in the series to be estimated. The null hypothesis that there is no cross-sectional dependence is rejected for every variable at the 1% level of significance, as seen in Table 2. This implies that there is evidence of cross-sectional dependence in the series, meaning that a shock in one of the Next 11 countries can be transferred to another. To account for cross-sectional dependence, the study uses both the Im-Pesaran-Shin (IPS) test and the Pesaran (2007) second-generation unit root test (CIPS). With the exception of economic complexity, all of the variables' estimates from the two tests show that they are I(1) and that they are stationary at first indifference.

A long-run association between the relevant variables is evident as the Westerlund (2007) cointegration finding rejects the null hypothesis that there is no cointegration among the variables. As the study rejects the null hypothesis of slope heterogeneity, the slope homogeneity test according to Pesaran and Yamagata (2008) in Table 2 shows the presence of slope heterogeneity in the panel analysis. These

results suggest that the study has to use an analysis approach that takes into consideration the slope heterogeneity and cross-sectional dependence among the variables.

Table 2. Pesaran CSD, panel unit root, cointegration, homogeneity test (Source: Author's computations)

Variable	CSD-test	Unit Root Test			
		IPS Unit Root Test		Pesaran (2007) CIPS	
		Level	1st Diff.	Level	1st Diff.
CO_2	16.00***	2.902	-8.800***	-0.783	-3.783***
ECI	14.54***	-0.3470	-10.337***	-2.945***	-5.415***
ECI^2	-2.42**	-1.136	-10.864***	-2.493***	-5.302***
LGDP	34.49***	2.737	-3.579***	-2.143	-2.989***
LURP	36.92***	1.540	-3.091***	-2.309	-2.381**
REN	12.62***	5.891	-7.378***	-1.631	-4.379***
Westerlund (2007) Cointegration Test					
	Without E_cKC	With E_cKC			
Variance ratio	-1.841**	-1.521*			
Pesaran and Yamagata (2008) Slope Homogeneity Test					
	Without E_cKC	With E_cKC			
Statistic	18.344***	15.207***			

Note: ***p<0.01, **p<0.05, *p<0.10; N/A: Not Applicable

Economic Complexity and Carbon Emissions

The study uses feasible generalised least squares (FGLS) regression for robustness checks and the corrected panel standard error estimation (PCSE) technique to investigate how economic complexity impacts carbon emissions in the Next 11 nations (see Table 3). The results are discussed basically on the variables of interest. The direction of the findings produced by both methods is similar, indicating that the FGLS and PCSE estimations are consistent. In the absence of the non-linear term of ECI, economic complexity has an insignificant positive impact on carbon emissions; nevertheless, when the economic complexity-Kuznets curve (E_cKC) relationship is tested, its impact on carbon emissions is both positive and significant. Therefore, the Next 11 countries' increased production of high-tech items would result in higher carbon dioxide emissions. The result is comparable to that of Laverde-Rojas et al. (2021), who found that increasing country's production sophistication can raise carbon dioxide emissions, which reduces the quality of the environment. Therefore, countries with high ECI are probably responsible for some of the environmental damage caused by their carbon dioxide emissions. The result implies that as the Next 11 countries progress towards producing sophisticated goods, there will be a rise in carbon dioxide emissions. More complex countries degrade the environment excessively, whereas lower-complexity countries often generate agricultural products and cause little environmental damage (Satrovic & Adedoyin, 2022). The results of Abdi (2023), Can and Gozgor (2017), Dogan et al. (2019); Kılıç et al. (2023), Kirikkaleli et al. (2023), Neagu and Teodoru (2019), Saqib et al. (2023), which suggested that economic complexity causes a lower level of carbon emissions in the selected countries, are not consistent with the finding that economic complexity has a positive relationship with carbon emissions. This indicates that countries with high ECI tend to invest significantly more in cleaner technologies due to their concern about high consumption of non-renewable energy. The ECI for the Next 11 countries reveals a positive trend, indicating a progressive shift towards the production of more advanced items (see Fig.1). Therefore, most countries belonging to the Next 11 countries are not using clean production technology. Economic complexity still significantly increases carbon emissions, even though the Next 11 countries are actively conserving energy and safeguarding the environment, as stated by the majority of research, including Paramati et al. (2017), Shahbaz et al. (2016), and Yildirim et al. (2014).

Both the linear and non-linear term of ECI significantly increases carbon emissions, regardless of the development level in the Next 11 countries, as captured by the economic complexity-Kuznets curve (E_cKC). The economic complexity-Kuznets curve (E_cKC) in the Next 11 countries is refuted in this study. Table 3 (columns 4, 8) shows a linear relationship between economic complexity and carbon

emissions that increases monotonically. Specifically, $\lambda_1>0$ and $\lambda_2>0$, meaning that the study is consistent with the "*pollution haven theory*" and supports a positive monotonic economic complexity-emissions link. This outcome is similar to the study of Boleti et al. (2021) but the study used GDP and not ECI to test the EKC hypothesis. The implication is that the study does not support either the U-shaped or the inverted U-shaped link between economic complexity and carbon emissions, hence the turning point for carbon emissions would not be applicable. The economic complexity-Kuznets hypothesis (E_cKC) is rejected in the Next 11 countries. This finding does not align with the studies of Balsalobre-Lorente et al. (2023) and Neagu (2019) who accepted the E_cKC hypothesis in BRICS countries. The findings disagree with Yu et al. (2022) who validated the U-shaped association between economic growth and environmental degradation. This could be explained by the difference in the choice of variables used in testing the EKC hypothesis and also, the difference in the estimating technique employed.

Growth in the productive capacity of the Next 11 countries is predicted to increase carbon emissions in the countries (Adeleye et al., 2023; Hamid et al., 2022; Kirikkaleli et al., 2023; Salahuddin et al., 2018), which is unsurprising, given that the majority of the Next 11 countries producing goods and services will send carbon dioxide into the atmosphere. This outcome is inconsistent with Yu et al. (2022), which could be attributed to differences in research methodologies. Surprisingly, the urban population has a negative effect on carbon emissions. The negative impact of urban population on carbon emissions is consistent with Azizalrahman and Hasyimi (2019) in high-income countries and lower-middle countries in the long run and Kazemzadeh et al. (2022), while it contradicts Adeleye et al. (2022), Lin et al. (2017), and Yang et al. (2018), who opined that urbanization or population growth leads to higher carbon emissions. Renewable energy has a negative effect on carbon emissions, which aligns with Abdi (2023), Adeleye et al. (2023), Balsalobre-Lorente et al. (2023), Hsu (2021), Murshed et al. (2022a), Nguyen and Kakinaka (2019), Salahuddin et al. (2018), Saqib et al. (2023), and Szetela et al. (2022). Since most renewable energy sources do not emit carbon dioxide or pollute the air when generating heat or electricity, this favourable effect of renewable energy on carbon emissions is to be expected.

Table 3. PCSE and FGLS results (Dependent Variable: CO_2) (Source: Author's computations)

Variable	PCSE (Main Analysis)				FGLS (Robustness)			
	Without E_cKC		With E_cKC		Without E_cKC		With E_cKC	
	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value
ECI	0.063 (0.071)	0.375	0.183** (0.086)	0.033	0.062 (0.070)	0.377	0.273*** (0.084)	0.001
ECI^2	N/A	N/A	0.144*** (0.039)	0.000	N/A	N/A	0.177*** (0.039)	0.000
LGDP	6.017*** (0.590)	0.000	5.765*** (0.528)	0.000	4.415*** (0.590)	0.000	5.302*** (0.426)	0.000
LURP	-3.061*** (0.744)	0.000	-3.058*** (0.517)	0.000	-2.201*** (0.728)	0.003	-2.781*** (0.442)	0.000
REN	-0.020*** (0.007)	0.003	-0.018*** (0.005)	0.000	-0.019*** (0.007)	0.007	-0.014*** (0.004)	0.001
Constant	6.227 (5.215)	0.232	6.716** (3.006)	0.025	4.666 (5.097)	0.360	5.871** (2.669)	0.028
Turning point	N/A		N/A		N/A		N/A	
Observations	275		275		275		275	
Countries	11		11		11		11	
R-squared	0.440		0.584		N/A		N/A	
Wald statistic	210.91***	0.000	431.50		116.13***	0.000	477.04***	0.000

*Note: ***p<0.01, **p<0.05; standard errors are reported in parenthesis. N/A: Not Applicable*

Conclusions

Environmental sustainability is among sustainable development goals (SDGs) to be achieved by 2030. Meanwhile, one of the ways to achieve this is to curtail the release of carbon dioxide in an economy. In light of this, the study examines the effect of economic complexity on carbon dioxide emissions in the Next 11 countries (Bangladesh, Egypt, Indonesia, Iran, Mexico, Nigeria, Pakistan, Philippines, South Korea, Turkey, and Vietnam) with the view to validate or refute the economic complexity-Kuznets curve (E_cKC) between 1995 and 2019. The study focuses specifically on E_cKC because the selected countries are moving towards the production of advanced goods which can add to environmental degradation. The study employs two econometric techniques: correlated panel standard error (PCSE) and feasible generalized least squares (FGLS) estimating techniques. The estimates from the FGLS approach are consistent with that of the PCSE approach. The results show that the next 11 countries' carbon dioxide emissions are found to rise with economic complexity. Additionally, according to E_cKC hypothesis, the study refutes the hypothesis and supports a positive monotonic linear relationship between economic complexity and carbon emissions, which also means the "*pollution haven hypothesis".* The inference drawn from these results is that carbon emissions will rise as the Next 11 countries shift to producing sophisticated goods. Stated differently, environmental challenges will start to rise as the Next 11 countries become less energy-efficient and more industry-intensive to encourage economic complexity. This is because the production of advanced items will require more energy, which will increase energy consumption and, if proper actions are not taken, can lead to an increase in carbon dioxide emissions.

A further rationale for the positive relationship between economic complexity and carbon emissions may be from the substantial number of industries present in the countries, especially in those with positive ECI like South Korea, Mexico, the Philippines, and Turkey. Based on its findings, the study contributes significantly to the existing knowledge by demonstrating that environmental degradation in the Next 11 countries will result from an increase in the production of sophisticated commodities (economic complexity). It is claimed that the health of the nation's citizens is negatively impacted by environmental deterioration caused by carbon dioxide emissions, which may have a knock-on effect on the economy as a whole. Also, the study disproves the Kuznets theory of economic complexity in the Next 11 countries but supports the "pollution haven hypothesis", which holds that there is a positive monotonic linear link between economic complexity and carbon emissions.

Since the Next 11 countries are already known to be progressively achieving greater economic complexity, as shown in Figure 1, steps should be taken to make sure that producing sophisticated commodities does not result in higher carbon emissions. This can be achieved in the selected countries by engaging in the use of cleaner energy and technologies that do not pollute the air. As economies get more complex, there is a need to employ cleaner energy and better technology, which will help meet SDG 7 in reducing carbon dioxide emissions. Also, using renewable energy instead of non-renewable energy in the production of (complex) goods and services. This is considered significant since renewable energy sources, such as wind, hydro, and solar, lower carbon emissions linked to burning fuel during production processes. Renewable energy provides cleaner alternatives to fossil fuels and helps in promoting energy efficiency. Lastly, decarbonizing other sectors like the transportation sector would go a long way in lowering carbon emissions. This can be achieved by switching fossil fuels with biofuels in the sector. This study is not without limitations. The present study focuses on the causal effect of increasing production leading to environmental pollution. It might be more realistic to account for other factors that can influence this relationship. These include global trends of implementations of SDGs, country contributions to the environmental fund, implementation of taxonomies beyond EU countries and challenges of reaching net zero on country levels. Also, the same subject matter of this study can be examined in different regions of the world or other emerging economies like MINTS and BRICS countries.

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ECONOMICS AND CULTURE 21(1), 2024

DOI: 10.2478/jec-2024-0006

EFFECT OF MONETARY POLICY DECISIONS AND ANNOUNCEMENTS ON THE PRICE OF CRYPTOCURRENCIES: AN ELASTIC-NET WITH ARIMA RESIDUALS APPROACH

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Received 29 February 2024; accepted 7 May 2024

Abstract

Research purpose. This study analysed the three cryptocurrencies with the largest market capitalization: Bitcoin, Ether (cryptocurrency built upon the Ethereum project's blockchain technology), and Binance coin, which account for 60% of the total cryptocurrency market capitalization. The purpose of this research was to measure the impact of monetary policy on the price of these cryptocurrencies using an adjusted R squared.

Design / Methodology / Approach. As dependent variables, we used interest rates controlled by the European Central Bank and the Federal Reserve and reports from the European Central Bank and the Federal Open Market Committee. A robust Elastic Net Regression with Autoregressive Integrated Moving Average (ARIMA) residuals machine learning approach was applied to obtain robust regression coefficients and corresponding standard errors. To ascertain the robustness of the model, a technique known as rolling window cross-validation was employed.

Findings. The results of this study show that monetary policy decisions and announcements significantly impact the price of cryptocurrencies. The impact on cryptocurrencies is likely to be significant both in the period of economic stability (2018-2020) and in the period of economic shocks (2020-2022). This relationship is likely to be indirect, acting through investor sentiment.

Originality / Value / Practical implications. The results of this study may be useful to monetary policymakers, as they reveal the link between their actions and the price of cryptocurrencies. Our model will also be useful for mutual fund managers and private investors, as they can anticipate the price dynamics of cryptocurrencies when assessing monetary policy frameworks.

Keywords: cryptocurrency, monetary policy, elastic net, ARIMA.

JEL codes: E42, E52, E58, G02, G15.

Introduction

The advent of blockchain technology has given rise to cryptocurrencies as a significant financial asset class. This development has sparked interest in understanding how these digital currencies react to external influences, particularly the monetary policy decisions enacted by central banks. Despite their decentralized nature, cryptocurrencies, especially Bitcoin, have attracted substantial academic interest, leading to an exploration of their relationship with conventional monetary policy mechanisms (Smith & Kumar, 2018). The remarkable growth in cryptocurrency valuation, highlighted by the total market capitalization surpassing $2 trillion in 2021, underscores the importance of investigating the drivers behind such exponential growth (U.S. Currency Education Program, n.d.).

In the face of global economic uncertainties, such as the Coronavirus 2019 (COVID-19) pandemic and geopolitical tensions, cryptocurrency markets have exhibited significant volatility. This has prompted questions about the impact of central bank actions and announcements on cryptocurrency prices

(Kizildag et al., 2020). While cryptocurrencies are often been viewed as operating independently of central authorities, recent research suggests they may be influenced by monetary policy interventions (Smith & Kumar, 2018).

The objective of the study is to empirically examine the impact of monetary policy decisions and announcements on cryptocurrency prices using an adjusted R squared. The central hypothesis posits that cryptocurrencies, due to their inherent decentralization and independence from central banks, should not exhibit significant reactions to monetary policy actions. However, initial analysis indicates a potential correlation between monetary policy measures, particularly those of the European Central Bank (ECB) and the Federal Reserve (FED), and the prices of leading cryptocurrencies such as Bitcoin (BTC), Ether a cryptocurrency constructed on the blockchain technology of the Ethereum project (ETH), and Binance Coin (BNB).

To accomplish these objectives, this study employs Elastic Net Regression with Autoregressive Integrated Moving Average (ARIMA) residuals, which was applied to data from November 8, 2017, to November 18, 2022. This approach enables the investigation of the impact of ECB and FED announcements and policies on cryptocurrency prices while addressing multicollinearity and autocorrelation in the data.

Contrary to the initial hypothesis, the findings reveal a discernible relationship between monetary policy decisions and announcements by the ECB and FED and the prices of selected cryptocurrencies. Notable correlations are found between certain types of monetary policy measures and fluctuations in cryptocurrency prices. These results suggest that, despite their decentralized nature, cryptocurrencies are not entirely insulated from the effects of traditional monetary policy mechanisms.

Literature Review

In this section, we delve into two key strands of literature pertinent to our investigation. The initial focus pertains to the multifaceted dimensions intrinsic to cryptocurrencies. This encompasses an examination of the efficacy of the cryptocurrency market (Bariviera, 2017; Nadarajah & Chu, 2017; Tiwari et al., 2018; Urquhart, 2016; Vidal-Tomás & Ibañez, 2018; Wei, 2018), the segregation of cryptocurrencies from other financial and speculative instruments (Bhanja et al., 2023; Bhuiyan et al., 2021; Corbet et al., 2018; Harb et al., 2022), patterns of price and volatility clustering (Baig et al., 2019; Hu et al., 2019; Li et al., 2020; Ma & Tanizaki, 2022; Urquhart, 2017; Zhang et al., 2018), the emergence and consequences of price bubbles (Cheah & Fry, 2015; Choi & Jarrow, 2022; Hayes, 2018; Moosa, 2020; Su et al., 2018), regulatory frameworks surrounding cryptocurrencies (Corbet et al., 2019; Monrat et al., 2019; Pieters & Vivanco, 2017; Schaupp et al., 2022), and the prevalence of fraudulent activities (Bartoletti et al., 2020; Nghiem et al., 2021; Shayegan et al., 2022).

The subsequent and predominant thread of related scholarship centres on the interplay between monetary policy and cryptocurrency markets. Within this domain, Panagiotidis et al. (2018) scrutinized the significance of various drivers of Bitcoin returns employing the Least Absolute Shrinkage and Selection Operator (LASSO) framework. Factors such as stock market returns, exchange rates, gold, and oil returns, as well as interest rates set by the FED and the ECB, alongside internet trends, were assessed. The findings underscored the pivotal roles of search intensity and gold returns in influencing Bitcoin returns. Corbet et al. (2020) explored the response of digital assets, encompassing cryptocurrencies, tokens, and decentralized applications, to announcements regarding interest rates and quantitative stimulus measures from the FED. Their analysis revealed that mined digital assets exhibit heightened sensitivity to volatility spillovers and feedback stemming from monetary policy. Panagiotidis et al. (2019) assessed the impact of various factors, including stock market returns, exchange rates, gold and oil returns, FED and ECB interest rates, and internet trends, on bitcoin returns, employing Vector Autoregression (VAR) and Factor-Augmented Vector Autoregressive (FAVAR) models. Notably, the study uncovered significant interactions between bitcoins and traditional stock markets, with relatively weaker linkages observed with currency markets and monetary policy. Corbet et al. (2017) utilized the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model of order (1,1) model to explore the effects of alterations in international monetary policy on bitcoin

returns, highlighting the pronounced impact of interest rate-based monetary policy decisions made by the US Federal Open Market Committee (FOMC) on bitcoin return volatility.

Furthermore, Lyócsa et al. (2020) employed quantum regression to investigate the influence of news and sentiment regarding bitcoin regulation, hacking incidents involving bitcoin exchanges, and scheduled macroeconomic news releases on bitcoin volatility. The analysis delineated a robust reaction of bitcoin volatility to news related to bitcoin regulation and positive investor sentiment concerning regulatory measures. Conversely, most scheduled US macroeconomic news releases were found to exert negligible effects on bitcoin volatility. Nguyen et al. (2019) delved into the asymmetric effects of monetary policy on cryptocurrency returns under differing monetary regimes, highlighting the substantial response of major cryptocurrencies, including bitcoin, to China's monetary tightening.

Nelson (2018) deliberated on the financial and monetary policy risks posed by digital currencies, suggesting minimal risks to monetary policy due to the improbable scenario of digital currencies supplanting fiat currencies. Yang (2020) used a smooth transition autoregressive model with exogenous variables (STARX) to investigate the non-linear relationship between bitcoin and the Taiwanese stock market, contingent upon Taiwan's monetary policy threshold. The study discerned a threshold effect and affirmed the existence of a non-linear relationship between the Taiwanese stock market and Bitcoin. Zhou (2021) utilized the Exponential Generalized Autoregressive Conditional Heteroskedasticity (EGARCH) framework to examine the evolution of bitcoin exchange rates from 2011 to 2018 and its correlation with global financial markets. The findings highlighted the influence of fundamental factors, bitcoin-specific events, regulatory pronouncements, and news reports on bitcoin volatility, alongside its role as a hedge during periods of low global financial uncertainty. Marmora (2022) investigated the impact of monetary policy announcements on local demand for bitcoins across 26 developing countries, revealing a notable increase in both local attention to bitcoins and local bitcoin trading volumes following such announcements. Additionally, Mnif & Jarboui (2022) assessed the effects of FED monetary policy on the dynamics of Islamic and conventional cryptocurrencies during the COVID-19 pandemic, utilizing novel methodologies to detect market bubbles and examining the impact of FOMC announcements on both conventional and Islamic Sharia-compliant cryptocurrencies. Their findings indicated a significant positive effect of FOMC announcements on conventional cryptocurrency markets in the immediate aftermath of the event, followed by a subsequent negative effect.

This comprehensive review of academic literature underscores the thorough exploration of cryptocurrencies from diverse perspectives and methodologies. While significant attention has been devoted to examining the nexus between monetary policy and cryptocurrencies, there remains a need for more holistic investigations. Many existing studies focus on partial aspects of monetary policy, often intertwined with other macroeconomic factors, thus necessitating a comprehensive understanding. Moreover, the literature predominantly relies on data up to 2018, overlooking subsequent developments such as the economic upheavals triggered by the COVID-19 pandemic and subsequent geopolitical events. Addressing these gaps, our study offers a focused analysis of the impact of monetary policy on cryptocurrency prices, disentangled from other economic factors, and leveraging robust methodologies. Spanning the period from 2017 to 2022, our investigation encompasses a phase marked by significant market capitalization and economic volatility. In this section, we discuss in more detail three literature strands relevant to our work.

Research Methodology

In this section, we provide details about sample characteristics as well as model architecture and rationale for the research methodology. The three cryptocurrencies chosen for the study are BTC, ETH, and BNB, that is, their relationship to the US dollar. They have been chosen as representatives of the cryptocurrency market. The procedure to select the representatives was elementary. The threshold was established at 60% of the market capitalization, and the cryptocurrencies that represent the entire market had to have a market capitalization of at least 60% of the total market capitalization. Based on this criterion, the first three cryptocurrencies were sufficient. In this study, when we refer to a cryptocurrency as being ‘first’, ‘second’, or ‘fifth’, we are referring to their respective rankings based on market capitalization. Market capitalization is a measure of the total value of all available coins of a particular

cryptocurrency. BTC, being the first cryptocurrency ever created and the most widely adopted, has the highest market capitalization, hence it is referred to as the 'first' cryptocurrency. ETH, known for its smart contract functionality, holds the second-largest market capitalization, making it the 'second' cryptocurrency. BNB, despite being fifth in terms of market capitalization, was chosen over the third and fourth-ranked cryptocurrencies. The reason for this selection is that the third and fourth cryptocurrencies, Tether and USD Coin, are Stablecoins. Stablecoins have their value pegged to a specific asset or a pool of assets, usually a fiat currency like the US dollar. This makes their response to monetary policy identical to that of the US dollar, and therefore they were not suitable for this study. It's important to note that these rankings are dynamic and can change as the market values of these cryptocurrencies fluctuate. The rankings used in this study were accurate as of the 1st of November 2022, according to data from CoinMarketCap (CoinMarketCap, n.d.).

In the domain of monetary policy, central banks traditionally establish and disclose their determinations on weekdays. This temporal selection aligns with the operational hours of financial markets, thereby facilitating prompt responses to any modifications in policy.

In contrast, the cryptocurrency market operates continuously, spanning 24/7 and encompassing weekends. Nevertheless, the noticeable impact of monetary policy determinations on cryptocurrency prices primarily materializes during weekdays. Consequently, for methodological rigour in a research endeavour, it is advisable to concentrate solely on weekdays when examining the consequences of monetary policy determinations on cryptocurrency valuations. This methodological approach serves to maintain the integrity of the study's findings by ensuring that the data utilized is highly relevant and enlightening.

The study sample period is from 7 November 2017 to 18 November 2022. This study period was chosen for a couple of reasons. First, due to data availability, the ETH and BNB data are only available from 7 November 2017, so to maintain the integrity of the study, we also started collecting the BTC data from the same date. The second reason is the abundance of studies on this topic for the period up to 2018 and the lack of studies from 2018 onwards, so there was no additional motivation to conduct the study using earlier data. The study used a one-day closing price.

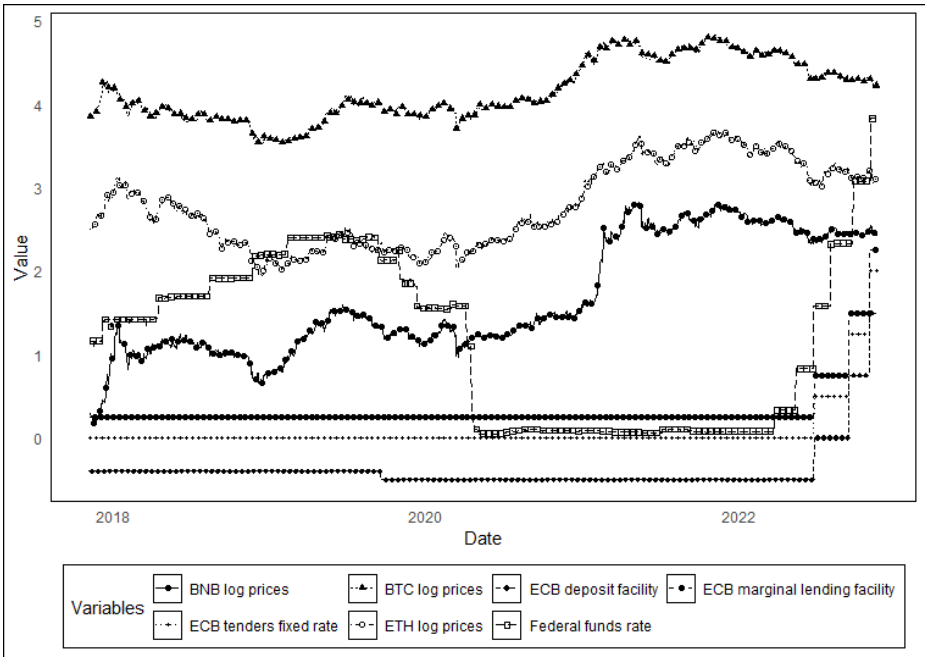

Fig. 1. Logarithmically Transformed BTC, ETH, BNB Prices, and Central Bank Interest Rates (Source: Prepared by the authors)

The central banks of the US and the Eurozone, the FED (n.d.), and the ECB were chosen as the monetary policy proxies, that is the interest rates controlled by these banks and the announcements made by

FOMC and ECB Governing Council. The Federal Funds Rate (FFR) was chosen as the FED's interest rate, and although the FED does not directly set it, it is very effective in setting the boundaries within which the FFR should be set by using the interest rate paid on reserve and the overnight repurchase agreement rate. This single interest rate, instead of the other three rates set by the FED, was chosen to make the research model as simple as possible without reducing its efficiency. The FFR is the key interest rate that the FED tries to influence, so by choosing the FFR, we simplify and make the model more efficient. The ECB unfortunately does not have a single interest rate that it tries to regulate, but it sets 3 main interest rates, all of which are included in the research model, that is the Deposit facility, the Fixed-rate tenders Fixed rate, and the Marginal lending facility. The variables under investigation are visually depicted in Figure 1. It is imperative to underscore that the cryptocurrency prices exhibited are not the raw prices, but rather, they have been subjected to a logarithmic transformation (base 10). The rationale behind the use of a logarithmic transformation was to ensure a consistent scale between the prices of the cryptocurrencies and the interest rates, thereby facilitating a more coherent visual comparison. This approach aids in maintaining the integrity of the data representation, particularly when dealing with variables that span different orders of magnitude. Furthermore, it is crucial to emphasize that the logarithmic transformation was employed solely for data visualization. However, in the subsequent stages of the research, the original, untransformed prices were utilized. This approach ensures a balance between clear data representation and the preservation of the original data characteristics in the analysis.

In the framework of this investigation, the phrase "FOMC positive" denotes instances where the FOMC issues favourable news, indicative of dissident decisions aimed at implementing expansionary monetary policies designed to stimulate economic growth. Conversely, "FOMC negative" characterizes scenarios wherein the FOMC makes decisions intended to contract the economy, reflecting a contractionary economic policy. This dichotomy in the impact of FOMC decisions on economic conditions applies analogously to the ECB.

Historical data for BTC, ETH, and BNB was downloaded from https://finance.yahoo.com/, using the Jupyter Lab platform in the Python programming language environment with the yfinance library. Historical FFR data were obtained from (FRED, n.d.) and processed using the Jupyter lab platform in Python. The FOMC announcements were manually edited by reading each message from FED (n.d.). ECB interest rates and ECB governing council messages were manually aggregated by checking each message from ECB Monetary Policy Decisions (n.d.).

The study was carried out using full-time series data, that is, from 7 November 2017 to 18 November 2022, to test how the model performs in a mixed environment, where a stable economic period transitions into a volatile one. We also isolated the stable period and the unstable period, so that each currency pair was subjected to 3 tests: the full period, the stable period before the pandemic, and the unstable period after the pandemic. Therefore, a total of 9 studies were conducted. The breakpoint between the stable and unstable periods was chosen as the date on which the first international case of the disease outside of China was declared, January 2020 (WHO, n.d.). It is imperative to clarify that by "post-Covid," we do not imply the cessation of the pandemic; rather, it denotes the commencement and continuation of the Covid era. The term "post-Covid" in the context of our research signifies the period after the onset of the Covid pandemic and its ongoing presence.

In our analytical framework, untransformed time series data was employed due to our focus on the examination of the variables themselves. This choice was motivated by a specific interest in understanding how monetary policy influences the pricing dynamics of cryptocurrencies, as opposed to assessing their returns. The objective of our research is to clarify the impact of monetary policy on the valuation of cryptocurrencies, with a central emphasis on contributing valuable insights for central banks. The methodological approach employed involves elastic net regression.

It is pertinent to note that elastic net regression was selected, given its inherent lack of the assumption of stationarity. This characteristic allows us to preserve the integrity of the data without violating underlying assumptions. Unlike many researchers who opt for log differences to address stationarity concerns, our focus diverges as our primary concern is the direct influence of monetary policy on cryptocurrency prices, which will be estimated by adjusted R squared. In this context, the primary

stakeholders benefiting from our research findings are central banks, as they gain insights into how their monetary policy decisions impact the cryptocurrency market.

Furthermore, attempts were made to assess the model using differenced data, revealing a suboptimal fit and additional issues with residuals. Consequently, the untransformed data approach was retained as the more suitable choice for our research objectives. It is important to acknowledge that the detailed examination of results derived from transformed data is beyond the scope of this research.

In this study, we used regression analysis to identify the relationship between the dependent variable (the price of the cryptocurrencies in question) and the independent target variables (monetary policy measures) with the ARIMA residuals to ensure that the assumptions of the regression will be held. The most common method for estimating linear models is the ordinary least squares (OLS) method. OLS is the most commonly used due to its simplicity, but it gives the best estimates of the regression coefficients and associated robust standard errors only when the model satisfies Gauss-Markov assumptions. In this study, we employed OLS as our baseline model. The findings derived from the application of the OLS model serve as a benchmark for our analysis.

However, in most cases, including the case of this study, compliance with these assumptions is a rather rare phenomenon. In the case of this study, the multicollinearity assumption may be violated when several related dependent variables are used. This is reflected in the above loss function. We can see that as the number of dependent variables approaches n, the loss function approaches infinity. When the multicollinearity assumption is violated, the variance of the OLS estimate will be very large. However, estimators with very large variances produce poor estimates. This phenomenon is called overfitting.

Each regression model has 2 possible errors based on its complexity: i) underfitting and ii) overfitting. To overcome underfitting, we can add new parameters to the model to increase the complexity of the model and thus reduce the high bias. In the case of this study, 4 interest rates are included as dependent variables and 4 dummy variables as proxies for expansionary and contractionary news, so the number of parameters is sufficient, and the model cannot suffer from underfitting. However, as the complexity of the model increases, the expected variance increases, but the bias decreases, this is known as overfitting. In the case of this study, overfitting is certainly possible using the usual OLS methodology. There are two ways to reduce the possibility of overfitting: (i) reducing the complexity of the model, but this would result in a loss of accuracy and would not allow the study of the impact of all the desired factors on the price of cryptocurrencies; and (ii) regularization, which is a technique that restricts, adjusts, or shrinks the estimated coefficient towards zero. In other words, this approach discourages the learning of more complex or flexible models to avoid the risk of overfitting. Regularization is one way to improve the performance of the model by ignoring the less important features without losing the ability to explore all the desired factors. Regularization also reduces validation loss and tries to improve the accuracy of the model. We can see that the OLS approach is not suitable for this study and that regularization should be used.

$$OLS\ loss = \sum_{i=1}^{n}(Y_i - \beta X_i)^2 \quad (1)$$

Where:

$OLS\ loss$ is an OLS loss function;

Y_i is the actual value at the time *I;*

β is the parameter obtained by OLS;

X_i is the value of the dependent variable at the time *I;*

There are three types of regularization: lasso, ridge, and elastic-net, a generalization of both. Elastic-net first emerged as a criticism of lasso (Tibshirani, 1996), which can make variable selection too data-dependent and therefore unstable. The solution was to combine the penalties of ridge regression and lasso to obtain the best results in both worlds. For all of the above reasons, the E-net method (Zou & Hastie, 2005) was chosen for this study. The e-net aims to minimize this loss function:

$$ENET\ loss = \sum_{i=1}^{n}(Y_i - \beta X_i)^2 + \lambda\left(\alpha\sum_{j=1}^{k}|\beta_j| + (1-\alpha)\sum_{j=1}^{k}|\beta_j|^2\right) \quad (2)$$

Where:

$ENET\ loss$ is the Elastic net regression loss function;

α is the mixing parameter for the ridge (α = 0) and the lasso (α = 1) and

λ is the Lasso parameter.

We can see that the first part of the e-net loss function is the regular OLS estimation, which has a penalty added. As mentioned above, our study consisted of a total of 9 samples: a full period sample, a pre-COVID-19 pandemic sample, and a post-COVID-19 pandemic sample with each of the currencies under study. Thus, 9 alpha and 9 lambda hyperparameters had to be estimated. These were obtained by cross-validation hyperparameter tuning in JupyterLab using the Python programming language, the sci-kit-learn library, and the GridSearchCV method. The resulting hyperparameter values are presented in Appendix 1.

The regression included four dummy variables that were supposed to represent the ECB Governing Council and FOMC announcements. These variables are ECB expansionary monetary policy announcements (ECB positive), ECB contractionary monetary policy announcements (ECB negative), FED expansionary monetary policy announcements (FED positive), and FED contractionary monetary policy announcements (FED negative). Following Corbet et al., (2020) methodology we denote the 50 days following the announcement, as the announcement period.

The regression parameters were obtained by machine learning in JupyterLab using the Python programming language, sci-kit-learn library. The coefficients obtained will be presented in more detail in the next section, Results.

Following the application of elastic-net regression to our dataset, a robustness check was executed utilizing the residuals of the model. Subsequently, the test results revealed the presence of autocorrelation, heteroskedasticity, and non-normality in the residuals. To address these issues, the ARIMA process was employed. Before the application of the ARIMA process, an Augmented Dickey-Fuller test was conducted to ascertain the stationarity of the residuals. The integration parameter of the ARIMA model was set to zero if the data was found to be stationary. The subsequent implementation involved the utilization of the classical ARIMA process, which will be expounded upon in the forthcoming paragraph.

For the AR(p) part of the ARIMA process formula 3 was used:

$$X_t = c + \sum_{i=1}^{p}\phi_i X_{t-i} + \epsilon_t \quad (3)$$

Where:

X_t is the time series value at time t;

$\phi_i$are the coefficients of the lagged values;

ϵ_t is the difference between the observed and the predicted value at each time point;

c is the mean value of the time series when the values of X_{t-i} are zero.

The AR part of the ARIMA model captures the influence of the previous values on the current value. The larger the value of p, the more past values are taken into account in the model.

For the MA(q) part of the ARIMA process formula 4 was used:

$$X_t = \mu + w_t + \sum_{i=1}^{q}\theta_i w_{t-i} \quad (4)$$

Where:

X_t is the time series value at time t;

q is the number of lag observations included in the model

θ_i are the coefficients of the lagged error terms;

μ is the mean of the series;

w_{t-i} is the error term at time t-1 respectively.

The MA part of the ARIMA model captures the influence of the previous error terms on the current value. The larger the value of q, the more past error terms are taken into account in the model.

The hyperparameters (p,q) were obtained by cross-validation hyperparameter tuning in JupyterLab using the Python programming language, the sci-kit-learn library. The GridSearchCV method upper values for cross-validation were chosen either by using Autocorrelation Function (ACF) and Partial Autocorrelation Function (PACF) or setting the upper limit to 5 in line with Petropoulos et al. (2021).

After performing the ARIMA procedure on the residuals obtained from elastic net regression, a subsequent evaluation of robustness was carried out. This involved subjecting the residuals of the ARIMA model to tests for autocorrelation, heteroskedasticity, and normality. In this process, it was found that there was no autocorrelation in any of the cases, and to a large extent, there was a lack of heteroscedasticity. However, the residuals still exhibited non-normality, which is an important aspect to consider, especially when using the model for forecasting purposes and constructing confidence intervals.

The examination of robustness was finalized through the utilization of the Rolling Window Forecasting Technique, which is a cross-validation technique. This technique was employed in the forecasting process, with the Mean Absolute Scaled Error (MASE) metric serving as the benchmark for evaluating forecast accuracy one step ahead of forecasting as suggested by (Qiang & Shen, 2021). As a result, it was not necessary to compare the performance of our model with the baseline naive forecasting method.

Results

In this section, we will present the results of the study in detail. Table 1 shows the general regression statistics. We can see that the values of the F-statistic range from 40 to 432, which are extremely high. The average value of the F-statistic is 205. Associated with these high F-statistics are extremely low regression p-values, which range from 1.62266860556908E-50 to 0, with a mean value of 1.80297E-51. These statistics show that all regressions are statistically significant, even at the 1% significance level, as the p-values are well below 1%.

We can also see that all the regression equations have high R-squared values ranging from 0.3944 to 0.6976, with a mean value of 0.5468. This shows that the monetary policy factors included in this model explain more than half of the cryptocurrency price movements. We can see that BTC has the highest R-squared values, which could be explained by the fact that BTC is the main cryptocurrency with the highest market capitalization and the most popular crypto unit of investment, and is, therefore, the most responsive to monetary policy decisions. We can also see that the full sample R-squared is the largest except for BNB. This is quite a logical conclusion since a larger amount of data usually means a more accurate model in econometrics. The most inaccurate model based on R-squared data is with the pre-covid sample. The reason for this could be the smallest data sample and rather passive monetary policy.

Appendix 2 presents the parameters and statistics of the regression coefficients for BTC, ETH, and BNB, using the full sample data. We can see that the e-net model has shrunk several insignificant coefficients down to zero, which is a good sign, as this is the task of the model to reduce or eliminate insignificant coefficients. Based on the data, we can see that the ECB Marginal Lending Facility rate could be excluded from the model; as with the three cryptocurrencies, this coefficient is zero, which means that it does not affect cryptocurrency price fluctuations at all. We can also see that ETH and BNB are also

unaffected by the deposit facility interest and the ECB negative news, while with ETH the ECB tender fixed interest rate the p-value is 0.376, which means that this coefficient is not significant, even with a 10% significance coefficient, and that the only element of the ECB that has a significant impact is the ECB positive, which is the ECB's expansionary monetary policy messages. Finally, it is worth noting that the FED has a much larger impact than the ECB, as all regression features related to the FED are statistically significant for the cryptocurrencies' price fluctuation, while many features related to the ECB are insignificant.

Appendix 3 shows the regression parameters and statistics for BTC, ETH, and BNB, using the pre-covid sample data. It can be seen that in this case many more parameters are reduced to zero. Six of the eight coefficients are significant for BTC, three for BNB, and only two for ETH. In the case of BTC, only the ECB coefficient parameters, i.e., ECB Tenders Fixed Rate and ECB Marginal Lending Facility, are collapsed, while all the features related to the FED remain significant.

Table 1. Statistics of the regressions (Source: Authors' calculations)

Sample	F statistics	P value	R squared
BTC-USD full sample	432,5	0	0,6976
BTC-USD pre-covid	40,13425072	1,62E-50	0,3944
BTC-USD post-covid	199,7849108	9,2337E-179	0,6188
ETH-USD full sample	298,1591381	5,0336E-288	0,6153
ETH-USD pre-covid	99,60301094	2,8767E-102	0,5514
ETH-USD post-covid	148,409287	6,0818E-148	0,5466
BNB-USD full sample	331,168657	0	0,4863
BNB-USD pre-covid	105,7203298	1,5671E-106	0,4028
BNB-USD post-covid	194,918554	4,3969E-176	0,6085
Average	205,5997932	1,80297E-51	0,546855556

As in the full sample. case, the ECB Marginal Lending Facility is insignificant with all cryptocurrencies, so this rate can also be dropped from the model. In the case of BNB, none of the ECB interest rates are significant, i.e., the parameters for all of them are shrunk to zero. In this case, the remaining coefficients are the FFR, FOMC positive, i.e., FOMC expansionary monetary policy announcements, and ECB negative, i.e., ECB restrictive monetary policy announcements. It is worth noting that in the case of BTC, the ECB negative does not collapse to zero, but the p-value of this parameter is 0.19, which means that it is not statistically significant. In the case of ETH, only two coefficients remain unshrunk, i.e., the FFR and the ECB deposit facility rate. Interestingly, no announcements from these central banks affect the ETH price using the pre-covid sample data.

Appendix 4 shows the parameters and statistics of the regression coefficients for BTC, ETH, and BNB, using post-covid sample data. In this case fewer coefficients are collapsed to zero than in the pre-covid sample, but more than in the full sample. Six of the eight coefficients are significant for BTC, five for BNB, and five for ETH. As in the full sample and the pre-covid sample, the ECB's marginal lending facility is insignificant with all cryptocurrencies, so this rate can be dropped from the model in any case, as it does not add any information. However, in this case, the only significant interest rate with all three currencies is the ECB's deposit facility. The parameters for the other two interest rates are set to zero. This should not be surprising, as the ECB deposit facility is the main interest rate used by European banks to set their commercial interest rates. As in previous samples, the ECB's restrictive policy announcements had no impact on BNB and ETH prices. The impact of the FED is much larger than that of the ECB, as all FED-related regression terms have a statistically significant effect on cryptocurrency price movements using the post-covid and the full sample data, while many ECB-related terms are insignificant.

The results of this study are surprising considering that cryptocurrencies are decentralized financial entities, independent of any government, economic policy maker, or central monetary authority such as a central bank. After studying the effect of interest rates and monetary policy announcements by the FED and the ECB, we have found a strong relationship between monetary policy and cryptocurrency prices, with high r-squared values as high as 0.69. Despite such a strong statistical relationship, central

banks cannot to be claimed to control cryptocurrency prices. The relationship is most likely indirect, working through investor sentiment, i.e., central banks' expansionary monetary policy, which in turn heats the economy and helps it to grow faster, influencing investor sentiment that cryptocurrencies as a unit of investment should also grow in price. In a positive sentiment, investors invest in cryptocurrencies, increasing both their demand and prices. Positive investor sentiment reduces the supply of cryptocurrencies, as many investors choose to hold cryptocurrencies instead of selling them in anticipation of an increase in value. Thus, increased demand and reduced supply further increase the price of cryptocurrencies. With positive investor sentiment toward cryptocurrencies, the price of cryptocurrencies has increased and continues to influence positive investor sentiment. Meanwhile, as central banks pursue restrictive economic policies, the economy freezes, economic growth slows, and investor sentiment turns negative, leading to the expectation that cryptocurrency prices may fall. The supply of cryptocurrencies increases as people are no longer willing to hold them as units of investment, but the demand for cryptocurrencies also decreases as fewer investors are willing to invest their money in cryptocurrencies considering negative sentiment, resulting in a downward price trend. Our study can neither confirm nor deny the hypothesis of a link between monetary policy, investor sentiment, and the price of cryptocurrencies, which is beyond the scope of this study and requires a separate investigation.

The results of this study may be useful for monetary policymakers, as they reveal the link between their actions and the price of cryptocurrencies, which have become an integral part of the economy. The model we have developed will also be useful for investors who allocate part of their investments to cryptocurrencies, as they can predict the dynamics of cryptocurrency prices when assessing the fundamentals of monetary policy. The findings of this study further confirm the results of previous research that both Bitcoin and other cryptocurrencies exhibit a response to monetary policy actions (Nguyen et al., 2019; Yang, 2020; Zhou, 2021).

In this section, we delve deeper into the robustness check. We share the outcomes of robustness checks, focusing on the cross-validation technique known as the rolling window. We also present the Mean Absolute Scaled Error metrics, offering insights into the forecasting performance of our model.

Table 2. MASE Metrics Results (Source: Authors' calculations)

Cryptocurrency	Sample period	MASE
BTC/USD	Full sample	2.19
BTC/USD	Pre-covid	0.98
BTC/USD	Post-covid	1.61
ETH/USD	Full sample	2.67
ETH/USD	Pre-covid	-18.17
ETH/USD	Post-covid	1.74
BNB/USD	Full sample	2.94
BNB/USD	Pre-covid	1.13
BNB/USD	Post-covid	1.87

Table 2 displays the results of the MASE metrics in the context of a rolling window cross-validation forecasting technique, employed as a part of a robustness check. The results are not confidence-inspiring, as the MASE values mostly exceed unity, indicating a significant deviation from optimal performance. In most cases, the model used in this study exhibits inferior forecasting capabilities compared to a baseline naive model. However, there are exceptions, particularly with Bitcoin before the COVID-19 pandemic, where the model outperformed the naive approach.

The use of the MASE metric confirms that, overall, the model shows suboptimal predictive accuracy. This is accompanied by a higher computational resource requirement, highlighting its disadvantage compared to the less computationally demanding naive model.

Conclusions

In this article, we have analysed the three cryptocurrencies with the highest market capitalization, BTC, ETH, and BNB, which represented 60% of the total market capitalization of cryptocurrency. We

examined the impact of monetary policy on the price of cryptocurrencies (as distinct from other economic and operational factors). We used the interest rates controlled or influenced by the ECB and the FED as dependent variables, as well as reports from these institutions. In addition, we use a robust e-net machine learning method with ARIMA residuals to obtain robust regression coefficients and the corresponding standard errors. The period of the analysis is from 2017-11-8 to 2022-11-18, thus covering a period of economic instability.

The degree of association between monetary policy actions and cryptocurrency prices was assessed using the adjusted R Square. In most instances, this measure exceeded 50%, indicating a substantial level of influence. Hence, The results of this study show that monetary policy decisions and announcements have a significant impact on the price of cryptocurrencies, i.e. the FFR, which is influenced by the FED, as well as the deposit facility, the fixed rate, and the marginal lending facility, which are set by the ECB's Governing Council, as well as the announcements by these two institutions of complementary programs, such as the quantitative easing programs in the United States and the asset purchase programs in the EU, have a significant impact on the price of the cryptocurrencies under investigation. The impact of the monetary policy decision on cryptocurrency is likely to be significant in both a period of economic stability (2018-2020) and a period of turmoil (2020-2022). This relationship is likely to be indirect, acting through investor sentiment.

In the primary robustness assessment, we conducted residual diagnostics, revealing autocorrelation, heteroskedasticity, and non-normality in the residuals of the elastic net regression. To address these issues, an ARIMA process was employed, successfully mitigating autocorrelation concerns. However, residual heteroskedasticity persisted in some instances, and non-normality remained prevalent in the majority of cases. This persistence is noteworthy and should be considered when engaging in forecast activities and constructing confidence intervals.

For the conclusive robustness check, we employed the rolling window cross-validation technique and MASE as a metric. The findings indicated that, in most instances, the model under consideration did not outperform the naive forecasting model, as reflected by MASE values exceeding one. This outcome underscores the comparative limitations of the model in achieving superior forecasting accuracy.

The results of this study may contribute to monetary policymakers, as they reveal the link between their actions and the price of cryptocurrencies, which have become an integral part of the economy. Our model will also be useful for mutual fund managers and private investors, as they can anticipate the price dynamics of cryptocurrencies when assessing monetary policy frameworks.

A primary limitation of the study pertains to the samples used. The research could benefit from more diverse sample sets. For instance, it would be advantageous to construct three distinct samples: one exclusively employing conventional monetary tools, another solely utilizing interest rates (commonly referred to as conventional monetary tools), and a third sample that combines both unconventional monetary tools and interest rates. This approach could provide a comprehensive understanding of the effects of different monetary tools. Therefore, this presents a promising avenue for future research.

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Appendices

Appendix 1. E-Net Regression Hyper-Parameters (Source: Authors' calculations)

Sample	Alpha	Lambda
BTC-USD full sample	0,9	0,1
BTC-USD pre-covid19	1	0,1
BTC-USD post-covid19	1	0,1
ETH-USD full sample	1	0,1
ETH-USD pre-covid19	1	0,2
ETH-USD post-covid19	1	0,1
BNB-USD full sample	0,5	1
BNB-USD pre-covid19	1	0,1
BNB-USD post-covid19	1	0,1

Appendix 2. Full Sample E-net Regression Coefficient Parameters and Statistics (Source: Authors' calculations)

(BTC)

Feature	Coefficient	Standard error	T-stat	p-value
Federal funds rate	-15348,86037	485,4355686	-31,6187386	2,5603E-163
ECB deposit facility	-11347,13822	9428,853073	-3,87411310	0,000112331
ECB tenders fixed rate	30518,26505	8611,487887	6,217935893	6,77065E-10
ECB Marginal lending facility	0			
FOMC negative	1898,391571	675,8808039	2,818421006	0,004899014
FOMC positive	12879,45887	750,2715782	16,54783939	5,65237E-56
ECB negative	3299,962518	730,6488209	4,46609218	8,65572E-06
ECB positive	-16870,83894	746,7507301	-23,3675895	3,7894E-101

(ETH)

Feature	Coefficient	Standard error	T-stat	P-value
Federal funds rate	-1059,443023	38,81430757	-27,2951674	4,1171E-130
ECB deposit facility	0			
ECB tenders fixed rate	1488,0341	753,9093277	-0,88534869	0,376131946
ECB Marginal lending facility	0			
FOMC negative	575,0716739	54,04186899	10,64122475	2,04505E-25
FOMC positive	924,8192362	59,98998359	15,41622753	2,2067E-49
ECB negative	0			
ECB positive	-1151,167558	59,7084647	-19,2798050	4,56638E-73

(BNB)

Feature	Coefficient	Standard error	T-stat	P-value
Federal funds rate	-135,3551923	5,746497976	-23,5543791	1,7305E-102
ECB deposit facility	0			
ECB tenders fixed rate	173,4219846	111,6170479	-5,54299133	3,59505E-08
ECB Marginal lending facility	0			
FOMC negative	24,48951922	8,000954035	11,05122318	3,34661E-27

FOMC positive	57,37405437	8,881578492	18,68080156	3,45332E-69
ECB negative	0			
ECB positive	-84,50197322	8,839899333	-21,3341147	7,41539E-87

Appendix 3. Pre-Covid Sample E-net Regression Coefficient Parameters and Statistics (Source: Authors' calculations)

(BTC)

Feature	Coefficient	Standard error	T-stat	p-value
Federal funds rate	-5303,496772	301,950521	-17,5641252	2,7761E-55
ECB deposit facility	44069,61666	4269,451664	10,32207884	5,64584E-23
ECB tenders fixed rate	0			
ECB Marginal lending facility	0			
FOMC negative	-883,6057367	259,9656858	-3,39893218	0,000724889
FOMC positive	3947,598215	322,9077875	12,22515643	1,30013E-30
ECB negative	356,8595659	272,2056021	1,310992732	0,19040044
ECB positive	2288,359013	469,4694193	4,874351596	1,42567E-06

(ETH)

Feature	Coefficient	Standard error	T-stat	p-value
Federal funds rate	-406,4245313	21,38363267	-25,1903829	4,8732E-94
ECB deposit facility	1695,954066	302,3554514	13,47958921	4,8243E-36
ECB tenders fixed rate	0			
ECB Marginal lending facility	0			
FOMC negative	0			
FOMC positive	0			
ECB negative	0			
ECB positive	0			

(BNB)

Feature	Coefficient	Standard error	T-stat	p-value
Federal funds rate	3,6668722	0,646782703	10,83517684	5,9125E-25
ECB deposit facility	0			
ECB tenders fixed rate	0			
ECB Marginal lending facility	0			
FOMC negative	0			
FOMC positive	4,2245675	0,691673493	14,95361377	9,463E-43
ECB negative	-0,8659431	0,583068625	-9,74277054	8,129E-21
ECB positive	0			

Appendix 4. Post-Covid Sample E-Net Regression Coefficient Parameters and Statistics (Source: Authors' calculations)

(BTC)

Feature	Coefficient	Standard error	T-stat	p-value
Federal funds rate	-19293,7651	852,252753	-22,6385483	1,5864E-86
ECB deposit facility	21381,57622	2007,991496	10,64824042	1,0056E-24
ECB tenders fixed rate	0			
ECB Marginal lending facility	0			
FOMC negative	6325,578009	1104,958556	5,724719695	1,5087E-08
FOMC positive	16265,47092	1092,291622	14,89114316	4,9545E-44
ECB negative	5246,008547	1154,962815	4,542144975	6,5054E-06
ECB positive	-19262,9244	1005,476162	-19,1580120	1,1095E-66

(ETH)

Feature	Coefficient	Standard error	T-stat	p-value
Federal funds rate	-1326,1551	69,70359062	-19,0256353	6,04178E-66
ECB deposit facility	1760,620499	164,2285305	10,72055199	5,12216E-25
ECB tenders fixed rate	0			

ECB Marginal lending facility	0			
FOMC negative	1126,742216	90,37175718	12,46785778	1,66212E-32
FOMC positive	1375,225137	89,33576075	15,39389294	1,45669E-46
ECB negative	0			
ECB positive	-1207,832254	82,23534455	-14,6875076	5,10321E-43

(BNB)

Feature	**Coefficient**	**Standard error**	**T-stat**	**p-value**
Federal funds rate	-179,691342	9,614653594	-18,6893205	4,3992E-64
ECB deposit facility	252,388048	22,65307162	13,56242902	1,4563E-37
ECB tenders fixed rate	0			
ECB Marginal lending facility	0			
FOMC negative	187,2013339	12,46554349	15,01750277	1,1562E-44
FOMC positive	254,7097712	12,322642	20,67006176	3,3728E-75
ECB negative	0			
ECB positive	-191,145826	11,34323704	-16,8510827	3,9461E-54

ECONOMICS AND CULTURE 21(1), 2024

DOI: 10.2478/jec-2024-0007

DO CULTURAL ACTIVITIES AND HAPPINESS MATTER TO THE TOURISM SECTOR?

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Received 13 March 2024; accepted 7 May 2024

Abstract

Research purpose. The primary goal of this research is to determine the impact of the efficiency of the tourism sector in the European Union (EU).

Design / Methodology / Approach. The analysis involved 25 selected EU countries using Data Envelopment Analysis (DEA) and the Tobit regression modelling. For DEA expenses according to the stays per visit (1 night or over) when going to a foreign country, individuals actively working in the tourism industry and tangible heritage inscribed on the United Nations Educational, Scientific and Cultural Organisation (UNESCO) are used as inputs and inbound tourism as an output. Variables for the Tobit model were as follows: cultural activities, Happiness index and tourist expenditure of Gross Domestic Product (GDP).

Findings. In nations characterised by lower efficiency levels, policymakers ought to enhance their strategies and encourage the advancement of their country's appeal to tourists. Additionally, there should be an increased emphasis on enhancing the well-being and happiness of the local population.

Originality / Value / Practical implications. Theoretical research on the efficiency of the tourism sector in the EU lacks comprehensive studies that systematically examine the factors influencing efficiency across diverse EU member states. Although some research exists on specific aspects of tourism efficiency, such as environmental sustainability or economic impacts, there is a scarcity of holistic investigations that encompass various dimensions of efficiency, including resource utilization, infrastructure development, policy effectiveness, and socio-cultural impacts, within the EU's overarching context. Moreover, there is a limited exploration of potential variations in tourism efficiency among different EU regions and the underlying factors driving these differences. Bridging this research gap could offer valuable insights for policymakers, industry stakeholders, and academics seeking to enhance the overall efficiency and sustainability of the tourism sector in the EU. The study's constraint lies in the exclusion of Denmark and Luxembourg, which is attributed to insufficient statistical data.

Keywords: cultural activities, tourism sector, Happiness Index, data envelopment analysis, efficiency.

JEL codes: L83, C83, D1, H1, Z1.

Introduction

Tourism and a variety of cultural activities are vital to the economic development of many regions of the world and significantly contribute to GDP growth and employment. Examining the tourism industry's varied effects on many aspects of the local economy is crucial, especially in light of its continued growth. The impact of tourism on efficiency is one critical factor that needs more research. Studies have demonstrated the benefits of tourism and cultural participation for people's pleasure and

general well-being, both personally and as a society. Travelling and taking part in cultural activities, like going to museums, seeing plays, or experiencing local customs, can enhance one's sense of contentment and happiness when done well. There are several similar researches that look at the impact of happiness, cultural activities, or tourism on efficiency independently (Ilić & Petrevska, 2018; Lin et al., 2023; Radovanov et al., 2020; Soysal-Kurt, 2017). Tourism plays a crucial role in bolstering the economy of the EU, producing considerable income and job prospects, and fostering economic advancement throughout its member nations. Below are essential highlights concerning the economic ramifications of tourism within the EU. According to recent findings from the World Tourism Organisation (UNWTO), Europe, the world's largest destination region, reached 94% of pre-pandemic levels in January- September 2023, supported by robust intra-regional demand as well as strong demand from the United States. According to the US National Travel and Tourism Office (NTTO), US travel to Europe grew 33% through August (compared to 2022), accounting for 21% of total US overseas travel (World Tourism Organisation, 2023). These findings underscore the significance of tourism to the economies of nations. Understanding the efficiency of the tourism sector is crucial for optimising its economic contributions and ensuring sustainable growth. Moreover, tourism has far-reaching cultural and societal implications. Efficient tourism practices can contribute positively to the preservation of local cultures, heritage, and environments. By studying efficiency, we can develop strategies that balance the economic benefits of tourism with the need for responsible and sustainable practices, ensuring the long-term well-being of communities and their natural resources.

The scientific literature on the effectiveness of the tourism sector in the EU has explored various dimensions and aspects. Numerous studies have investigated the economic contributions of the tourism sector to the EU, including its contribution to GDP, employment generation, foreign exchange earnings, and regional development. Researchers have examined how tourism impacts various sectors of the economy and its role in fostering economic growth and development (Lin et al., 2023; Perić et al., 2021; Soysal-Kurt, 2017). Research has examined the social and cultural impacts of tourism on communities within the EU. This includes studies on cultural heritage preservation, social cohesion, cultural exchange, community empowerment, and the effects of tourism on local lifestyles and traditions (Bosone et al., 2021; Cerisola & Panzera, 2021; Noonan, 2022).

While considerable scientific inquiry has been conducted on the ramifications of the efficiency of the tourism sector, one potential gap in the scientific literature concerning the impact of the efficiency of the tourism sector in the EU is the need for more comprehensive studies that consider the multifaceted nature of efficiency and its implications across different dimensions. While existing research may focus on specific aspects such as economic efficiency or environmental sustainability, there is a lack of holistic analyses that consider the interplay between various factors influencing efficiency within the EU tourism sector. Specifically, this study broadens the scope of research within the tourism sector by examining inbound tourism, household expenses on travelling, employed persons in the tourism sector, and the properties of countries' tangible heritage. This highlights the distinctiveness of this study compared to others. The main objective of this study is to determine the impact of the efficiency of the tourism sector in the EU. In order to achieve this goal, Data Envelopment Analysis and Tobit regression were applied. Limited access to comprehensive and reliable data on various aspects of the tourism sector across EU member states partially limits the depth of analysis. For this reason, the exclusion of Denmark and Luxembourg is attributed to insufficient statistical data. The study may not fully account for contextual differences among EU member states, including diverse socio-economic conditions, cultural norms, and policy environments, which could influence the efficiency of the tourism sector.

Literature Review

In the EU, tourism performs a wide range of purposes, such as fostering regional development, encouraging cross-cultural interchange, and accelerating economic progress. It is essential to the preservation of cultural assets, the creation of jobs, and the general improvement of living standards among EU members. One of the EU's main economic drivers is tourism. It dramatically boosts the GDP of EU member states by creating jobs, assisting small businesses in the area, and promoting economic expansion. (Balsalobre-Lorente & Leitão, 2020; Haller et al., 2021). Travel attracts people from all over the world, which fosters cross-cultural exchange. Europe becomes more harmonious and interconnected

as a result of these interactions with many cultures, which foster understanding, acceptance, and appreciation of diversity (Noonan, 2022). Infrastructure development for cultural assets is closely linked to tourism. A typical combination of tourist attractions is historical sites, museums, and cultural landmarks. The preservation and maintenance of these critical components of Europe's cultural heritage are made possible in part by tourism (Perić et al., 2021). All of these reasons demonstrate the significance of tourism in the EU and how closely it is linked to a range of cultural pursuits. EU cultural activities are crucial for forming the identity of the region, fostering social cohesion, igniting the economy, and influencing global affairs.

These endeavours are vital in moulding Europe's cultural terrain and fostering a feeling of cohesion among its many constituent nations. The EU is renowned for its multifaceted cultural environment, in which every member state has its own unique customs, dialects, and artistic expressions. Cultural pursuits contribute to respecting and preserving this diversity by fostering a sense of unity despite the disparities (Perić et al., 2021). The concept of efficiency typically denotes the capability to complete a work using minimal wasted resources, effort, or time. It gauges the efficiency of a system, process, or individual in generating desired outcomes or outputs compared to the inputs utilised.

Despite its myriad of implications, efficiency is frequently constrained to a specific significance within a given discipline. In the tourism sector, we have observed some studies assessing the efficiency of tourism. Ilić & Petrevska (2018) evaluate the efficiency of tourism in Serbia and neighbouring countries. The efficiency of sustainable tourism is analysed, and what elements of tourism development could be included in order to increase its efficiency Other topics related to efficiency include cultural efficiency, such as studies that look at how cultural activities contribute to economic development and social welfare (Cerisola & Panzera, 2021). In addition, studies that analyse resource efficiency are important in the context of the green economy, as they help to assess how production processes can be organised in a way that results in less resource consumption and fewer negative environmental impacts (Mikhno et al., 2021). All these efficiency studies show that positive efficiency contributes to economic development, environmental protection, international prestige and competitiveness, and more effective policymaking, so it is a vital topic to analyse.

Selections of Inputs and Output Measures

Statistical information is essential for studying efficiency, which is not always easy to collect due to its lack. Studies of the tourism sector using the DEA method have already been carried out in the research of other authors. Bayrak and Bahar (2017) sought to determine the efficiency of tourism in OECD countries from an economic point of view. Radovanov et al. (2020) assess tourism potential in EU and western Balkan countries through a two-stage DEA model for sustainable development strategy. Pavković et al. (2021) sought to assess the efficiency of the tourism sector in specific European countries and regions, considering established parameters and offering recommendations for enhancement. In the discussed research, the most commonly found variables are the number of employees, tourism expenses, tourist arrivals, tourism receipts, number of nights spent, number of hotels and similar accommodation capacities, and tourism revenues. Based on the literature review (Bednarska, 2017; Bosone et al., 2021; Gozgor et al., 2019; Wakelin-Theron et al., 2018), the current research utilises the following inputs and output measures.

Expenses According to the Stays per Visit (1 Night or over) When Going to a Foreign Country

Examining the determinants influencing tourists' spending choices is a prominent subject in the field of tourism research, considering its implications for destinations and the resulting effects on marketing strategies. Tourist expenditure significantly contributes to economic growth through various channels (García-Sánchez et al., 2013). The expenditure by tourists creates a positive economic impact by fostering job creation, business development, infrastructure improvement, and overall economic diversification. The continuous cycle of spending and reinvestment contributes significantly to the sustained growth of the local and national economy (Wakelin-Theron et al., 2018). This variable measures how many euros were spent per visit or stay.

Individuals Actively Working in the Tourism Industry

Individuals actively working in the tourism industry play a crucial role in various aspects of the sector's functioning and its impact on local, national, and global economies; therefore, this variable was included. Individuals working in the tourism industry contribute significantly to economic development, cultural exchange, destination promotion, and the overall sustainability of the sector (Ilić & Petrevska, 2018; Wakelin-Theron et al., 2018; Yıldırım, 2021). Their function goes beyond rendering services; they also actively mould a destination's perception and experience. They play a critical role in creating jobs because tourism is a significant driver of job growth. Workers from a variety of businesses, including hospitality, dining, travel, and allied fields, make up a sizable portion of the labour force and generate revenue. This is a significant variable for the cultural field. People who work in the tourism sector, such as tour guides and hospitality personnel, deal with visitors directly. These interactions facilitate cultural exchange, fostering mutual understanding and appreciation among people from different backgrounds (Bednarska, 2017; Wakelin-Theron et al., 2018).

Tangible Heritage Inscribed on UNESCO

The primary element in defining the identity and distinctiveness of cities and regions is cultural heritage. Presently, cultural heritage is viewed as having artistic value and is recognised for its positive impact on well-being, job creation, social engagement, and the promotion of tourism. This, in turn, contributes to the economic development of a country. Numerous authors argue that heritage's influence on a country's economy is most pronounced through tourism development, underscoring the importance of proper protection and management (Bosone et al., 2021; Chhabra, 2021; Zhenrao et al., 2021). Hence, cultural heritage emerges as a crucial metric in the realm of cultural economics. Inclusion on the UNESCO World Heritage List often indicates that a site or element has met specific criteria related to its cultural, historical, scientific, or architectural significance. These tangible heritage sites can include iconic landmarks, archaeological sites, historic cities, or cultural practices that have global importance (Jiménez de Madariaga & Seño Asencio, 2019). The number of tangible heritage sites inscribed on UNESCO in this research is recalculated for 100,000 population.

Inbound Tourism

Inbound tourism was chosen as an output for this research. Inbound tourism, which involves visitors coming to a country from other nations, holds significant importance for both the destination country and the global travel industry. In the development of a nation, the significance of inbound tourism is pivotal, contributing not only to economic growth but also facilitating cultural interchange and comprehensive destination promotion (Gozgor et al., 2019). Its influence reaches beyond economic considerations, encompassing social, cultural, and diplomatic dimensions, thereby establishing it as an integral element of a country's broader global engagement strategy (Arain et al., 2020). Inbound tourism is measured in this study per thousand persons. Based on the literature review and available statistical data, the inputs and the output of this research are depicted in Table 1.

Table 1. Inputs and Output Used in DEA (Source: Compiled by the authors)

Input/ Output	Indicator	Type of measurement	Data source
Output	Inbound tourism.	Thousand persons	(Tourism statistics database, 2023)
Input 1	Expenditure by duration, purpose, main destination of the trip and expenditure category: expenditure on transport; expenditure on restaurants/cafés; expenditure on accommodation; other expenditure on tourism trips (including restaurants/cafes if not reported separately); expenditure on package arrangement (1 night or over) (Foreign country).	Euro	(Eurostat database, 2023)
Input 2	Total number of employed persons by total (full-time/part-time) by activity (air transport; accommodation and food service activities; travel	Thousand persons	(Eurostat database, 2023)

	agency, tour operator and other reservation service and related activities).		
Input 3	Properties of countries' tangible heritage inscribed on the UNESCO World Heritage List.	Number for 100,000 population	(UNESCO database, 2023)

As Table 1 shows, there are three inputs: expenses according to the stays per visit (1 night or over) when going to a foreign country, individuals actively working in the tourism industry and tangible heritage inscribed on UNESCO and one output – inbound tourism was selected for the research.

Another method used in the research is the Tobit econometric modelling. The efficiency of the chosen variables is depicted in the research through the utilisation of a Tobit regression analysis. Based on the literature review, the following variables were identified.

Tourist Expenditure of GDP

The inclusion of this variable was motivated by the need to monitor tourist expenditure as a percentage of GDP in order to assess the economic relevance of the tourism industry, guide policy decisions, and promote sustainable economic development. The study uses GDP as a percentage to measure it.

Cultural Activities

Cultural activities are integral to societal well-being, fostering identity, diversity, social cohesion, and economic vitality. They contribute to the enrichment of individuals' lives and play a crucial role in shaping the fabric of communities and nations. Online cultural activities provide a platform for global participation (Kumi-Yeboah, 2018). People from diverse geographical locations can engage in and appreciate cultural events, breaking down geographical barriers and fostering a more interconnected world. Such a cultural activity encourages creativity and innovation. Artistic expression, whether in visual arts, literature, or performing arts, fosters a culture of innovation and contributes to the development of a society's creative potential (Nicolaou, 2021). They are presented in the study by percentage of individuals.

Happiness Index

The Sustainable Development Solutions Network, utilising data from the Gallup World Poll, produces the World Happiness Report (Helliwell et al., 2023). This report signifies a global call for increased emphasis on happiness and well-being in shaping government policies. It assesses the current global happiness landscape, illustrating how the scientific study of happiness elucidates the differences in happiness levels both at an individual and national level. The index employs recorded information on the six factors and evaluations of their connections with life satisfaction to account for the differences among nations. These factors encompass GDP per capita, social support, healthy life expectancy, freedom, generosity, and corruption. (Helliwell et al., 2023). The Happiness Index is a frequently used variable to analyse efficiency. Lin et al. (2023) the authors examine the happiness and sustainable development of the population of Organisation for Economic Cooperation and Development (OECD) member countries.

Variables for the Tobit model: tourist expenditure of GDP, cultural activities, and Happiness index are depicted in Table 2.

Table 2. Variables for Tobit Model (Source: Compiled by the authors).

Variables	Indicator	Type of measurement	Data source
Tourist expenditure of GDP	Expenditure on recreation, tourism, and culture. Percentage of GDP.	%	(Eurostat database, 2023)
Cultural activities	Participation in cultural activities by using Internet activities. Frequency of internet access: daily.	%	(Eurostat database, 2023)

Happiness index	Happiness index.	Score	(https://worldhappiness.report/data/, 2023)

By examining these factors depicted in Table 2, the study offers a multifaceted perspective on the interplay between economic, cultural, and social aspects within the tourism industry. The findings underscore the importance of monitoring tourist expenditure as a percentage of GDP to gauge the economic relevance of tourism and guide policy decisions for sustainable economic development. The analysis of cultural activities highlights their integral role in fostering societal well-being, promoting diversity, and stimulating innovation, particularly through online platforms. The incorporation of the happiness index provides a nuanced understanding of national well-being levels, offering valuable insights for policymakers in shaping strategies aimed at enhancing overall happiness and quality of life.

Research Methodology

For selected variables, descriptive statistics provide a summary of key features of a dataset, helping researchers and analysts understand its characteristics and make informed decisions. Table 3 presents descriptive statistics for selected variables: mean, standard deviation, minimum and maximum definitions.

Table 3. Descriptive Statistics of the Used Data (Source: authors' calculations).

Variable	Unit measurement	Mean	Std. Dev.	Min	Max
Inbound tourism	Thousand persons	28699,2	38823,8	2057	168346
Expenditure on tourism by duration, purpose	Euro	9726192	19791122	483453,9	96139532
Number of persons working in the field of tourism	Thousand persons	8103,6	10618,9	283,3	42528,6
Tangible heritage inscribed on the UNESCO World Heritage List	Number for 100,000 population	0,1	0,1	0,03	0,6
Tourist expenditure of GDP	%	4,4	0,9	1,4	6,6
Cultural activities	%	84,5	5,5	71,2	94
Happiness index	Score	6,6	0,5	5,5	7,8

As can be seen from Table 3, descriptive statistics provide a summary of the basic features of a dataset. Descriptive statistics include measures such as mean, median, mode, standard deviation, minimum, and maximum. These statistics offer insights into the central tendency, dispersion, and distribution of the data. In the context of research, descriptive statistics reveal the average levels of cultural activities, happiness, and tourism metrics across the 25 selected EU countries, as well as the variability and distribution of these variables within the dataset.

Standard DEA Model

The efficiency of the tourism sector, considering the impact of cultural activities, happiness, and tourist expenditure, was calculated using EU data and applying the DEA. The study encompassed 25 EU countries. However, Denmark and Luxembourg were eliminated, which was attributed to insufficient statistical data. DEA is a numerical technique utilised to assess the relative efficiency of units known as decision-making units (DMUs) (Dobos & Vörösmarty, 2023). Within the framework of DEA, it is crucial to define the inputs and outputs pertinent to the assessment. Inputs denote the resources or elements utilised by the DMUs, while outputs represent the products, services, or results produced by these DMUs. The chosen inputs and output for the study, along with references to the utilised databases, are presented in Table 1. All the statistical information has been sourced from statistical databases, ensuring the reproducibility of the research. Table 3 shows the statistical summary of the data used.

DEA is extensively applied across diverse research domains and industries to evaluate and quantify relative efficiency, and the cultural and tourism sectors are no exception. DEA is used to analyse the

efficiency of the cultural sector by evaluating the relative performance of different cultural organisations or entities. Utilising DEA in the cultural sector aids decision-makers, cultural institutions, and stakeholders in making informed choices to enhance resource allocation and boost overall efficiency in fostering cultural activities and experiences (De Jorge-Moreno & De Jorge-Huertas, 2020). DEA facilitates continuous monitoring, empowering cultural organisations to adjust and improve their operations as needed. Examines the impact of cultural tourism on the economies of countries (Wu & Lin, 2022). DEA is evaluating the efficiency and effectiveness of the tourism sector by assessing factors such as tourism infrastructure, individual destinations, and investments made in tourism (Pavković et al., 2021; Nurmatov et al., 2021). Based on the given information, it can be asserted that there are some research studies analysing cultural and tourism sectors, but there is no study that covers cultural activities, happiness, and the tourism sector. Other researchers have applied the DEA method to examine the culture and tourism sectors; however, the variables they consider as inputs and outputs differ from the ones employed in this particular study.

In order to implement the DEA method, it is essential to choose the inputs and outputs. In this study, the input indicators are expenses according to the stays per visit (1 night or over) when going to a foreign country, individuals actively working in the tourism industry, and tangible heritage inscribed on UNESCO and inbound tourism was selected as an output. The selection of inbound tourism as an output is grounded in its correlation with the inputs under scrutiny in this study, a connection that is supported by existing literature in the scientific field. Xu et al. (2023) claim that tourists are frequently drawn to UNESCO World Heritage Sites, encompassing historical monuments, natural wonders, or cultural landscapes. The designation by UNESCO often serves as a compelling motivation for inbound tourists to visit a destination, seeking to explore and experience the unique and globally recognised attractions listed by UNESCO. Perić et al. (2021) say that inbound tourism to UNESCO sites can have a substantial economic impact on the local and national levels. It generates revenue through entrance fees, accommodations, dining, and various tourism-related services. Ivanunik et al. (2021) state that acknowledgement by UNESCO offers international recognition of the cultural or natural significance of a site. This acknowledgement functions as a promotional instrument, enticing a greater number of tourists interested in discovering destinations renowned for their cultural and heritage importance.

After the DEA application, the Tobit regression modelling was used. It was selected in order to investigate how the calculated efficiency is influenced by tourist expenditure in GDP, cultural activities, and the happiness index.

Results

In order to assess how efficiently the inputs represented by the expenses according to the visit of stay (1 night or over) when going to a foreign country, individuals actively working in the tourism industry and tangible heritage inscribed on UNESCO transforms to the output represented by inbound tourism, DEA was performed, and the results are stated in Table 4.

Table 4. DEA Efficiency Results in EU (Source: Authors' calculations).

DMU name	Efficiency score	Efficiency	DMU name	Efficiency score	Efficiency
Belgium	0,147023	Inefficient	Latvia	0,078768	Inefficient
Bulgaria	0,35934	Inefficient	Lithuania	0,131578	Inefficient
Czechia	0,166255	Inefficient	**Hungary**	1	Efficient
Germany	1	Efficient	Malta	0,334421	Inefficient
Estonia	0,175293	Inefficient	Netherlands	0,231476	Inefficient
Ireland	0,499729	Inefficient	Austria	0,504937	Inefficient
Greece	0,754754	Inefficient	**Poland**	1	Efficient
Spain	1	Efficient	Portugal	0,29872	Inefficient
France	1	Efficient	Romania	0,53401	Inefficient
Croatia	1	Efficient	Slovenia	0,136215	Inefficient
Italy	0,949611	Inefficient	Slovakia	0,508645	Inefficient
Cyprus	0,244603	Inefficient	Finland	0,057055	Inefficient
Sweden	0,068714	Inefficient			

As shown in Table 4, Germany, Spain, France, Croatia, Hungary, and Poland are considered the most efficient countries with the highest ratio of outputs to inputs. According to the results, Latvia, Sweden, and Finland are the least efficient. According to the United Nations geoscheme, three European regions can be divided according to results. The most efficient countries in Eastern Europe are Hungary and Poland; in Southern Europe – Croatia and Spain; and in Western Europe – France and Germany. One of the main factors leading to these outcomes might be the population of these countries. Almost all of the EU countries with the highest results are the largest in terms of population in their United Nations geoscheme groups to which they belong. The only exception is Croatia, which has less population than Italy and Greece, but both of these countries are very high (Italy and Greece occupy 7 and 8 places respectively) according to the results in Table 4. Croatia's higher ranking compared to Greece or Italy may be attributed to the number of UNESCO heritage sites recalculated for 100,000 population as indicated by this data, wherein Croatia exceeds both Italy and Greece. According to research findings, the quantity of heritage sites plays a crucial role in attracting inbound tourism (Ivanunik et al., 2021; Perić et al., 2021). Further analysis of the results shows that France and Spain are the most efficient countries. This is not an unexpected result; these countries have well-developed tourism, which is also shown by the data of incoming tourism used in the study, which were the highest compared to other countries that participated in the study. The elevated performance of Germany can also be explained by scrutinising the statistical data, as both expenditures related to the duration of visits and the presence of individuals actively engaged in the tourism sector are the most substantial when compared to other nations. The outcomes for Poland and Hungary might appear unexpected since, in contrast to other EU countries, they are not the foremost tourist destinations.

Nevertheless, the examined statistical data indicates that the nations hold a relatively high position concerning expenses per visit compared to other EU countries and it might have caused this outcome. When comparing the achieved outcomes with those of the happiness index, it is apparent that all proficient nations rank within the top 50 happiest countries globally. Hungary slightly lags behind this benchmark, securing the 51st position. It can be assumed that such results are because nations with elevated happiness indexes typically enjoy superior living standards, encompassing elements such as healthcare accessibility, educational opportunities, safety measures, and overall welfare. These attributes render such countries appealing to tourists in search of gratifying and enriching experiences. Also, countries that rank high on happiness indexes generally prioritise substantial investments in infrastructure, encompassing transportation systems, lodging choices, cultural sites, and recreational amenities. This infrastructure not only elevates the overall tourist experience but also facilitates visitors in exploring and relishing the destination.

A Tobit regression was conducted to evaluate the factors that influenced the performance. As previously stated, the DEA calculation yields truncated discrete distribution values ranging from 0 to 1. Using the OLS method could introduce estimation bias; therefore, the choice for the research was to employ Tobit regression. The summary of the Tobit econometric model is presented in Table 5.

Table 5. Summary of Tobit Regression (Source: Authors' calculations).

Log-likelihood = - 0,97682877				LR $\chi^2(2)$ = 4,29 Prob > χ^2 = 0,2318 Pseudo R^2 = 0,6871		
Efficiency*	**Coefficient**	**Std. err**	**t**	**P > |t|**	**[95% conf. interval]**	
Tourist expenditure of GDP	-0,0517121	0,0562563	-0,92	0,068	-0,1683806	0,0649564
Cultural activities	0,0010515	0,0131541	0,08	0,037	-0,0262284	0,0283314
Happiness index	-0,2047734	0,1351226	-1,52	0,004	-0,4850005	0,0754537
Const	1,835289	0,9046425	2,03	0,000	-0,040825	3,711402
Var (e.Efficiency)	0,2516124	0,0355833			0,1778171	0,3254078

As indicated in Table 5, there are three independent variables: tourist expenditure of GDP, cultural activities, and Happiness Index. Tourist expenditure of GDP and the Happiness Index both have a negative impact on efficiency. The proportion of GDP allocated to expenditure on recreation, tourism, and culture is a vital indicator with substantial implications for the nation's economic well-being. The

economic ramifications extend beyond these sectors and can also positively influence associated industries like hospitality, transportation, and retail.

However, such results may be due to the fact that not all EU countries are equally developed in the field of tourism. Economic conditions, government policies and other factors can affect the development of tourism (Barišić & Cvetkoska, 2020). The value of the happiness index is also negative, a result that is also partly unexpected, as the happiness index aims to provide insights into the factors that lead to happiness and to encourage policies that prioritise the well-being of citizens. However, the rankings of this index are based on survey data, which is normal for different countries, even on the same continent, to be very different.

Cultural activities are the only one of the three variables that positively affect efficiency. Cultural activities integrated with internet usage in tourism contribute to improved accessibility, convenience, communication, and decision-making processes for both tourists and businesses, establishing it as an essential component of the contemporary travel experience. Internet availability in the EU is fairly even, which may be one of the reasons why this factor has a positive influence effectively. Chianese et al. (2017) state that cultural activity on the Internet is a very important factor in increasing cultural accessibility, which is especially relevant for cultural heritage, stimulating the interest of visitors, and creating new routes, including cultural resources.

Discussion

The main objective of this study is to examine how cultural activities, happiness levels, and the tourism sector affect efficiency within the EU. The research analysed data from 25 chosen EU countries using both Data Envelopment Analysis and the Tobit econometric model. Wu & Lin's (2022) DEA method is applied to analyse the value generated by cultural tourism in multiple Asian nations. In this research, cultural tourism demand and revenue were chosen as output measures, while cultural resources and labour were considered as the input. Tu et al. (2017) explore the efficiency of local Chinese government expenditure on public cultural services and the factors influencing it through a two-stage DEA-Tobit analysis. Public cultural spending serves as the input variable, while the output variables encompass cultural resources capable of directly offering public cultural products. These resources include the number of cultural, and institutional organisations, newly acquired copies of books in public libraries, average performance frequency per art performance troupe in the cultural sector, and practical completed investment in capital construction by cultural undertakings. Huang et al. (2017) authors aimed to evaluate the effectiveness of promoting cultural tourism by examining cultural activities and the dynamics of the cultural tourism sector. The studies presented indicate that the assessment of efficiency in cultural activities and the tourism sector is a well-established practice, both within the EU and globally. In this research, the element of happiness plays a role in cultural activities and the tourism sector, quantified through the Happiness Index, an aspect not addressed in prior studies, underscoring the unique contribution of this study. By identifying the most effective countries, the results provide an opportunity to apply the practices of efficient countries in the cultural and tourism sectors to inefficient countries. As a result, countries with lower efficiency levels have the opportunity to enhance their policies and initiatives. For instance, Latvian authorities have already initiated measures to address the decline in tourist numbers.

The Development Agency of Latvia collaborated with regional tourism associations and local authorities to coordinate numerous domestic promotional campaigns: “Open Days in the Countryside”, “Home Café Days”, “Zoom Latvia Closer”, “Let’s visit Latvian castles and manors!” [2] These initiatives have attracted more than 70,000 visitors and are planned to be repeated. Latvian practice can be an excellent example for other countries seeking to promote tourism in their country. The results can be used by governments and policymakers to create integrated strategies that give priority to the interaction of tourism, culture, and social welfare. This all-encompassing strategy guarantees that the advancement of general happiness and cultural heritage preservation are balanced with economic progress. Our research sheds light on the variables affecting tourist industry efficiency. Strategic planning for tourism

[2] https://www.oecd-ilibrary.org/sites/dd19c30e-en/index.html?itemId=/content/component/dd19c30e-en

development can benefit greatly from this information, as it enables nations to customise their offerings in accordance with happiness indicators and cultural interests, so drawing in a more contented and involved tourist base. Targeted investments are made possible by the identification of factors influencing efficiency.

To promote a more thriving and sustainable tourism industry, governments and private sector partners can prioritise investments in areas that most significantly contribute to great experiences for visitors and local communities. Community Empowerment and Engagement: local communities gain power when they comprehend the connection between cultural pursuits, well-being, and tourist effectiveness. Through community involvement in tourist planning and execution, nations can guarantee a more equitable distribution of economic gains while cultivating a feeling of pride and ownership. Marketing and Branding Strategies: The study can help with marketing and branding strategies by emphasising the value of promoting locations that enhance happiness and distinctive cultural experiences. Marketing campaigns can draw in a more discriminating and contented traveller base by being tailored to these variables. Sustainability Initiatives. Nations can create sustainability initiatives if they have a better understanding of how tourism affects social cohesion and cultural preservation. The long-term sustainability of destinations and the development of constructive relationships between the tourism sector and host communities are ensured by striking a balance between economic gains and responsible tourism practices. Advocacy for Policies: Based on the study, policies that prioritise the comprehensive growth of the tourism industry will be promoted. One aspect of this is pushing for the inclusion of cultural preservation and community welfare in national and local tourist plans.

Conclusions

The economic progress of various global regions depends significantly on tourism and a variety of cultural pursuits, making substantial contributions to both GDP growth and employment. With the continuous expansion of the tourism industry, it becomes essential to examine its varied impacts on various aspects of the local economy. An especially critical aspect that requires in-depth investigation is the influence of tourism on efficiency. To determine the impact of cultural activities, happiness and the tourism sector on EU efficiency, Data Envelopment Analysis was adopted. In this study, the output was inbound tourism, while inputs were expenses according to the stays per visit (1 night or over) when going to a foreign country, individuals actively working in the tourism industry, and tangible heritage inscribed on UNESCO. As per the findings, Germany, Spain, France, Croatia, Hungary, and Poland are identified as the most efficient nations, displaying the highest ratio of outputs to inputs. On the other hand, Latvia, Sweden, and Finland are deemed the least efficient based on the results.

The second stage of this study was Tobit regression, which determined which of the selected factors had a positive effect on efficiency. Three factors are chosen for the Tobit regression: tourist expenditure of GDP, cultural activities, and Happiness Index. The results showed that tourist expenditure of GDP and Happiness Index negatively impact efficiency while cultural activities yield a positive impact.

In nations characterised by lower efficiency levels, policymakers ought to enhance their strategies and encourage the advancement of their country's appeal to tourists. Additionally, there should be an increased emphasis on enhancing the well-being and happiness of the local population. The methodology outlined in the research provides a systematic approach that can be adapted to different contexts. This requires only available statistical data. By replicating this study in other countries or regions, researchers can contribute to a better understanding of the relationships between tourism, culture, and social welfare on a global scale. Comparative studies across different countries can provide valuable insights into best practices and strategies for sustainable tourism development.

Acknowledgement

This work was supported by national funds through FCT/MCTES (PIDDAC): UNIAG, UIDB/04752/2020 (DOI 10.54499/UIDB/04752/2020) and UIDP/04752/2020 (DOI 10.54499/UIDP/04752/2020).

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ECONOMICS AND CULTURE 21(1), 2024

DOI: 10.2478/jec-2024-0008

UNDERSTANDING SOCIAL ENTREPRENEURS' VIEWS ON STRATEGIES FOR ENSURING SOCIAL ECONOMY SUSTAINABILITY

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Received 19 March 2024; accepted 21 May 2024

Abstract

The research purpose. This study aims to probe the internal consistency of survey questions aligning with priorities outlined in the World Economic Forum Insight Report "Unlocking the Social Economy" within Latvia and Georgia. It delves into the structural makeup of contemporary social entrepreneurs in these nations, their attitudes towards report priorities, and perceptions on fostering social economy development. Additionally, it explores how social entrepreneurship impacts Sustainable Development Goals (SDGs) like 11, 12, and 8, and proposes ways to enhance collaboration between public bodies and social economy actors in Latvia and Georgia.

Design / Methodology / Approach. The body of the survey was constructed according to the World Economic Forum Insight Report "Unlocking the Social Economy" priorities and the developed questionnaire was distributed in Latvia and Georgia from February to March 2024. The respondents were social entrepreneurs from both countries. The pilot study aimed to test the internal consistency of the survey`s questions.

Findings underscore the role of social innovation in tackling contemporary development issues, and in fostering employment and economic growth. It delineates the modern social entrepreneur's profile in Latvia and Georgia, analyses their stance towards report priorities, solicits their views on actions vital for social economy growth.

Originality / Value / Practical implications. Social entrepreneurship is commonly recognized as an integral element of Catalyst 2030, a global movement of social entrepreneurs and social innovators looking to attain the SDGs by 2030. In particular, SDG 11 (Sustainable Cities and Communities), SDG 12 (Responsible Consumption and Production), and SDG 8 (Decent Work and Economic Growth) have been the most strongly impacted by sustainable entrepreneurship research. The research contributes to the process of unlocking the social economy towards an inclusive and resilient society more comprehensive for the social entrepreneurs and public bodies aiming to foster the development of the social economy. The main value of the research is revealing the need to update the relation of the public bodies of Georgia and Latvia to the interaction of social entrepreneurs.

Keywords: SDG, social economy, social entrepreneurship, sustainable development, public bodies.

JEL codes: L31, J08, I31.

Introduction

Background of the Research

In the contemporary world, the role of businesses in addressing social concerns has witnessed substantial growth, exemplified by the 'United Nations 2030 Agenda for Sustainable Development' (United Nations, 2015). In recent years, there has been a growing recognition of the importance of social entrepreneurship in addressing social challenges and promoting sustainable development (Presnyakova & Khryuchkina, 2020). Social enterprises aim to generate positive impacts in their communities while also ensuring the

sustainability and scalability of their business models. Their work often aligns with multiple Sustainable Development Goals (hereinafter SDGs), as they tackle issues such as poverty, inequality, climate change, and more. Social enterprises can contribute to the SDGs by demonstrating socially responsible practices, creating inclusive jobs, and promoting sustainable consumption and production patterns (Littlewood & Holt, 2018).

In Georgia and Latvia, social entrepreneurship has shown promising potential in addressing social well-being, unemployment, environmental protection, and cultural heritage preservation. Despite scarce resources, social enterprises have demonstrated resilience, particularly during crises such as the COVID-19 pandemic, emphasizing their commitment to retaining employees and adapting operations to meet social needs (OECD, 2020).

The choice of Latvia and Georgia for this research is strategic. Both countries represent transitional economies with unique socio-political landscapes and emerging social entrepreneurship sectors. Latvia, with its progressive legislation and institutional support, stands as an example of how policy frameworks can nurture the social economy. On the other hand, Georgia's evolving social economy, influenced by historical context and informal sector dynamics, presents distinct challenges and opportunities. However, despite the progress made in the field of social entrepreneurship, there are still gaps and challenges that need to be addressed (Gigauri et al., 2022). By studying these contrasting contexts, this research seeks to identify key success factors and barriers to the sustainable development of the social economy in the countries where the economy is developing progressively. By analysing the attitudes, perceptions, and proposed actions by Social Entrepreneurs, this research contributes to enhancing collaboration between public bodies and the social economy representatives, ultimately advancing the pursuit of SDGs and fostering an inclusive and resilient society.

This study serves as the inaugural phase of an ongoing research endeavour. Subsequent phases will extend the investigation to encompass additional countries within the Baltic region, Poland, and select CIS nations. This expansion aims to ascertain the extent of relevance regarding congruences and impediments to social entrepreneurship development across diverse regions with varying degrees of socioeconomic advancement. By broadening the scope to include a more comprehensive array of geopolitical contexts, the research seeks to provide a nuanced understanding of the factors influencing social entrepreneurship dynamics. This systematic approach enables the identification of commonalities and disparities, facilitating the formulation of targeted strategies to foster social entrepreneurship ecosystems. Through rigorous comparative analysis, the study endeavours to contribute empirically grounded insights to the scholarly discourse on social entrepreneurship and regional development.

Aim and Objectives

The study aims to investigate the internal consistency of survey questions related to the priorities outlined in the World Economic Forum Insight Report "Unlocking the Social Economy" within the context of Latvia and Georgia. Specifically, the research seeks to assess the structural characteristics of modern social entrepreneurs in these countries, analyse their attitudes towards the priorities identified in the report, and gauge their perceptions regarding actions necessary to foster social economy development. Additionally, the study aims to explore the impact of social entrepreneurship on achieving SDGs, particularly SDG 11, SDG 12, and SDG 8, and to provide insights into enhancing the collaboration between public bodies and social economy representatives in Georgia and Latvia.

Hypotheses Testing and Insights

Following an extensive exploration of the structural characteristics and attitudes of social entrepreneurs in Latvia and Georgia, this study sought to test two hypotheses regarding the perceptions and roles of social economy players. Hypothesis 1 posited that there would be a significant difference in how social economy players from both countries are perceived in leading social and environmental innovations, while Hypothesis 2 proposed a significant disparity in their contributions to green and digital transitions.

Literature Review

The literature on social entrepreneurship and the social economy has been growing rapidly in recent years, indicating global interest in understanding, and promoting sustainable solutions to societal

challenges (Gigauri et al., 2022). According to Bansal et al. (2023), the concept of the social economy encompasses a diverse range of organizations and initiatives prioritizing social and environmental objectives alongside economic goals. For instance, in a study by Scuotto et al., the authors propose a conceptual framework enhancing the current understanding of the social dimensions of SEOs' business model (Scuotto et al., 2023). "Social entrepreneurship" in the "entrepreneurial ecosystem" aids social development, as these start-up companies generate strategies to contribute to societal welfare alongside organizational growth (Monir & Geberemeskel, 2023). Scholars argue that social entrepreneurship can contribute to achieving the SDGs by addressing social and environmental issues through innovative business models. It is evident from the literature review that social entrepreneurship plays a crucial role in driving sustainable development by addressing social and environmental challenges through innovative business models (Neumann, 2020). Schumpeterian social entrepreneurship, as termed by Joseph Schumpeter, emphasizes the role of innovation and creative destruction in economic transformation (Rahdari et al., 2016). Schumpeter's ideas support the concept that social enterprises can disrupt traditional ways of doing business by integrating sustainability considerations into their core operations, thus contributing to the achievement of the SDGs.

Sauermann's empirical analysis demonstrates that effective social entrepreneurship initiatives require robust leadership, community engagement, funding accessibility, and adaptability to local challenges (Sauermann, 2023). These aspects underscore the multi-dimensional nature of sustainable development challenges that social entrepreneurs aim to address. In practical terms, social enterprises apply innovative business models and practices aimed at creating widespread social value while ensuring environmental stewardship and sustainable economic growth, aligning with the broader sustainable development agenda highlighted in seminal works such as "Our Common Future" (Rahdari et al., 2016). Moreover, Austin et al. (2006) emphasize the importance of social innovation in achieving SDGs, highlighting how social entrepreneurship can serve as a catalyst for transformative change in societies.

Rahdari et al. (2016) highlight the role of social entrepreneurship particularly regarding SDG 11, SDG 12, and SDG 8. SDG 11, "Sustainable Cities and Communities," focuses on making cities inclusive, safe, resilient, and sustainable. Social entrepreneurs contribute to this goal by developing affordable housing solutions, improving urban infrastructure, and enhancing public spaces. SDG 12, "Responsible Consumption and Production," aims to ensure sustainable consumption and production patterns. Here, social entrepreneurial ventures excel in promoting circular economy practices, reducing waste, and creating sustainable products and services that minimize environmental impact. Literature examining the role of social entrepreneurship in furthering SDG 12 highlights the importance of innovation (Lubberink et al., 2019) and stakeholder engagement in creating systems that foster sustainable consumption behaviours. SDG 8, "Decent Work and Economic Growth," focuses on promoting inclusive and sustainable economic growth, employment, and decent work for all. Social enterprises often create job opportunities for marginalized groups and support fair trade practices, thus contributing to economic inclusion.

In the World Economic Forum (WEF) report by the Schwab Foundation (2022), the fusion of social entrepreneurship and sustainable development is explored, emphasizing their interconnectedness. Social entrepreneurs operate within the circular and social economy models, promoting resilience, inclusion, and sustainability. The report stresses the importance of supportive ecosystems and coherent policies, advocating for regulatory frameworks, funding incentives, and inclusive procurement channels. It outlines a dual strategy: fostering a conducive environment for the social economy and utilizing its experiences to address structural challenges in profit-driven economies. Finally, it emphasizes the critical role of governments in supporting the social economy through regulatory frameworks and policy strategies.

Public-private partnerships (PPPs) are fundamental to pushing the boundaries of the social economy, leveraging the strengths of both sectors: the public sector's regulatory and policy-making capabilities and the private sector's innovation, efficiency, and capital (Shin, 2016). These collaborations often lead to the creation of more sustainable and effective solutions to social challenges. The success of PPPs in the social economy often hinges on robust policy frameworks that encourage and facilitate such collaborations. The establishment of clear legal definitions, supportive legislation, and incentive structures can create an environment conducive to social economy initiatives (Cheng, 2016). For

instance, the Social Entrepreneurship Law in Latvia (Likumi.lv, 2018) is an example of a policy that helps define the parameters and provides a foundation for social enterprises. Despite the potential benefits, numerous challenges can impact the effectiveness of public-private collaboration. Limited availability of funding, bureaucratic obstacles, and difficulties in aligning the goals of public and private entities are commonly cited issues. Moreover, evaluating the social impact and sustainability of collaborative projects remains a complex task (Cheng, 2016).

Delving into private-public partnerships supporting the development of the social economy in Latvia and Georgia reveals distinct contexts. In Georgia, social entrepreneurship is an emerging field, and collaboration between public bodies and social economy representatives is gaining momentum. However, the regulatory framework lacks specificity regarding social enterprises, posing challenges in obtaining funding and support. Partnerships between public bodies and social economy actors are crucial to developing a more conducive environment for social businesses to thrive and contribute to the SDGs. In contrast, Latvia presents a more evolved example of collaboration between public bodies and social economy representatives. The country's Social Entrepreneurship Law, active since April 1, 2018, signifies a step forward in creating a legal identity for social enterprises and aligning them with economic goals. The government provides various support measures, including tax benefits and grants, to bolster the social economy. Moreover, Latvian public institutions engage in dialogue with social entrepreneurs through platforms like the Social Entrepreneurship Association of Latvia, facilitating an exchange of ideas and best practices. Yet, challenges persist in terms of ensuring adequate support and visibility for social businesses, which stakeholders believe to be essential for sustainable development and the attainment of the SDGs.

Balancing support for the social economy while maintaining a fair and competitive economic landscape is essential (Ávila & Bono, 2020). Critics argue that specific incentives for the social economy may create unfair advantages, distort the wider economy, discourage innovation, and lead to dependency on government support (Abramson & Billings, 2019). The social economy has emerged as a vital conduit for socio-economic development and innovation in transitional economies. In exploring the development of the social economy in Latvia and Georgia, it is crucial to consider scholarly perspectives and documented experiences to understand the challenges and achievements within these contexts.

In Latvia, the social economy's evolution is marked by significant legislative milestones and burgeoning scholarly interest. Latvia has recognized social enterprises through specific legislation, addressing issues of legal structure and societal impact. Pre-2018, the landscape was dominated by non-profit approaches, but post-legislation changes permitted the establishment of profit-making social enterprises, defining the operational and financial framework within which social enterprises in Latvia function (Millere et al., 2023). Despite these advancements, scholars have identified various challenges including the inadequacy of experienced personnel, difficulty in fostering institutional partnerships, and intricate funding mechanisms. Improved business education, streamlined support, and an elevated public profile for social enterprises are needed (Millere et al., 2023).

The literature review emphasizes that social entrepreneurship in Latvia and Georgia is still in its early stages, with no established models or coherent strategies. However, organizations and initiatives in both countries have successfully implemented social entrepreneurship approaches with positive impacts on local communities (Gigauri et al., 2022). In Latvia, social entrepreneurship has facilitated the development of local communities that were previously at the subsistence level. Common challenges faced by social entrepreneurs in both Latvia and Georgia include the lack of a legal framework, complex business models, limited public awareness, difficulty in accessing funding and investment markets, and the need for more qualified employees and institutional cooperation (Millere et al., 2023). The literature also highlights the importance of legislation and formalization in the field of social entrepreneurship in both Latvia and Georgia. Additionally, the role of trust in social enterprises and the need to balance competencies and ethics are emphasized. In summary, the literature review suggests that social entrepreneurship has the potential to contribute to economic growth and positive social impact in both Latvia and Georgia, but further research is needed to fully understand the context and dynamics of social entrepreneurship in these countries.

Research Methodology

For the purpose of the research, a survey was created, while for pilot testing of the survey, 55 respondents answered questions. The authors' intention in this specific study is to test the questionnaire on its internal consistency using the Cronbach Alpha coefficient, as well as to provide data on descriptive statistics based on the results and test two hypotheses:

H1: There is a statistically significant difference between evaluations of social economy players as leading social and environmental innovations and collaborating, which is later adopted by mainstream economy within the respondents from Latvia and Georgia;

H2: There is a statistically significant difference between evaluations of the statement that social entrepreneurs can contribute to the green and digital transitions within the respondents from Latvia and Georgia.

For the testing of the hypothesis, the authors used Mann-Whitney non-parametric tests.

The body of the survey was constructed according to the WEF report "Unlocking the Social Economy" (Schwab Foundation, 2022) priorities and the developed questionnaire was distributed in Latvia and Georgia from February to March 2024. The respondents were social entrepreneurs from both countries. The questionnaire consists of two parts:

- Part A – respondent profile
- B part – questions related to social entrepreneurship

Table 1. represents the structure of the survey:

Table 1. Structure of the Survey (Source: Compiled by the authors)

Part	Question	Type of the question; responses
A	Respondent profile	Country, gender, education, age, relation to the social enterprise
B	Attitudes towards social entrepreneurship	10 statements. Evaluation scale: level of agreement (1 – absolutely disagree; 5 – absolutely agree)

For the B part of the questionnaire, the authors created labels, which are represented In Table 2. This part of the questionnaire was dedicated to the attitudes towards different aspects of social entrepreneurship. B part of the questionnaire included 10 statements, which were based on the Likert scale with evaluation from 1 to 5, where 1 was absolutely disagree and 5 – was absolutely agree. The statements of the B part of the questionnaire. The statements of the B part of the questionnaire with labels are presented in Table 2.

Table 2. B-part Statements with Labels (Source: Compiled by the authors)

Nr.	Statements	Labels
1.	The social economy must be recognized and supported by the regulatory framework.	Regulatory framework
2.	Governments should grow the social economy via public investment, favourable taxation; encouraging private investment in the sector.	Growth of social economy
3.	Social economy in secondary and higher education institutions increase its visibility	Education institutions
4.	The public sector should choose to buy goods and services from enterprises that deliver social and environmental value, or that are led by women, minority groups or those with disabilities.	Choice of public sector
5.	To increase the visibility of social entrepreneurship, governments are encouraged to systematically measure and report statistics on the social economy.	Statistics on the social economy

6.	Social economy players are known for leading social and environmental innovations and collaborating on solutions later adopted by the mainstream economy.	Social and environmental innovations
7.	Social entrepreneurs can bring contributions to the green and digital transitions.	Green and digital transitions
8.	Governments should improve accountability and use clear classification systems related to social entrepreneurship.	Classification systems
9.	Government should support innovation and inclusive business models.	Innovation and inclusive business models
10.	The social economy should contribute to the structural transformation of the existing economic model and its continuous challenges.	Structural transformation

The questionnaire was generated using Google Forms and distributed via emails to the owners of social enterprises/employees of social enterprises in Latvia and Georgia.

Results

During the pilot testing of the survey, in total, 55 respondents answered questions, 21 respondents from Latvia and 34 respondents from Georgia. Thirty-eight respondents were females, while 17 – males. Table 3 represents information about the respondents, such as data about their education, age, and relation to the social enterprise of respondents.

Table 3. Education, Age, Gender and Relation to Social Enterprise of Respondents (Source: Compiled by the authors)

Area	Specific answer	% from the total share
Education	Higher education	78%
	Secondary or professional education	4%
Age	18-24	4%
	25-44	53%
	45-64	35%
	65+	9%
Relation to social enterprise	Owner	53%
	Employee	33%
	Other	15%
Gender	Male	31%
	Female	69%

As is presented in Table 3, the largest share of the respondents has higher education – 78% of the total share, while secondary or professional education owners represent only 4% of the total share. The largest share of the respondents were 22-44 years old – 53%, followed by 44-64 years old respondents with 35% of the total share. Other age groups were represented by less than 10% of the total share. More than half (53% of the total share of the respondents) were the owners of social enterprises, while 33% were employees and 15% noted the answer to this question as "other". The largest % of the share were female respondents – 69%, while male respondents were 31% of the share.

To respond to the questions of the B part of the questionnaire, respondents were offered to use a five-point scale (1 – absolutely disagree; 5 – absolutely agree). Table 7 and Table 8 summarize the responses. The authors analysed only the answers "4" (agree) and "5" (absolutely agree) in order to rank the statements on the scales.

Table 4. Percentage of Respondents Who Selected "Agree" or "Absolutely Agree" to Evaluate the Statements of B Scale (Source: Compiled by the authors)

Labels	% of the respondents
Regulatory framework	91%
Growth of social economy	91%

Education institutions	80%
Choice of public sector	76%
Statistics on the social economy	78%
Social and environmental innovations	69%
Green and digital transitions	85%
Classification systems	89%
Innovation and inclusive business models	82%
Structural transformation	93%

Analysis of the answers of the respondents shows that all statements were rated with the two highest possible evaluations by at least 69% of the respondents. 93% of the respondents rated the statement "The social economy should contribute to the structural transformation of the existing economy" with two highest possible evaluations – "4" and "5". Two statements that were rated by the second largest group of respondents - "Regulatory framework" and "Growth of social economy" – 91% of the total share of the respondents evaluated their statements with "4" or "5". The statement that was rated by the two highest evaluations by the largest group of respondents is "Structural transformation", it was rated with "4" or "5" by 93% of respondents from the total share. Two statements that were rated by the second largest group of respondents - "The social economy must be recognized and supported by the regulatory framework" and "Governments should grow the social economy through public investment, favourable taxation, and encouraging private investment in the sector." – 91% of the total share of the respondents evaluated their statements with "4" or "5". Statements "Social economy in secondary and higher education institutions increase its visibility", "Social entrepreneurs can bring contributions to the green and digital transitions", "Governments should improve accountability and use clear classification systems related to social" and "Government should support innovation and inclusive business models" were evaluated by 80%, 85%, 89%, and 82% of the respondents, respectively. Statements "The public sector should choose to buy goods and services from enterprises that deliver social and environmental value, or that are led by women, minority groups or those with disabilities" and "To increase the visibility of social entrepreneurship, governments are encouraged to systematically measure and present statistics on the social economy" were rated by 76% and 78% of the respondents by "4" and "5". The statement, which was rated by the two highest evaluations by the smallest group of respondents was "Social economy players are known for leading social and environmental innovations and collaborating on solutions later adopted by the mainstream economy" – it was rated by 69% of the respondents.

For internal consistency of the Part B questionnaire was checked using calculations of Cronbach's alpha coefficient and is represented in Table 5.

Table 5. Internal Consistency of Measurement Scales of Part B of the Questionnaire (Source: Compiled by the authors)

Labels	**Scale if item deleted**
Regulatory framework	.922
Growth of social economy	.920
Education institutions	.916
Choice of public sector	.920
Statistics on the social economy	.919
Social and environmental innovations	.929
Green and digital transitions	.918
Classification systems	.916
Innovation and inclusive business models	.917
Structural transformation	.917

Results showed .927 Cronbach's Alpha coefficient, which shows excellent questionnaire consistency. The analysis of the measure "alpha if item deleted" pointed to adequate relevance of all statements.

Based on the analysis of the literature, respondent profile, and descriptive statistics, the authors of the research developed two main hypotheses, which were tested by the Mann-Whitney non-parametric test:

H1: There is a statistically significant difference between evaluations of social economy players as leading social and environmental innovations and collaborating, which is later adopted by mainstream economy within the respondents from Latvia and Georgia.

Respondents were asked to state their agreement or disagreement on the statement: "Social economy players are known for leading social and environmental innovations and collaborating on solutions later adopted by the mainstream economy" based on the Likert scale, where 1 state for totally disagree, while 5 states for fully agree. Mann -Whitney non-parametric test showed that there is no statistically significant difference between evaluations of the statement, Asymp.Sig. (2-tailed) was .870, (as the standard alpha level is 0.05). Based on the results of the Mann-Whitney non-parametric test hypothesis is rejected.

H2: There is a statistically significant difference between evaluations of the statement that social entrepreneurs can contribute to the green and digital transitions within the respondents from Latvia and Georgia.

Respondents were asked to state their agreement or disagreement on the statement: "Social entrepreneurs can bring contributions to the green and digital transitions" based on the Likert scale, where 1 state totally disagrees, while 5 states fully agree. Mann -Whitney non-parametric test showed that there is no statistically significant difference between evaluations of the statement, Asymp.Sig. (2-tailed) was .761, (as the standard alpha level is 0.05). Based on the results of the Mann-Whitney non-parametric test hypothesis is rejected.

Conclusions

Modern business plays a pivotal role in addressing social concerns, resonating with the UN's Sustainable Development Goals (SDGs). Social entrepreneurship emerges as a powerful force in the contemporary landscape, aiming to create positive impacts while ensuring business sustainability. In Latvia and Georgia, social enterprises have demonstrated resilience, particularly during crises like the COVID-19 pandemic, underlining their commitment to social needs. The choice of these countries for research is strategic, considering their transitional economies and unique socio-political dynamics. Latvia serves as a great progressive policy example of social economy nurture, while Georgia presents evolving dynamics influenced by historical contexts. Still, the literature review identifies persisting challenges, calling to the discussion. The research aimed to test hypotheses regarding perceptions and roles of social economy players in Latvia and Georgia. Several limitations should be acknowledged: firstly, the sample size may not fully represent the diverse landscape of social entrepreneurship in both countries. Additionally, the reliance on self-reported data and the use of a Likert scale for measurement may introduce response bias and limit the depth of analysis. The study's cross-sectional design restricts the assessment of long-term trends and causality. Findings indicate no significant difference in how players from both countries are perceived in leading social and environmental innovations or in their contributions to green and digital transitions. The survey results show high consensus among respondents on the importance of various actions to foster social economy. The research serves as a basis for a discussion of how the collaboration between public bodies and social entrepreneurs could serve as a crucial tool for advancing SDGs and building inclusive and resilient societies. The robustness of the survey, reflected in a high Cronbach's Alpha coefficient, underscores its reliability in assessing internal consistency. Overall, the study offers insights into the complexities and potentials of social entrepreneurship in transitional economies, laying the groundwork for future endeavours in this field.

Acknowledgement

The present paper was designed according to the EKA University of Applied Sciences Scientific Institution project No 16-20.2 "21st century skills" order.

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ECONOMICS AND CULTURE 21(1), 2024

DOI: 10.2478/jec-2024-0009

WHAT HR ISSUES AND CHALLENGES ARE ADDRESSED BY CONTEMPORARY HR PROFESSIONALS AND LIME MANAGERS? A SURVEY EVIDENCE FROM THE CZECH REPUBLIC

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Received 28 March 2024; accepted 20 May 2024

Abstract

Research purpose. Succeeding in a changing business world means being familiar with emerging business trends, including issues and challenges related to human resources (HR). The paper investigates HR issues and challenges addressed by HR professionals and line managers of businesses in the Czech Republic. The investigation aims to uncover which HR issues are faced most often and which HR challenges are expected in the coming years to identify existing and potential HR issues and challenges that businesses should deal with to meet their needs.

Design / Methodology / Approach. The investigation is founded on the reanalysis of data from the 2023 HR survey carried out by the Grafton Recruitment Czech Republic staffing agency at the end of 2022. The original data were provided by the co-author representing the staffing agency. The reanalysis was used to utilize the original data, to evaluate responses depending on the business type (manufacturing, non-manufacturing) and size (small, medium-sized, large), and to verify hypotheses concerning realized and planned changes in the number of employees. The original online survey addressed roughly a thousand clients of the staffing agency. The responses were obtained from 478 businesses across the Czech Republic that responded to thirty questions about their HR policies and plans. The reanalysis covers eight questions about their HR roles, issues, and challenges. The original data were not modified. To verify hypotheses, a non-parametric chi-square test of independence for a contingency table was used. To evaluate the degree of dependence between variables, a contingency coefficient was used.

Findings. The surveyed businesses most often face HR issues of employee resourcing. The HR challenges they expect in the coming years concern the development of the employer brand, the introduction of digital and AI technologies, or the introduction of innovative organizational arrangements to hire suitable employees or replace the missing employees. The findings revealed a dependence between realized and planned changes in the number of employees. The realized increase and decrease in the number of employees referred to the planned increase and decrease in the number of employees. The findings revealed no significant differences in responses depending on the type (manufacturing and non-manufacturing) and size (small, medium-sized, and large) of businesses.

Originality / Value / Practical implications. The findings bring original perspectives on existing and potential HR issues and challenges addressed by surveyed businesses in the Czech Republic. The findings contribute to the present theory and practice of employee resourcing by confirming the value of HR professionals and line managers in addressing staffing issues. The findings can be applied in the design of HR service delivery systems in different businesses by highlighting HR issues and challenges that businesses should focus on.

Keywords: human resource management, HR professionals, line managers, employee resourcing, Czech Republic.

JEL codes: M10, M14.

Introduction

Research concerning issues and challenges addressed by HR (human resources) professionals has been quite extensive worldwide in recent years. Researchers mainly focus on the roles of HR professionals, their cooperation with line managers, and their contribution to business success (Cayrat & Boxall, 2023). Current findings confirm that HR professionals enable businesses to succeed by helping them ensure quality employees to meet business needs (Morris, 2018). HR professionals organized in HR departments usually operate in medium and large businesses employing hundreds and thousands of employees (Nguyen et al., 2019). In such businesses, HR professionals are involved in such HR activities as planning, recruiting, hiring, onboarding, rewarding, training, and offboarding (Ferm et al., 2023). HR professionals ensure these HR activities mainly administratively and methodically while cooperating with line managers responsible for their day-to-day performance (Bainbridge, 2015).

The current human resource management concepts assign HR professionals the role of HR business partners, where HR professionals provide services to line managers who are responsible for the day-to-day management of employees (Nadiv et al., 2017). In other words, line managers have the main responsibility for implementing HR policies and practices delivered by HR professionals, including employee planning, organizing, staffing, leading, and controlling (Townsend & Hutchinson, 2017). Line managers supported by HR professionals are then accountable to higher-level managers for the productive use of the employees the business employs (Yang & Arthur, 2021). HR professionals also ensure the development of leadership skills of line managers (Maheshwari & Yadav, 2019). HR professionals contribute to more effective human resource management in the business by providing line managers with efficient solutions to everyday issues related to people and their performance (Trullen et al., 2016). To meet their role, HR professionals should have both HR and business know-how to be able to provide line managers with effective solutions for the productive use of employees (Lo et al., 2015). However, the evidence shows that the role of HR professionals in many businesses is more administrative than supportive (Wallo & Coetzer, 2023). Moreover, the partnership between HR professionals and line managers in managing employees can be negatively affected by various disagreements and conflicts arising from different views on the productive use of employees (Op de Beeck et al., 2016).

The greatest issue and challenge for HR professionals and line managers in many businesses around the world today is to staff the business with suitable employees to meet business needs (Tucker, 2022). There is an increasing shortage of quality people in the current labour markets, and therefore HR professionals and line managers must look for innovative ways to recruit suitable people or replace missing people (Verma et al., 2021). A big challenge of the near future is the introduction of innovative information technologies, mainly based on artificial intelligence (AI), which would enable to flexibly respond to shortages or surpluses of people (Malin et al., 2023). The main purpose of using information technology in human resource management is the analysis of the workforce and the prediction of the future development of labour supply and demand (Kryscynski et al., 2017). HR professionals and line managers must effectively predict how many and what kind of people they will need and from what sources they will recruit the people needed (Zoller, 2018). For this purpose, they need efficient tools for analysing big data regarding the situation and development in the labour markets (Zhou et al., 2023).

Current findings on the roles of HR professionals and their contribution to line managers demonstrate that the roles of HR professionals are about enabling line managers to succeed through quality employees whose know-how represents a competitive advantage (Ulrich, 2020). The issues and challenges that HR professionals and line managers will face in the coming years will be mostly associated with the attraction and retention of quality people meeting the business needs concerning the advancement of innovative digital technologies (see e.g., Corrocher et al., 2024; Luo & Yang, 2023; Roos et al., 2024, Wang et al., 2023; etc.). These HR issues and challenges are particularly topical in the Czech Republic, where low unemployment persists and where employers experience a serious shortage of quality people across industries (Mala & Cabla, 2022). Within the businesses operating in the Czech Republic, the shortage of quality people is increasingly addressed by labour migration or process automation (Posta, 2023), which brings new HR issues and challenges for HR professionals and line managers.

Following the mentioned findings on the partnership between HR professionals and line managers in staffing the business with suitable employees (see e.g. Al-Harazneh & Sila, 2021; Hewett et al., 2024, Trullen et al., 2016; Vuorenmaa et al., 2023; Wach et al., 2021; etc.), this paper investigates HR issues and challenges addressed by contemporary HR professionals and line managers of surveyed businesses in the Czech Republic. The investigation aims to respond to two research questions:

RQ1: Which HR issues do HR professionals and line managers of surveyed businesses face most often?

RQ2: Which HR challenges do HR professionals and line managers of surveyed businesses expect in the coming years?

The investigated HR issues represent problems that HR professionals and line managers routinely deal with, such as hiring suitable employees. HR challenges represent matters related to emerging changes in the business environment and which require great effort to be managed successfully, such as the HR digital transformation. The responses to research questions should result in an overview of existing and potential HR issues and challenges that businesses should deal with to meet their business needs.

The investigation is founded on the idea of reanalysing data from the 2023 HR survey carried out by the Grafton Recruitment Czech Republic staffing agency at the end of 2022. The original data were provided by the co-author representing Grafton Recruitment Czech Republic staffing agency in the position of Project Manager HR services. The reanalysis of the data taken was found to be more beneficial than the performance of a new survey, mainly due to the number of responses available. The reanalysis also enabled fully utilizing the potential of the original data, including statistical analysis. The original data were not modified. The original survey included responses from 478 businesses in the Czech Republic. The respondents originally responded to thirty multiple-choice questions incorporated in an online questionnaire and investigated the HR policies and plans of surveyed businesses. The reanalysis targets responses to eight questions concerning HR roles, issues, and challenges. The reanalysis also covers the verification of hypotheses concerning realized and planned changes in the number of employees and HR professionals in surveyed businesses:

H1: There is a dependence between realized changes in the number of employees and HR professionals in surveyed businesses.

H2: There is a dependence between realized and planned changes in the number of employees in surveyed businesses.

The findings contribute to the present theory and practice of employee resourcing by analysing various HR issues and challenges in businesses of different types (manufacturing, and non-manufacturing) and sizes (small, medium-sized, and large). The findings revealed that HR professionals and line managers of surveyed businesses most often face HR issues of staffing the business with suitable employees. The HR challenges they expect in the coming years concern innovative organizational arrangements and digital technologies to hire suitable employees or replace the missing employees.

Literature Review

The literature review provides recent findings of selected research studies on the roles, issues, and challenges of HR professionals and line managers in managing human resources across the world and in the Czech Republic. Applicable research studies published in the Web of Science and Scopus databases in the last ten years were selected.

From the world perspective, the contribution of HR professionals to business success was analysed, for example, by Jørgensen and Becker (2015) who investigated how HR services delivered by HR professionals contribute to business performance in three financial investment businesses in Denmark. They revealed that HR services concerning professional and organizational commitment had the greatest impact on business performance. The delivery of quality HR services meeting business needs depends on the quality skills of HR professionals, which was confirmed by Kryscynski et al. (2017). They surveyed the association between analytical skills and job performance of HR professionals using a sample of 1,117 HR professionals from 449 organizations across the United States. They revealed

a positive association between analytical skills and the job performance of HR professionals. They confirmed that HR professionals need efficient analytical and other problem-solving skills to be effective business partners. The specific roles of HR professionals in businesses were examined by Ferm et al. (2023) who interviewed 34 HR professionals from large private and public organizations in Sweden. The most common roles of interviewed HR professionals were related to the support of activities of line managers, the promotion of interests of employees, and the enhancement of organizational performance. The partnership between HR professionals and line managers who applied HR practices was examined by Wach et al. (2021) who used a sample of 102 businesses in Germany. They concluded that the application of HR practices is most effective and efficient when there is consensus between HR professionals and line managers who introduce HR strategies and policies.

The relationship between HR practices and job performance was examined, for example, by Khoreva and Wechtler (2018) who analysed the effect of HR practices on job performance using a sample of 300 employees and 34 managers working in a professional service business in Finland. They revealed that the effect of HR practices on job performance was mediated by employee well-being associated with the perceived ability and motivation to participate. The suggestion for HR professionals and line managers has been to provide employees with meaningful and autonomous job opportunities to be motivated by the job itself and fully use their potential. Similarly, Zirar et al. (2021) analysed the introduction of lean HR practices to enhance business performance by interviewing 27 HR professionals from five service businesses in England. They revealed that the lean HR practices introduced to enhance business performance were related to hiring, training, leading, and rewarding people. These are the HR practices that allow the business to recruit and retain quality people. First, suitable people must be hired for suitable jobs in the business. Second, people need to be trained systematically to learn the skills needed to perform well in their jobs. Third, people need to be led effectively to achieve desired business objectives. Finally, people need to be rewarded fairly for achieving performance. All of these issues should be the focus of HR professionals and line managers in any business. Trivedi and Srivastava (2023) examined HR practices introduced to enhance knowledge sharing by surveying 387 employees from the top twenty IT and consulting businesses in India. They confirmed that HR professionals can positively affect knowledge sharing across the business by introducing HR practices oriented toward developing a communicative and cooperative environment. Such an environment is founded on natural teamwork supported by effective training and rewarding practices that enhance employee engagement and performance.

The effective application of HR practices to efficiently improve job performance depends on the abilities of HR professionals and line managers, which was confirmed by Cuellar-Molina et al. (2019). They examined the effect of emotional intelligence on the decision-making of HR professionals and line managers in small- and medium-sized businesses using a sample of 157 HR professionals and line managers who made HR-related decisions in their small- and medium-sized businesses in Gran Canaria. They confirmed that the ability to manage one's own emotions as well as the emotions of other people associated with emotional intelligence has a significant effect on the decision-making of HR professionals and line managers in surveyed small- and medium-sized businesses. These findings demonstrate that HR professionals and line managers involved in HR issues and decisions need to develop their soft skills related to communication, collaboration, and coordination. A sign of HR professionalism is also adherence to an ethical approach to people, which was confirmed by Simoes et al. (2019). They analysed the ethical practices of HR professionals by surveying 134 HR professionals from various businesses in Portugal. They revealed that most of the surveyed HR professionals tend to avoid unethical practices, mainly those concerning discriminatory behaviour. These tendencies were more evident in businesses advocating socially responsible behaviour.

Within the ongoing technological advancement, the future of HR belongs to digital technologies and their application seems to be a big challenge for HR professionals and line managers. It was confirmed by Isari et al. (2019) who investigated the perceptions and expectations of HR professionals regarding the HR digital transformation. They surveyed 53 HR professionals from a branch of one international consulting business in Italy. They confirmed that the HR digital transformation is a challenging issue for most HR professionals and they suggested that the change of the digital mindset of HR professionals requires to development of fundamental digital skills as digital technologies are going to play an

increasingly important role in HR. Talukdar and Ganguly (2022) investigated the positive and negative effects of the introduction of innovative information technologies in HR surveying representatives of 276 industrial businesses in India. They concluded that the introduction of innovative information technologies in surveyed industrial businesses increased the efficiency of HR services delivered to line managers. On the other hand, the frequent use of innovative information technologies in meeting common HR issues harmed the quality of communication and cooperation, where most issues were addressed online without direct interaction. These findings demonstrate that the purpose of introducing innovative information technologies in HR must be to support the communication and cooperation of people across the business. Mantzaris and Myloni (2023) explored perceptions of HR professionals concerning the introduction of innovative HR technologies to deal efficiently with upcoming HR challenges by surveying 251 HR professionals from eleven countries. They concluded that most of the surveyed HR professionals believed in the introduction of innovative HR technologies to deal with upcoming HR challenges. However, the technologies cannot meet all the human-related issues.

From the perspective of the Czech Republic, specific research studies on the roles, issues, and challenges of HR professionals and line managers are relatively rare. Most research studies deal with specific HR practices. For example, Fajcikova et al. (2018) analysed talent management practices in businesses operating in the Czech Republic using three samples of businesses surveyed in 2014/2015 (389), 2015/2016 (402), and 2016/2017 (207). They revealed that talent management practices in surveyed businesses were related to employee recruitment and selection, training and development, and evaluation and compensation. These talent management practices were mostly applied in medium-sized and large businesses with an HR department. Horvathova et al. (2020) examined differences in HR practices between non-family and family businesses surveying a sample of 572 non-family (288) and family (284) businesses operating in the Czech Republic. They revealed no significant differences in HR practices between non-family and family businesses. However, the non-family businesses showed a more strategic approach to HR practices than family businesses. Mikova et al. (2021) investigated the effectiveness of on-the-job training practices delivered by HR professionals using a sample of 611 employees from the millennial generation working in businesses operating in the Czech Republic. They revealed that businesses still mostly use traditional on-the-job training practices that are not very attractive to employees who had perceived them as ineffective. They confirmed the necessity to deliver HR practices effectively for both employees and employers. Vrabcova and Urbancova (2021) surveyed the use of HR information systems in 70 agricultural businesses in the Czech Republic to evaluate the effect of HR information systems on the effectiveness of HR processes. They confirmed that most of the surveyed agricultural businesses use HR information systems to support administrative rather than innovative HR processes related to the development of human resources. However, agricultural businesses demonstrated a solid IT infrastructure for the future HR digital transformation.

The provided findings of selected research studies on the roles, issues, and challenges of HR professionals and line managers in managing human resources demonstrate that HR professionals and line managers across the world and in the Czech Republic mostly deal with HR issues and challenges related to employee resourcing to staff the business with suitable employees meeting the business needs. Following these findings, this paper deals with the HR issues and challenges addressed by contemporary HR professionals and line managers of surveyed businesses in the Czech Republic.

Research Methodology

The investigation of HR issues and challenges addressed by contemporary HR professionals and line managers of surveyed businesses in the Czech Republic results from the research cooperation between co-authors representing various universities in the Czech Republic and Grafton Recruitment Czech Republic staffing agency. The investigation itself is founded on the idea of reanalysing data from the 2023 HR survey carried out by the Grafton Recruitment Czech Republic staffing agency at the end of 2022. The original data were provided by the co-author representing Grafton Recruitment Czech Republic staffing agency in the position of Project Manager HR services. The reanalysis of the data taken was found to be more beneficial than the performance of a new survey, mainly due to the number of responses available. The reanalysis also enabled fully utilizing the potential of the original data, including statistical analysis.

The original survey used an online questionnaire addressing business clients of the staffing agency. The core database used contained roughly a thousand contacts. The responses were obtained from 478 businesses and their HR professionals and line managers in the Czech Republic. The respondents originally responded to thirty multiple-choice questions with single and multiple options investigating HR policies and plans of surveyed businesses. This paper reanalyses responses to eight questions concerning HR roles, issues, and challenges. The original data were not modified. The survey questions reanalysed are characterized in Table 1.

Table 1. The Reanalysed Survey Questions (Source: Author processing based on Grafton Recruitment Czech Republic 2023 HR survey, May 2024)

Questions	Single-answer options
1. How did the number of HR professionals in your business change in 2022?	– Increased – Decreased – Unchanged
2. How did you deal with the increase in HR issues during 2022?	– Automation of some HR processes – Outsourcing of some HR processes – Overtime of existing HR professionals – Temporary part-time contracts with needed HR professionals – Involvement of employees of other departments – We did not need to deal with it – Other actions
3. How do you perceive the HR challenges you expect in 2023 compared to 2022?	– Harder – Easier – Comparable
4. Which HR challenges do you expect in 2023?	– HR data analysis – Improvement of HR processes – Employer brand development – Introduction of online HR tools – Introduction of AI and automation in HR – Nothing important – Other challenges
5. How did the number of employees in your business change in 2022?	– Increased – Decreased – Unchanged
6. Do you plan to change the number of employees in 2023?	– Yes, increase – Yes, decrease – No
7. Do you hire foreign employees?	– Yes, through our recruitment – Yes, through staffing agencies – No
8. Do you plan to hire employees from third countries (outside the EU) in 2023?	– Yes, more – Yes, alike – Yes, less – No

Table 2 provides characteristics of surveyed businesses by type (manufacturing and non-manufacturing businesses) and size (small, medium-sized, and large businesses). Regarding the type, there were more manufacturing than non-manufacturing businesses. The Czech Republic is a more industrialized economy than most EU countries, where most people are employed in services. In the Czech Republic, the industry sector represents less than forty per cent of the economy, while the service sector represents about sixty per cent of the economy (Holy, 2020). Within the industry sector, manufacturing businesses account for almost a quarter of gross value added (GVA) and employ more than thirty per cent of all employees in the business sector. The most important are automotive businesses (Novotny, 2022). By the end of 2023, there were over three hundred thousand registered manufacturing economic entities in the Czech Republic (Czech Statistical Office, 2024). The main issues of manufacturing businesses in the Czech Republic are the low added value of production and a lack of qualified labour (Zabojnikova, 2020). The potential solution to these issues is the advancement of process automation or labour

migration (Posta, 2023). Regarding the size, there were the most medium-sized businesses (101-500 employees) followed by large businesses (501 or more employees) and small businesses (100 or less employees). Among medium-sized and large businesses, manufacturing businesses predominated, while among small businesses, non-manufacturing businesses predominated. In the Czech Republic, small and medium-sized businesses represent more than ninety per cent of all businesses and employ almost sixty per cent of all employees in the business sector (Ministry of Industry and Trade of the Czech Republic, 2021). By the end of 2023, there were almost two hundred and eighty thousand registered economic entities in the Czech Republic having from one to two hundred and forty-nine employees belonging to the category of small and medium-sized businesses (Czech Statistical Office, 2024). The sample of surveyed businesses is not representative. However, the structure of the sample in terms of the type and size of the surveyed businesses is close to the real state within the economy of the Czech Republic, where manufacturing medium-sized and large businesses play an important role.

Table 2. The Characteristics of Surveyed Businesses (Source: Author processing based on Grafton Recruitment Czech Republic 2023 HR survey, May 2024)

Categories	**Surveyed businesses**	**N = 478**
Type	Manufacturing	61%
	Non-manufacturing	39%
Size	Small	27%
	Medium-sized	44%
	Large	29%

Responses were reanalysed using Microsoft Excel. The reanalysis involved the evaluation of relative frequencies of responses depending on the type and size of surveyed businesses. The verification of defined hypotheses concerning realized and planned changes in the number of employees and HR professionals in surveyed businesses was performed using a non-parametric chi-square test of independence for a contingency table (χ^2) suitable for nominal variables with a non-normal distribution. The test was performed according to Formula 1 with a significance level of 0.05. The realized changes in the number of employees and HR professionals in surveyed businesses were rated on a scale of "increased", "decreased", and "unchanged". The planned changes in the number of employees in surveyed businesses were rated on a scale of "yes, increase", "yes, decrease", and "no".

$$\chi^2 = \sum_{i=1}^{k} \frac{(O_i - E_i)^2}{E_i} \quad (1)$$

Where:
χ^2 is the computed value of the chi-square statistic;
O_i is the observed frequency determined for each of the cells of the contingency table;
E_i is the expected frequency computed for each of the cells of the contingency table.

To evaluate the degree of dependence between realized and planned changes in the number of employees and HR professionals in surveyed businesses, a contingency coefficient (C) computed according to Formula 2 was used. The computation of the contingency coefficient proceeds from the computed value of the chi-square statistic (χ^2). The contingency coefficient itself varies from 0 to 1. The higher the contingency coefficient, the higher the degree of dependence.

$$C = \sqrt{\frac{\chi^2}{n + \chi^2}} \quad (2)$$

Where:

C is the computed value of the contingency coefficient;
χ^2 is the computed value of the chi-square statistic;
n is the total frequency in the contingency table.

Results

The HR issues addressed by HR professionals and line managers of surveyed businesses in the Czech Republic were investigated to reveal which HR issues HR professionals and line managers face most often (RQ1) at present and are expected to encounter in the coming years (RQ2).

Question (1) investigated how the number of HR professionals in surveyed businesses changed in 2022. In 71% of businesses, the number of HR professionals remained unchanged, in 20% of businesses it increased, and in 9% of businesses it decreased. Regarding the type, the most common changes were in manufacturing businesses, where the number of HR professionals both increased and decreased. Regarding the size, the most common changes were in large businesses, where the number of HR professionals both increased and decreased (Table 3).

Table 3. Change in the Number of HR Professionals in Surveyed Businesses in 2022 (Source: Author processing based on Grafton Recruitment Czech Republic 2023 HR survey, May 2024)

1. How did the number of HR professionals in your business change in 2022 (N = 478)?			
Businesses	**Increased (20%)**	**Decreased (9%)**	**Unchanged (71%)**
Manufacturing	21%	11%	68%
Non-manufacturing	19%	5%	76%
Small	15%	2%	83%
Medium-sized	19%	8%	73%
Large	26%	16%	58%

Question (2) investigated how HR professionals and line managers in surveyed businesses dealt with the increase in HR issues during 2022. In 47% of businesses, they did not need to deal with any increase in HR issues. In other businesses, they used overtime of existing HR professionals (32%), automation of some HR processes (8%), involvement of employees of other departments (5%), outsourcing of some HR processes (4%), and temporary part-time contracts with needed HR professionals (4%). Regarding the type, in both manufacturing and non-manufacturing businesses, overtime of existing HR professionals and automation of some HR processes were used more often. Regarding the size, in small, medium-sized, large businesses, overtime of existing HR professionals was used most often (Table 4).

Table 4. Addressing the Increase in HR Issues in 2022 (Source: Author processing based on Grafton Recruitment Czech Republic 2023 HR survey, May 2024)

2. How did you deal with the increase in HR issues during 2022 (N = 478)?							
Businesses	**A (8%)**	**B (4%)**	**C (32%)**	**D (5%)**	**E (4%)**	**F (47%)**	**G (0%)**
Manufacturing	8%	3%	38%	5%	4%	42%	0%
Non-manufacturing	7%	5%	24%	4%	3%	56%	0%
Small	4%	5%	25%	5%	2%	59%	0%
Medium-sized	9%	3%	34%	6%	4%	43%	0%
Large	8%	4%	36%	2%	5%	45%	0%
A. Automation of some HR processes B. Outsourcing of some HR processes		C. Overtime of existing HR professionals D. Involvement of employees of other departments			A. Temporary part-time contracts with needed HR professionals B. We did not need to deal with it C. Other actions		

Question (3) investigated how HR challenges in 2023 compared to 2022 were perceived in surveyed businesses. In 52% of businesses, the HR challenges were perceived as comparable, in 46% of businesses as harder, and only in 2% of businesses as easier. Regarding the type, in manufacturing businesses, the HR challenges were perceived as harder than in non-manufacturing businesses. Regarding the size, in medium-sized businesses, the HR challenges were perceived as harder than in small businesses and large businesses (Table 5).

Table 5. The perception of HR challenges expected in 2023 compared to 2022 (Source: author processing based on Grafton Recruitment Czech Republic 2023 HR survey, May 2024)

3. How do you perceive the HR challenges you expect in 2023 compared to 2022? (N = 478)?			
Businesses	**Harder (46%)**	**Easier (2%)**	**Comparable (52%)**
Manufacturing	47%	1%	52%
Non-manufacturing	44%	2%	54%
Small	42%	3%	55%
Medium-sized	49%	1%	50%
Large	45%	1%	55%

Question (4) investigated which HR challenges HR professionals and line managers in surveyed businesses expected in 2023. In 37% of businesses, they expected nothing important. In other businesses, they expected employer brand development (21%), introduction of online HR tools (17%), introduction of AI and automation in HR (13%), HR data analysis (8%), and improvement of HR processes (4%). Regarding the type, in manufacturing businesses, employer brand development and introduction of online HR tools were expected more often while in non-manufacturing businesses, brand development, introduction of online HR tools, and introduction of AI and automation in HR were expected more often. Regarding the size, in small, medium-sized, and large businesses, employer brand development and introduction of online HR tools were expected most often (Table 6).

Table 6. HR Challenges Expected in 2023 (Source: Author processing based on Grafton Recruitment Czech Republic 2023 HR survey, May 2024)

4. Which HR challenges do you expect in 2023 (N = 478)?							
Businesses	**A (8%)**	**B (4%)**	**C (21%)**	**D (17%)**	**E (13%)**	**F (37%)**	**G (0%)**
Manufacturing	8%	5%	23%	19%	11%	33%	0%
Non-manufacturing	7%	3%	19%	14%	14%	43%	0%
Small	5%	6%	21%	16%	9%	44%	0%
Medium-sized	9%	4%	23%	15%	14%	34%	0%
Large	7%	2%	20%	21%	15%	35%	0%
A. HR data analysis B. Improvement of HR processes	C. Employer brand development D. Introduction of online HR tools			E. Introduction of AI and automation in HR F. Nothing important G. Other challenges			

Question (5) investigated how the number of employees in surveyed businesses changed in 2022. In 38% of businesses, the number of employees remained unchanged, in 43% of businesses it increased, and in 19% of businesses it decreased. Regarding the type, the number of employees increased in both manufacturing and non-manufacturing businesses, although it was more common in non-manufacturing businesses. Regarding the size, the number of employees increased in small, medium-sized, and large businesses, although it was the most common in small businesses (Table 7).

Table 7. Change in the Number of Employees in Surveyed Business in 2022 (Source: Author processing based on Grafton Recruitment Czech Republic 2023 HR survey, May 2024)

5. How did the number of employees in your business change in 2022 (N = 478)?			
Businesses	**Increased (43%)**	**Decreased (19%)**	**Unchanged (38%)**
Manufacturing	40%	24%	36%
Non-manufacturing	47%	13%	40%
Small	46%	9%	45%
Medium-sized	43%	22%	35%
Large	39%	26%	35%

Withing question (5), hypothesis H1 was verified that there is a dependence between realized changes in the number of employees and HR professionals in surveyed businesses (see Table 8). To perform the chi-square test of independence for a contingency table (χ^2), The null hypothesis was defined that there is no dependence between realized changes in the number of employees and HR professionals in surveyed businesses ($H_0$1). Then a chi-square statistic (χ^2) was computed and a critical chi-square value for the significance level of 0.05 ($\chi^2_{0,05}$) was determined. Since the chi-square statistic (χ^2) was higher than the critical chi-square value ($\chi^2_{0,05}$), the null hypothesis was rejected in favour of the alternative hypothesis (H_A1). The dependence between realized changes in the number of employees and HR professionals in surveyed businesses was proved. The value of the contingency coefficient (C) indicated a moderate dependence between realized changes in the number of employees and HR professionals in surveyed businesses.

Table 8. Dependence between Realized Changes in Number of Employees and HR Professionals in Surveyed Businesses (Source: Author processing based on Grafton Recruitment Czech Republic 2023 HR survey, May 2024)

H_A1. There is a dependence between realized changes in the number of employees and HR professionals in surveyed businesses				
	The number of HR professionals in surveyed businesses in 2022			
The number of employees in surveyed business in 2022	Increased	Decreased	Unchanged	∑
Increased	59	9	137	**205**
Decreased	12	17	64	**93**
Unchanged	25	15	140	**180**
∑	**96**	**41**	**341**	**478**
Chi square statistic $\chi^2 = 29.669$				
Critical chi-square value $\chi^2_{0,05}(4) = 9.488$				
H_0 was not rejected. There is a dependence between realized changes in the number of employees and HR professionals in surveyed businesses. Contingency coefficient C = 0.242. The value of C indicated a moderate dependence between realized changes in the number of employees and HR professionals in surveyed businesses.				

Question (6) investigated whether HR professionals and line managers in surveyed businesses planned to change the number of employees in 2023. In 46% of businesses, they planned no changes in the number of employees in 2023. In other businesses, they planned to increase (39%) or decrease (15%) the number of employees in 2023. Regarding the type, they more often planned to increase the number of employees in 2023 in both manufacturing and non-manufacturing businesses, although it was more common in non-manufacturing businesses. Similarly, regarding the size, they more often planned to increase the number of employees in 2023 in small, medium-sized, and large businesses, although it was more common in small businesses (Table 9).

Table 9. Plan to Change the Number of Employees in 2023 (Source: Author processing based on Grafton Recruitment Czech Republic 2023 HR survey, May 2024)

6. Do you plan to change the number of employees in 2023 (N = 478)?			
Businesses	**Yes, increased (39%)**	**Yes, decreased (15%)**	**No (46%)**
Manufacturing	37%	18%	45%
Non-manufacturing	42%	10%	48%
Small	46%	10%	44%
Medium-sized	37%	15%	48%
Large	36%	18%	45%

Withing question (6), hypothesis H2 was verified that there is a dependence between realized and planned changes in the number of employees in surveyed businesses (see Table 10). To perform the chi-square test of independence for a contingency table (χ^2), The null hypothesis was defined that there is no dependence between realized and planned changes in the number of employees in surveyed businesses ($H_0$2). Then a chi-square statistic (χ^2) was computed and a critical chi-square value for the significance level of 0.05 ($\chi^2_{0,05}$) was determined. Since the chi-square statistic (χ^2) was higher than the critical chi-square value ($\chi^2_{0,05}$), the null hypothesis was rejected in favour of the alternative hypothesis (H_A2). The dependence between realized and planned changes in the number of employees in surveyed businesses was proved. The value of the contingency coefficient (C) indicated a medium dependence between realized and planned changes in the number of employees in surveyed businesses.

Table 10. Dependence between Realized and Planned Changes in the Number of Employees in Surveyed Businesses (Source: Author processing based on Grafton Recruitment Czech Republic 2023 HR survey, May 2024)

H_A2. There is a dependence between realized and planned changes in the number of employees in surveyed businesses				
	The number of employees in surveyed businesses in 2023			
The number of employees in surveyed business in 2022	Increase planned	Decrease planned	No changes planned	∑
Increased	139	14	52	**205**
Decreased	16	35	42	**93**
Unchanged	32	21	127	**180**
∑	**187**	**70**	**221**	**478**
Chi square statistic $\chi^2 = 161.059$				
Critical chi-square value $\chi^2_{0,05}(4) = 9.488$				
H_0 was not rejected. There is a dependence between realized changes in the number of employees and HR professionals in surveyed businesses. Contingency coefficient C = 0.502. The value of C indicated a medium dependence between realized and planned changes in the number of employees in surveyed businesses.				

Question (7) investigated whether HR professionals and line managers in surveyed businesses hire foreign employees. In 31% of businesses, they hire no foreign employees. In other businesses, they hire foreign employees through their recruitment (45%) or staffing agencies (24%). Regarding the type, in manufacturing businesses, foreign employees are hired through their recruitment or staffing agencies while in non-manufacturing businesses, foreign employees are hired mostly through their recruitment. Regarding the size, foreign employees are more often hired in medium-sized and large businesses than small businesses, whereas in medium-sized businesses, they more often use their recruitment than staffing agencies while in large businesses, they more often use staffing agencies than their recruitment (Table 11).

Table 11. Hiring of Foreign Employees (Source: Author processing based on Grafton Recruitment Czech Republic 2023 HR survey, May 2024)

7. Do you hire foreign employees (N = 478)?			
Businesses	**Yes, through our recruitment (45%)**	**Yes, through staffing agencies (24%)**	**No (31%)**
Manufacturing	39%	35%	27%
Non-manufacturing	54%	8%	38%
Small	45%	10%	45%
Medium-sized	51%	24%	25%
Large	36%	38%	26%

Question (8) investigated whether HR professionals and line managers in surveyed businesses planned to hire employees from third countries (outside the EU) in 2023. In 56% of businesses, they did not plan to recruit employees from third countries in 2023. In other businesses, they planned to hire the same number (32%), fewer (7%), or more (5%) employees from third countries in 2023. Regarding the type, in manufacturing businesses, the hire of employees from third countries in 2023 was planned more often than in non-manufacturing businesses. Regarding the size, in medium-sized and large businesses, the hire of employees from third countries in 2023 was planned more often than in small businesses (Table 12).

Table 12. Plan to Recruit Employees from Third Countries (outside the EU) in 2023 (Source: Author processing based on Grafton Recruitment Czech Republic 2023 HR survey, May 2024)

8. Do you plan to hire employees from third countries (outside the EU) in 2023 (N = 478)?				
Businesses	**Yes, more (5%)**	**Yes, alike (32%)**	**Yes, less (7%)**	**No (56%)**
Manufacturing	5%	38%	9%	48%
Non-manufacturing	5%	22%	5%	68%
Small	2%	16%	5%	77%
Medium-sized	7%	35%	7%	51%
Large	5%	42%	11%	42%

The investigation of HR issues and challenges addressed by contemporary HR professionals and line managers of surveyed businesses in the Czech Republic revealed the following results:

- The number of employees, including the number of HR professionals, in surveyed businesses remained mostly unchanged or increased in 2022. The dependence between realized changes in the number of employees and HR professionals was proved.
- In most of the surveyed businesses, they planned no changes in the number of employees in 2023. The dependence between realized and planned changes in the number of employees in surveyed businesses was proved.
- HR professionals and line managers in surveyed businesses mostly did not need to deal with any increase in HR issues during 2022. If so, they used overtime of existing HR professionals, automation of some HR processes, involvement of employees of other departments, outsourcing of some HR processes, and temporary part-time contracts with needed HR professionals.
- In most of the surveyed businesses, the HR challenges in 2023 compared to 2022 were perceived as comparable. The HR challenges faced in 2023 included employer brand development, introduction of online HR tools, introduction of AI and automation in HR, HR data analysis, and improvement of HR processes.
- In most of the surveyed businesses, HR professionals and line managers hire foreign employees through their recruitment or staffing agencies. At the same time, they planned to hire no employees from third countries (outside the EU) in 2023.
- The results revealed no significant differences in responses depending on the type (manufacturing and non-manufacturing businesses) and size (small, medium-sized, and large businesses) of surveyed businesses.

Discussion

The investigation of HR issues and challenges addressed by contemporary HR professionals and line managers of surveyed businesses in the Czech Republic revealed that the HR issues faced by HR professionals and line managers most often (RQ1) are related to staffing the business with suitable employees in terms of numbers (quantity) and kinds (quality). Staffing is the most important HR issue that affects the quality of human resources of the business (Prochazka et al., 2023). The quality of human resources affects the productivity of the business as a whole (Gallego & Gutierrez Ramírez, 2023). Therefore, it is important to hire people who meet the business needs (Padilla-Vega et al., 2020). To successfully meet this objective, staffing needs to be carried out following the effective arrangement of other HR issues, such as the HR data analysis (Ekka & Singh, 2022), the employer brand development (Bharadwaj, 2023), and the introduction of online HR tools (Al-Harazneh & Sila, 2021). All these were revealed as other issues that HR professionals and line managers face very often.

Hypothesis H1 that there is a dependence between realized changes in the number of employees and HR professionals in surveyed businesses was confirmed. Within 43% of businesses where the number of employees increased in 2022, there were 29% of businesses where the number of HR professionals increased as well in 2022. In the rest of the businesses, the number of HR professionals remained unchanged (67%) or decreased (4%). On the other hand, within 19% of businesses where the number of employees decreased in 2022, there were 18% of businesses where the number of HR professionals decreased as well in 2022. In the rest of the businesses, the number of HR professionals remained unchanged (69%) or increased (13%). These findings indicate that the increase and decrease in the number of employees also refers to the increase and decrease in the number of HR professionals in businesses. HR professionals contribute by ensuring suitable human resources for the business (Amarakoon et al., 2019). However, their contribution to business success must be reflected in the business performance (Syrigou & Williams, 2023). If business performance decreases, the number of HR professionals can also decrease, as well as the number of other employees (Pandey, 2018).

Similarly, hypothesis H2 that there is a dependence between realized and planned changes in the number of employees in surveyed businesses was confirmed. Within 43% of businesses where the number of employees increased in 2022, there were 68% of businesses where the increase of employees was planned in 2023. In the rest of the businesses, no changes in the number of employees were planned (25%) or the decrease of employees was planned (7%). On the other hand, within 19% of businesses where the number of employees decreased in 2022, there were 38% of businesses where the decrease of employees was planned in 2023. In the rest of the businesses, no changes in the number of employees were planned (45%) or the increase of employees was planned (17%). These findings indicate that the realized increase and decrease in the number of employees refers to the planned increase and decrease in the number of employees in businesses (Kremer, 2023). The tendency to increase or decrease the number of employees depends primarily on the demand for goods and services. Growth in this demand means growth in demand for employees to ensure production and distribution, and vice versa (Sayekti et al., 2020). Businesses must learn to respond flexibly to fluctuations in the demand for goods and services by adjusting the demand for employees (Colombo & Marcato, 2023). In practice, this means learning how to flexibly deal with a shortage or surplus of employees. In present days, characterised by a prevailing shortage of qualified people in the labour markets (Morosan & Bowen, 2022), it is necessary to look for solutions other than employee recruitment, such as innovative organizational arrangements (Ho, 2016) or innovative technologies (Ratnam & Devi, 2024) to replace the missing workforce.

The HR challenges HR professionals and line managers of surveyed businesses expect in the coming years (RQ2) include the improvement of HR processes or the introduction of AI and automation in HR. These HR challenges correspond to the big HR issue of staffing the business with suitable employees or finding effective ways of replacing the missing employees (Kwok, 2022). As was mentioned above, the future of HR belongs to innovative organizational arrangements and digital technologies that will enable businesses to achieve high performance (Isari et al., 2019). This will be the greatest challenge for HR professionals and line managers to discover and apply such ways concerning business needs (Mantzaris & Myloni, 2023).

The comparison of the obtained findings with the findings of other research studies on the roles, issues, and challenges of HR professionals and line managers in managing human resources shows that the contribution of HR professionals and line managers to business success consists in staffing the business with suitable employees (Horvathova et al., 2020), which is the most important HR issue of any business (Fajcikova et al., 2018). Only suitable employees meeting the business needs can achieve the required job performance (Khoreva & Wechtler, 2018) and thus the expected business performance (Zirar et al., 2021). Meeting this HR issue successfully, requires both the effective partnership between HR professionals and line managers (Wach et al., 2021)) as well as the efficient application of professional and personal skills related to human resource management (Simoes et al., 2019). The main HR issue of manufacturing and non-manufacturing businesses in the Czech Republic is a lack of qualified labour (Zabojnikova, 2020), which can be met by the advancement of process automation or labour migration (Posta, 2023).

In the context of the obtained findings and the findings of other research studies, the existing and potential HR issues, and challenges that businesses should deal with to meet the business needs consist of staffing the business with suitable employees or finding ways of replacing the missing employees, which may include:

- The development of the employer brand to market job opportunities and employer reputation and attract the attention of potential employees in the domestic and foreign labour markets.
- The introduction of digital and AI technologies to improve and automate HR processes from recruitment and selection through training and development to evaluation and compensation.
- The introduction of innovative organizational arrangements to provide employees with more autonomy and flexibility and improve their engagement and productivity.

Conclusions

The HR issues and challenges addressed by HR professionals and line managers of surveyed businesses in the Czech Republic were investigated to reveal which HR issues HR professionals and line managers face most often and which HR challenges they expect in the coming years.

The HR challenges that HR professionals and line managers in surveyed businesses expect most often include employer brand development, introduction of online HR tools, introduction of AI and automation in HR, HR data analysis, or improvement of HR processes. All these HR challenges are associated with the HR issue of staffing the business with suitable employees representing the most important HR issue of any business. The results revealed a dependence between realized and planned changes in the number of employees in surveyed businesses, including the number of HR professionals. This indicates that the realized and planned increase and decrease in the number of employees refers to the increase and decrease in the demand for goods and services of the business. The results revealed no significant differences in responses depending on the type (manufacturing and non-manufacturing businesses) and size (small, medium-sized, and large businesses) of surveyed businesses. To maintain high business performance, HR professionals and line managers need to concentrate on staffing the business with suitable employees or finding ways of replacing the missing employees, which may include the development of the employer brand, the introduction of digital and AI technologies, or the introduction of innovative organizational arrangements.

The findings and conclusions are limited by the small scope of the survey in terms of the territory of the Czech Republic and the sample of businesses included. However, the findings and conclusions contribute to the present theory and practice of human resource management by confirming the value of HR professionals and line managers in dealing with employee resourcing and meeting business needs. Originality can be seen in revealing different perspectives on existing and potential HR issues and challenges addressed by HR professionals and line managers in businesses of different types (manufacturing and non-manufacturing) and sizes (small, medium-sized, and large), although only within the Czech Republic. The findings and conclusions can be applied in the design of services delivered by HR professionals and line managers in different businesses. Further research following

the findings and conclusions could be oriented on arrangements and technologies helping businesses to recruit suitable employees or replace missing employees.

Acknowledgements

The authors are thankful to Grafton Recruitment Czech Republic for providing 2023 HR survey data and the Internal Grant Agency of Ambis University for financial support to create this article.

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ECONOMICS AND CULTURE 21(1), 2024

DOI: 10.2478/jec-2024-0010

UPDATING THE INFORMATIONAL AND CONTROL PRACTICES IN THE SUSTAINABILITY AGENDA

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Received 27 March 2024; accepted 21 May 2024

Abstract

Research purpose. The sustainability concept embraces a wide scope of linked practices: green thinking, sustainability informational and management assurance, ESG reporting and scoring, responsible and impact investment, stability measurements, and others. Significantly expanding beneficiary's and stakeholders' circle needs information to build and implement a policy providing ESG values creation and meeting their requirements in relevant sustainable agenda. This is why it is important to create a transparent information landscape and to shape new highlights in management and decision-making. The article is aimed at exploring specific ways to transform information and management practices, primarily accounting, ESG-reporting, analysis, and assurance to create a transparent information environment for sustainability.

Design / Methodology / Approach. The study is designed as a qualitative analysis of existing information and related practices to identify gaps in the information needed by stakeholders for decision-making with that practically generated in the current environmental momentum. It involves summarising, categorizing, and interpreting open access sources data, such as unidirectional studies, non-financial reporting and ESG-rankings databases, program documents, frameworks and standards for sustainability and "responsible" reporting, professional audit analytics, and others. Logical and comparative analysis was used for data processing. The study's theoretical framework is based on accounting theories, particularly the Interpretative paradigm.

Findings. The possibilities were assessed following proposed approaches to upgrade the up-to-date system of informational-verifying appraisal practices by the requirements of a proper ESG environment. A holistic system layout was suggested, including information and control practices employed to provide sustainability. The main part of the recommendations refers to accounting and reporting for sustainability. New accounting ESG objects to display in this system were identified. It developed an integrated balance model of total capitals and their sources engaged and ESG -value-creating, taking for the basis traditional balance theory. Given the diversity of corporate non-financial reporting, classification characteristics for ESG reporting were suggested, and two key models of ESG reporting were defined. Recommendations were made in the field of design and methodology for information support of sustainability.

Originality / Value / Practical implications. The article is the author's vision of the problems and ways of advancing traditional information practices in the context of global sustainability management requests. Recommendations for the holistic system of sustainability governance, informational support creation, transformation of accounting, ESG-reporting, other linked practices, streamlining, and methodological development of information activities that can be used in the practical field and employed in programmatic, advisory, and regulatory documents that structure the information field of socio-economic life.

Keywords: information, accounting, reporting, sustainability, ESG, practices, models.

JEL codes: O10, M40, M48, C81, O44.

Introduction

Transparency and the capacity of the information environment are important criteria for sustainable development. Global sustainable development and ESG governance have greatly expanded the circle of stakeholders involved in the last decades. Among them are businesses and public sector institutions, market actors, investors and lenders, government and regulative structures, international bodies, society in general, and every individual. All of them need the information to build and implement a policy providing ESG values creation and meeting their needs of the sustainable agenda. This affects a full range of information and linked control, compliance, finance, and management practices including

accounting for sustainability, corporate reporting, ESG-scoring and analysis, audit, and "green" data quality assurance.

Some markers can stress the popularity of sustainability information and control practices providing green transition, impacts regulation, responsible investments, and socially liable governance. Bloomberg estimates that "ESG assets may hit $53 trillion by 2025, a third of global assets under management" (Bloomberg, 2023). In the largest international database of social responsibility reports as of November 2023, submitted 200,298 reports from 27,896 organizations (2023) (Corporate Register, 2023). The Ernst & Young survey of large-company executives found that "more than 78 % believe companies should invest in ESG issues, even if it reduces profits in the short term, and 99 % of investors surveyed utilize companies' ESG disclosures as a part of their investment decision-making" (Ernst & Young, 2022). According to a study by the Governance & Accountability Institute, "96% of S&P 500 Companies and 81% of Russell 1000 Companies Published ESG Reports" (Governance & Accountability Institute, 2022). An analytical review by the International Federation of Accountants (IFAC, 2023) found that ESG disclosures appear in the reporting of "95% of the 1,350 companies studied in various countries and 64% of companies now obtain assurance/verification over some of the information they provided in 2021 (increasing from 91% and 51%, respectively, in 2019)". According to KPMG, 45% of large companies' executives admit that ESG programs increase the financial performance of businesses, 69% recognize a significant demand for "responsible" reporting, 72% predict increased attention and control to indicators of non-financial reports (KPMG, 2021). The Corporate Sustainability Reporting Directive, adopted by the European Parliament, makes it mandatory to apply ESRS by most of the EU companies (Official Journal of the EU, 2023).

Given the importance and high demand for ESG information, it has become crucial to appraise its quality, consistency, and transparency for decision-making and to improve the efficiency of practices ensuring such information.

Several issues can be highlighted in the field of sustainability governance information support. Firstly, there is a high diversity of information produced and low convergence of ESG assessments from different providers and sources. According to the summary report of Targeted consultation on the functioning of the ESG rating market in the EU and the consideration of ESG factors in credit ratings (2022), 83 % of respondents noted the lack of transparency on the methodologies used, 91 % emphasized significant biases in the methodology used by providers, 80 % consider that the market tends to potential conflicts of interests and 81 % find the level of correlation of ESG ratings inadequate.

Secondly, there is no holistic approach to the full cycle of information practices. They embrace different stages, methodologies of collecting and proceeding, producers, and outcome design. ESG reporting is the product of accounting and measurements out of the accounting field in matters of environmental, social, and corporate impacts, it employs a wide range of sources and follows frameworks and standards presented in an extensive variety. ESG rating is based on different sources of information, including public disclosures, media, third-party databases, government, NGOs, company data, and questionnaires. There are hundreds of ratings applied in the exploration of sustainable investment and corporate governance, evaluation of risks, and opportunities for different branches and business models. These ratings are provided by such giants of ESG analytics as MSCI (Morgan Stanley Capital International), Dow Jones Sustainability Indices, Bloomberg, ISS (International Shareholders Services), and many others published in platforms (such as Barra, RiskMetrics, FactSet, POINT, StyleResearch, Aladdin, ARISTA), and highly used by institutional investors, assets managers, companies and other stakeholders for decision-making. The main focus of the information traditionally provided has been placed on two key groups of stakeholders – investors and company managers.

This leads to one significant issue. The application of ESG information mostly supposes the financial logic of decisions aimed at such traditional targets as investment payback, profitability, value creation, and risk' minimizing for equally investors and managers. Thus, even though sustainability is a priority, ESG information ensures more than responsible practice, but reputational benefits and attractiveness for the capital providers. Still, when we want to succeed in non-financial goals, we must employ financial incentives to make this system work. One can note good examples of this – Emission Trading System

for Carbon Markets, which defines carbon as a new class of assets and uses pure financial logic to reach ecological net zero objectives.

Being in the scope of research attention for decades the issues of information and control support sustainability governance have not been examined enough from a comprehensive angle. The spreadiest research pillars in the area considered are issues of corporate sustainability reporting evolution (Chopra, 2024; Fleaca et al., 2023; Miln & Gray, 2013), accounting for sustainability development (Bebbington & Larrinaga, 2014; Bebbington et al., 2017; Chetanraj & Kumar 2023; Chopra, 2024; Hopwood et al., 2010; Unerman & Chapman, 2014), sustainability performance, ESG-indicators and rating enforcement to manage policies, support responsible and impact investment, provide "green" capital allocation and evaluate sustainable development contribution of companies and countries (Fleaca et al., 2023; Halper et al., 2022; In et al., 2019; Luque-Vílchez et al., 2023, Sandberg et al., 2022). In this paper, we will focus mostly on the first two areas.

Even not-in-depth academic literature review shows the shortage of comprehensive exploration covering the entire cycle of external and internal information collection, processing, and control to make existing info-sourcing practices non-fragmentary and collinear. Research on most common information practices is mostly intra-disciplinary or covers the "bundles" of evidently linked academic disciplines. The trends of excessive theorizing in the area under consideration look alarming as well.

We define the research problem in two main planes – is the existing system of ESG information holistic, transparent, and efficient enough to provide the proper level of sustainability governance, what are the major elements of this system, and how could their design and methodology be transformed to give relevant support for the responsible decision-making to contribute not only financial but multidimensional progress and human well-being. This allows us to define study results as a comprehension of a holistic view of the practices providing proper quality ESG information cycle, and improvement of this system's main elements (primarily accounting and reporting) methodology to consider momentum cutting-edge stakeholders' information requirements.

The article is aimed at providing a complex outlook on the information and control practices in the sustainability agenda and exploring specific ways to transform them, foremost accounting, and ESG reporting, to create a transparent and active information environment for sustainability. This paper continues previous studies, where the author has already examined problems of development accounting and reporting methodology regarding sustainability in ongoing medium turbulence (e.g., Odintsova, 2023, 2024).

Literature Review

Criteria of corporate sustainability performance "refers to a company's ability to operate in a manner that upholds ecological integrity, social well-being, and sound governance principles, while simultaneously generating value for its shareholders" (Ahmad et al., 2023; De Souza Barbosa et al., 2023; Luque-Vílchez et al., 2023). "The assessment of corporate sustainability performance requires the evaluation of both qualitative and quantitative indicators, examining various dimensions such as environmental stewardship, social responsibility, and corporate governance" (Sandberg et al., 2022).

"The capacity of society to comprehend knowledge pertaining to sustainable development determines its ability to respond to current challenges and opportunities" (Fleaca et al., 2023; Chan et al., 2020). Recent bibliometric studies analyse the newest trends around sustainability information overall and in some specific subject areas. Pasko et al. (2021) reasoned that "sustainability matters (e.g., sustainability reporting, corporate social responsibility, and sustainable development disclosure) seem to become the major research directions soon". The authors emphasized the fast expansion of the corporate sustainability data market, linking the rise in demand with the growth of investment products that "specifically aim to meet certain sustainability standards, the changing nature of business risks and investor awareness of the financial ramifications of those risks due to environmental issues, as well as rapidly evolving consumer preferences, market practices, and public awareness all contribute to this rise in demand" (Fleaca et al., 2023).

Maas et al. (2016) highlight four main related practices to bring ESG values in corporate operations which should have linked each other and included in an integrated system of organizational sustainability governance - assessment, accounting & control, reporting, and management. For Fleaca et al. (2023) there are two levels of sustainability monitoring and reporting – the level of countries and the level of companies. Countries' level is mostly represented by indexes developed by the UN Sustainable Development Solutions Network to measure countries' ability to achieve Sustainable Development Goals and monitor progress. The level of corporate sustainability performance information is introduced by the current reporting standards and frameworks.

Sustainability reporting mixes financial and non-financial information to show a company's economic, environmental, and social impacts (Jovanovic & Jovanovic, 2022), so companies provide data that is more timely, relevant, credible, and comparable and that demonstrates improved ESG performance. With this information, "financial analysts and investors can redirect and accelerate capital flows towards corporate investments that help tackle important problems related to climate crises and the reaching of sustainable development" (Arvidsson & Dumay, 2022). "Sustainability reporting frameworks provide a method of categorizing and regulating the semantics of non-financial information. The process of organization incorporates consensus-based typologies, definitions of concepts, controlled vocabularies, and methods of measurement. Frameworks are intended to advance precision, validity, consistency, and inter-operability" (Esty & Cort, 2020).

The multiplicity of sustainability reporting frameworks and metrics can be interpreted both as an obstacle and an opportunity (Esty & Cort, 2020). There are currently more than 600 different systems for regulating non-financial information, e.g. ESG standards and frameworks, data providers, and ratings reporting. On the one hand, the abundance of reporting regulatory systems in place creates a patchwork effect, heterogeneity, and questionable quality of the information provided, complicating the choice of the standard and reports provision. This drives complexity of the corporate reporting and adds costs for business since giving rise to companies' structural subdivisions designed to manage sustainability and control ESG indicators (Halper et al., 2022). At the same time, some studies emphasize as an advantage of reporting diversity that ESG-ratings based on reporting various frameworks improve the quality of analytics. "Many ESG-ratings providers tout the range of underlying information sources as a strength of their rating systems. For example, the rating provider CSRHub notes that it integrates information from 900 different sources in its ESG rating, including ESG analysts, government data, crowd-sourced information, and non-governmental organizations" (CSRHub, 2024).

Analysis of major sustainable reporting frameworks highlighted that "a broad range of frameworks comprise different typologies and categorizations of aspects of sustainability. A review of the major frameworks available to investors reveals that there is much collaboration among them, and very little duplication or contradiction. With a few exceptions, they can be used in tandem. They all rely upon the Triple Bottom Line as a foundational conceptual framework for incorporating non-financial measures of performance into the evaluation of corporate activity" (Esty & Cort, 2020). The authors (Esty & Cort, 2020) included in the list of frameworks Standards of Global Reporting Initiative, the Integrated Reporting framework of IIRC, Sustainability Accounting Standards Board (SASB) Standards, Impact Reporting Frameworks for Small and Medium Enterprises (including Impact Reporting and Investment Standards (IRIS), the B Impact Assessment, and the Future-Fit Assessment), Climate Change-Related Frameworks (including Climate Disclosure Standards Board (CDSB), the Carbon Disclosure Protocol (CDP), and recommendations of the Task Force on Climate-related Financial Disclosures (TCFD)) and Sustainable Development Goals (SDGs). Fleaca et al. (2023) in their research divided approaches for sustainability monitoring & reporting on International Standards of voluntary reporting (e.g. GRI, SASB, ISO26000, SA8000, AA1000), International Initiative for Sustainability Reporting (IFRS Sustainability Disclosure Standards developed by ISSB), European Initiative for Sustainability Reporting (ESRS – European Sustainability Reporting Standards developed by European Financial Reporting Advisory Group) and International Instruments (UN Compact Principles, UN Responsible Investment Principles, OECD Guidelines for Multinational Enterprises and OECD Due Diligence Guideline For Responsible Business conduct).

Since this study dated 2020, there have been some changes in standards and bodies, setting them. Following the results of the International Climate Change Conference the International Sustainability

Reporting Standards Board (ISSB) was created in 2021 as an international initiative to develop a global framework of standards for sustainable development disclosure. The International Integrated Reporting Committee (IIRC) and the Sustainability Accounting Standards Board (SASB) became parts of the Value Reporting Foundation (VRF), merged with the Climate Disclosure Standards Board (CDSB) and the International Sustainability Reporting Standards Board (ISSB) in 2022. Since IFRS Foundation's ISSB to work, it has released 2 standards, the IFRS S1 and S2 - general sustainability-related and climate-related disclosures which are to be integrated into the company's annual reports. So far under the umbrella of this organization there are three kinds of sustainability reporting standards – IFRS sustainability, SASB, and Integrated Reporting standards.

Fleaca et al. (2023) in their research divided approaches for sustainability monitoring & reporting on International Standards of voluntary reporting (e.g. GRI, SASB, ISO26000, SA8000, AA1000), International Initiative for Sustainability Reporting (IFRS Sustainability Disclosure Standards developed by ISSB), European Initiative for Sustainability Reporting (ESRS – European Sustainability Reporting Standards elaborated by European Financial Reporting Advisory Group) and International Instruments (UN Compact Principles, UN Responsible Investment Principles, OECD Guidelines for Multinational Enterprises and OECD Due Diligence Guideline For Responsible Business conduct).

The issues of accounting for sustainability started to go on the fore in the 80s and passed several stages of numerous academic discussions. They embrace various strands of its theoretical framing, methodology, principles, scientific interlinking, intra-disciplinary partitions. Considering components of accounting practice arose, accounting research tends to justify new practices by theories accepted in the professional domain, and articulates new types and concepts of accounting, uniting them with related ESG-governance activities. "There is a long-standing tradition of academic research examining a range of policies, processes and practices related to sustainability accounting and accountability" (Bebbington & Larrinaga, 2014; Buhr, 2007; Gray, 2010; Gray et al., 2010; Thomson, 2014; Unerman & Chapman, 2014) argue that "if accounting practices are to develop in a manner that can positively contribute towards sustainable development, there is a need for researchers to draw more broadly from the latest understandings provided by sustainability science" (Unerman & Chapman, 2014).

Academic writings in accounting for sustainable development are commonly based on the Interpretative research approach. In the theoretical background one can note the employment of stakeholder theory, legitimacy theory (Bebbington & Larrinaga, 2014); organizational change theoretical framing (Bouten & Hoozee, 2013; Contrafatto & Burns, 2013; Moore, 2013), control theory (Arjalies & Mundy, 2013; Rodrigue et al., 2013). Studies encompass "a multi-disciplinary problem-focused rather than a siloed-disciplinary approach to research" (Unerman & Chapman, 2014) to build new insight into long-term company efficiency and comply with cutting-edge sustainability sciences (ecosystem services, environmental disclosure, and corporate social responsibility). Accounting embraces sustainability accounting, social and environmental management accounting, social accountability, human rights, biodiversity, and corporate social performance (Guenther et al., 2016). According to the bibliometric analysis of Chetanraj and Kumar (2023) commonly mentioned are these accounting types: social and environmental accounting, environmental management accounting, economically focused accounting, environmental performance, carbon accounting, green accounting, integrated accounting, impact accounting, and others. Popular schools are social and environmental accounting (Gray & Laughlin, 2012; Chopra, 2023) and environmental management accounting (Dasanayaka et al., 2021; Schaltegger et al. 2013).

"Economically focused accounting is a highly complex field comprising both management and financial accounting. It can be characterized as communicating and helping to manage direct economic interactions and impacts between an organization and the world external to the organization. It draws a boundary around the organization and records, analyses and/or reports on economically material interactions and impacts that have an effect within or across this boundary" (Hopwood et al., 2010; Unerman & Chapman, 2014). Accounting for sustainable development necessitates to incorporate not just direct short-term economic interactions and impacts but also "to incorporate the direct interactions and impacts between the organization, the society in which it operates and the natural environment". (Bebbington et al., 2001).

Impact accounting can be well-represented by the ideas of the Impact-Weighted Accounts Initiative at Harvard Business School and similar developments. The foundations of the Impact Accounting System methodology were developed in 2023 in partnership between the International Foundation for Valuing Impacts and the Value Balancing Alliance. The impact accounting methodology was developed to complement financial reporting with decision-useful information related to sustainability topics, to harmonize two existing methodologies from the perspective of both investors and entity managers. This methodology uses a cross-disciplinary complex approach based on financial accounting, impact management, and sustainability-related disclosures to measure impacts, and value changes in human well-being with a combination of qualitative, quantitative, and monetary approaches aimed to inform corporate managers' decisions or to provide a comprehensive view of the positive and negative impacts generated by an entity to inform investment decisions based on risk, return, and impact (IVFI, 2024). This document was preceded by the series of Harvard Business School developments designed in the frame of the Impact-Weighted Accounts project, each of which deserves special attention. These include A Framework for Product Impact-Weighted Accounts (Serafeim & Trinh, 2020), Accounting for Employment Impact at Scale (Fadhel et al., 2021), Accounting for Organizational Employment Impact (Freiberg et al., 2021), A Conceptualization of Sub-Living Wages: Liabilities, Leverage, and Risk (Keller et al., 2022) and others. For every case it was suggested original methodology; for example, product impact was evaluated in several dimensions including product reach (quantity and duration), customer usage (affordability, quality, and ability to choose), affecting environment (pollutants and efficiency), and the end of product's life (recyclability). Each evaluation dimension featured the kinds of data required, sources of this information, and proper method to make this information commensurable and estimate impact.

A similar comprehensive approach is an Impact-Weighted Accounts Framework of the Impact Economy Foundation, developed in 2022 with two accompanying documents (Impact Economy Foundation, 2022). This framework includes methodology detailing and explaining such basic topics of impact accounting as identification, measurement, providing comparability, aggregation, and presentation in statements of Impact -Weighted Accounts. An important feature of this document is that it is largely linked with the concept of Integrated Reporting, embracing value creation for society and stakeholders through the entity's impacts on the different kinds of capital involved (the same idea proposed in the six-capital classification of Value Reporting Foundation): "financial, manufactured, intellectual, human, social and natural capital" (IFRS Foundation, 2021). A highly interesting concept of impact statements: Integrated Profit and Loss Statement and Integrated Balance Sheet and three derived statements: the Stakeholder Value Creation Statement (ability to create value for society and stakeholders), the Sustainability Statement for External Costs (act sustainably by operating within planetary and social boundaries) and the Sustainability Statement for SDG Contribution (contribute the sustainable development according to SDGs) (Impact Economy Foundation, 2022). The mix of economic and societal impact measurement issues and the design of proper methodology are discussed in studies by Peng and Yang (2014), Rawhouser et al. (2019) and Salazar et al. (2012).

Research Methodology

Given high-level academic concerns, diversity of studies and matters argued in the scope of sustainability, the study was designed as an analysis of existing information, control, and other related practices to identify gaps in the information needed by stakeholders for decision-making that practically generated in the current environmental momentum. It involves exploration, summarizing, interpreting open access sources data, such as unidirectional studies, non-financial reporting and ESG-ranking databases, program documents, frameworks and standards for sustainability reporting, professional audit analytics, and others. Much of the paper was initiated into an academic writing overview, there were 60 sources examined, including 52 scientific studies in unidirectional and linked topics.

This research is grounded on general philosophical approaches (system method and dialectics, synthesis, analysis, induction, and deduction). It was decided a qualitative approach in this research is the most suitable because it makes it possible to analyse the evolution of accounting and corporate reporting for sustainability over time; to assess the potential of existing information practices to provide the information needed; and to suggest upgrade of accounting and bound activities' constructions in ESG

landscape. Since research has been descriptive to gather an in-depth understanding of sustainability information systems it applied mostly theoretical methods e.g., qualitative analysis, analogy, comparing, evaluation of cause-and-effect relationships, inference, and interpretation. There were methods of classification to build an ESG frameworks classification system, summarizing and modelling to define the two key ESG reporting models. Logical and comparative analysis was used for data processing. Legal methods (formal-logic analysis) are used as the basis for conclusions drawn.

The study's theoretical framework was mostly based on relevant social science theories, particularly the Interpretative paradigm. When assessing the possible impact of the new agenda on the methodology of accounting, the balance sheet theories were used in conjunction with such key accounting methods as accounts, and reporting.

Results

Sustainability management is a proactive process that is employed by various actors at different levels for both financial and non-financial decision-making and significantly changes the stakeholders' priorities and behaviour logic. For now, the effectiveness criteria for any economic activity are much broader than just financial efficiency associated with investment decisions. Company competitive stability, dominance, and credibility are determined by their impacts on the capital aggregated, influence along the entire value chain, activity-linked risks, and long-term consequences. The implementation of such an approach requires a transparent and conveniently organized information environment that ensures a consistent integral chain of information flows for immediate and further use.

Sustainability management-engaged information and control practices analysis defines the concept of the sustainability information support system including several sequential and parallel information practices. These practices provide not only ESG-data collection, proceeding, presentation, verification, and interpretation, but also communication with the stakeholders, focusing on the areas of executive attention and providing a pro-active sustainability governance model. Since information support of sustainability governance is introduced by a set of practices carried out by different actors with distinct objectives, methodologies, and "input-output" designs, it leads to a high level of diversity, discrepancy, and insufficient quality of information produced.

The quality of the information support system can be assessed as lacking due to the absence of a holistic system, practices apartness, a variety of frameworks, "game rules" and regulators, a shortage of methodology unity and continuity, and scatter of metrics and criteria for evaluation ESG goals.

Being complex, the system of sustainability information and control maintenance should be built as a whole chain of consistent and mutually ensuring targeted processes. By incorporating the decision-making process in this system, it can be considered as a cycle with feedback for new ESG information needed at the next decision-making stage in the sustainability governance contour.

Hence, a holistic systemic approach should be realized to streamline the full cycle of information production and control practices by engaging regulatory methods, infrastructural changes, and a cross-disciplinary approach. We believe several key practices should be included in this system – accounting, ecological, social, and impact measurements, ESG reporting, verification of reported data (ESG assurance), ESG rating, analysis, and decision support.

Figure 1 presents our insight into basic information and control practices employed to provide Sustainability.

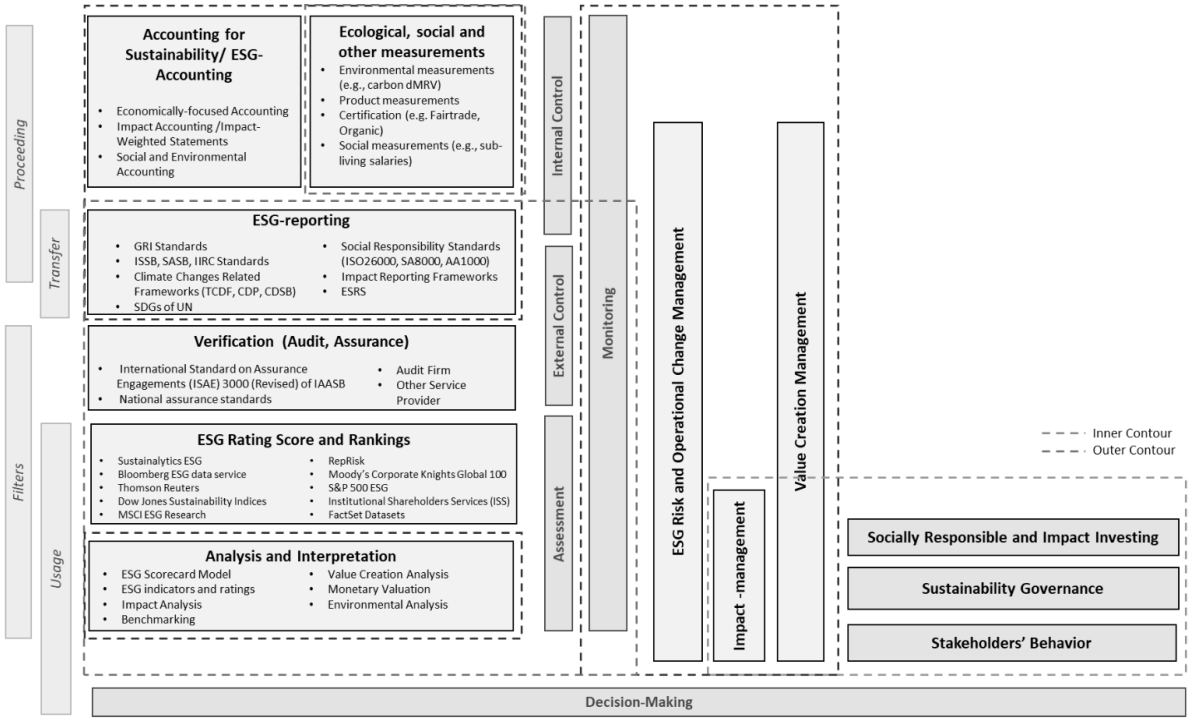

Fig. 1. Information and Control Practices in Sustainability Governance (Source: Developed by author)

Accounting for sustainability and organizational non-financial ESG reporting are two major elements of information providing inherent to the system being considered.

Accounting, treated in a broad sense, largely according to the Interpretive paradigm allows us to construct socio-economic reality, and not just reflect it. Sustainability accounting is a rapidly developing dynamical informational area that has an interdisciplinary and multi-paradigm nature, associated with bound practices, such as internal control, management analytics, and prediction, social and ecological measurements, human behaviour governance, etc. It could be differently intradisciplinary structured or focused to supply information for the reporting and analytical systems and embrace impact- accounting, environmental, social accounting, material flow-cost accounting, life cycle or value chain costing, ESG-management accounting, economically focused accounting, and other existing or emerging types. ESG accounting expands its methodology through cutting-edge sustainability sciences knowledge engagement, starting to operate with a big scope of non-financial information obtained from a wide range of sources. The key features and components of accounting in the sustainability agenda are drawn in Figure 2.

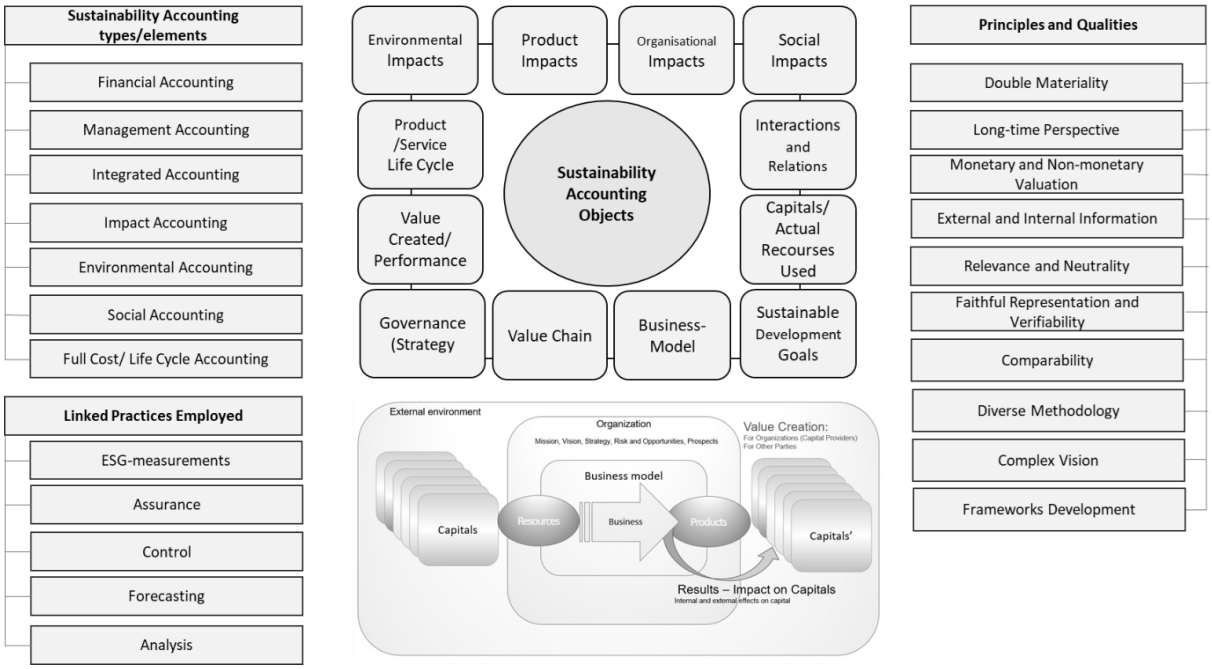

Fig. 2. The Main Fitting Components of Accounting for Sustainability (Source: Developed by author)

Through sustainability semantics, new accounting objects have emerged, like all the capital employed, impacts and interactions, their consequences in a long-term perspective, full value chain and product's life cycle, business model, governance matters (strategy, interaction with stakeholders, management team ethics and integrity, management approaches). Content of even regular accounting objects such as assets, capital, liabilities, and performance are expanded. So, we can define an asset as a resource existing as a means or opportunity to accomplish something, and its value is not always monetary, there are other types of utility (environmental, humanitarian, etc.). The rights of ownership are replaced by the rights of access/use/receipt of some benefit embodied in it (in the form of obligations or voluntary encumbrances). The evolution of the concept of assets passed several stages, from balanced and controlled resources to available and used resources (Fig. 3).

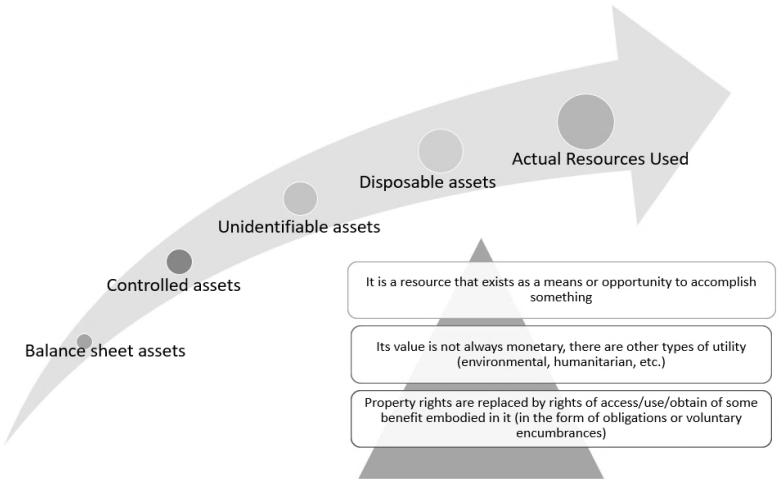

Fig. 3. Evolution of the "Asset" Concept for Sustainability Accounting (Source: Developed by author)

The results of value creation, distributed over time and embodied in various types of organization's capital, are provided by aggregate sources related both to its financial relations and non-financial obligations to society due to the humanitarian values, and ethical norms. For example, the balance sheet model may look like presented in Figure 4.

Resources Derived from Capital to Be Used in Value Creation	Obligations to the owners/holders of these capitals
Financial Capital (Monetary and Non-Monetary) Assets	Legal obligations to suppliers of financial capital (owners, creditors)
Manufacturing Capital (Producing Assets)	
Intellectual Capital (Knowledge and Intelligence Assets)	Legal obligations to society, its individual groups, institutions, and subjects
Human Capital (Human Resources - Skills, Experience, Qualifications, Interaction, Development)	
Social Capital (Social and Reputational Assets)	Obligations to suppliers of any type of capital, assumed voluntarily (encumbrances or humanitarian burden)
Natural Capital (Environmental and Nature Resources Employed)	
Δ Capitals	Impact on capitals / Δ Obligations

Fig. 4. Recommended Balance Sheet Model for Sustainability Accounting (Source: Developed by author)

The main issue for ESG reporting remains the high diversity of existing frameworks and standard systems complicating reporting design and further data application. To bring a variety of sustainability reporting systems in order we suggest using features for classification presented in Figure 5.

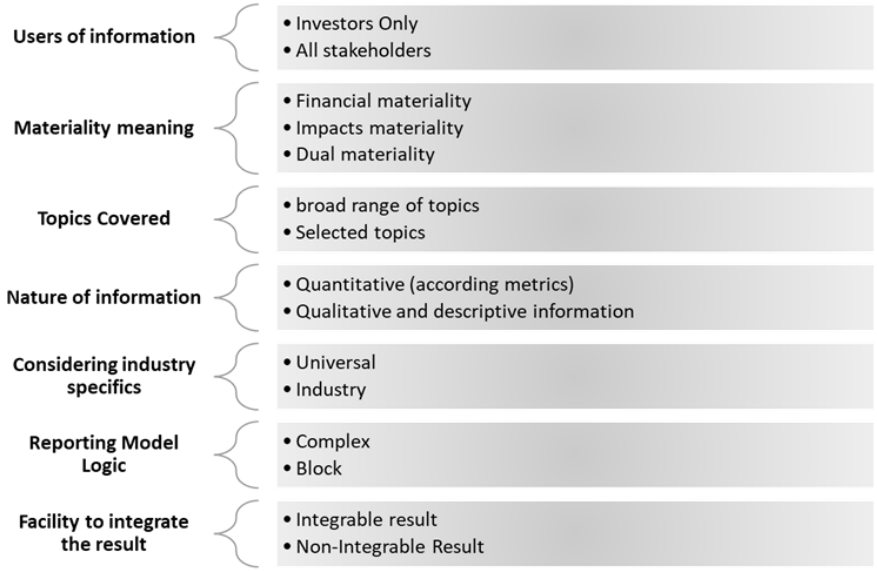

Fig. 5. Characteristics of ESG Reporting Systems Classification (Source: Developed by author)

Thus, the key distinctive features permit the divide ESG-reporting multitude for basic models - the "Bottom Lines" model including the set of ESG indicators (for example GRI Reporting), and the Model of capital impact and value creation (e.g., Integrated Reporting).

The reporting model can be described as a method of creating a system that discloses financial and non-financial indicators, with explanations, that help users evaluate a company's sustainability contribution and its impact on all the types of capital involved in the overall value-creation process.

To provide extensiveness, reliability, and effectiveness of ESG information for users the cycle of practices should include such important practices as stability and impact measurements, data filters – audit and assurance, and analysis concentrated in rating and decision-making support. Almost all the operations noted are focused on external information provision. When talking about internal use information within the organization, then the cycle of generation, processing, control of this information changes to a certain extent and includes accounting, with parallel monitoring and control of ESG

information to carry out proactive management, internal and external reporting involving actions to avoid risks, manage value creation factors, and maximize the positive impact on the total capital.

To provide efficiency of this system it should be built with incorporation following primary principles and information requirements:

- double materiality to provide both financial and non-financial decisions for all stakeholders,
- consistency and mutual interconnection of practices included,
- transparency, neutrality, and impartiality of the information provided,
- multi-disciplinarity, academic openness, and constant development,
- rejection of formal boundaries in the subject area and methodology employed (relevance as a main criterion for information usefulness),
- organization's impacts measurement, evaluation of affecting overall capitals employed and value creation,
- long-term time coverage of impacts and interactions consequences, application life cycle and value chain approaches,
- commensurability and comparability of information, possibility of metrics' usage, monetary and non-monetary valuation,
- verifiability of information and control objectivity.

Discussion

The results of the study can help to improve the sustainability governance information support system and give some reply to the research question. As was shown in the literature review, unidirectional studies mostly concentrated on isolated parts of information and control practices tending to improve accounting for sustainability, non-financial reporting, verification, and analytics. In this paper, some ideas of Chopra (2024); Fleaca et al., (2023), and Maas et al. (2016), were developed and the holistic view is not presented sufficiently and could be applied with the developed model of the information practices cycle to improve information provision for sustainability.

With a diversity of academic and practical insights regarding accounting development in the sustainability agenda (Chopra, 2023; Dasanayaka et al., 2021; Fadhel et al. 2021; Freiberg et al., 2021; Impact Economy Foundation, 2022; Serafeim & Trinh, 2020; Unerman & Chapman, 2014; and many others), we believe it is feasible to design an updated system of accounting for sustainability with these main fitting components:

- impact accounting to give information regarding product, organizational, environmental, social, and human well-being impacts, describing impact pathways and measure impacts,
- accounting of the entity's Sustainable Development Goals contribution,
- integrated accounting of a company's ability to create value embodied in the capital (financial, manufactured, intellectual, human, social and relationship and natural) while influencing the external environment and capital during its activities,
- accounting of the full entity's value chain, which encompasses its activities and relationships (including upstream, own operations, and downstream) to create its products from initial project to production, delivery, consumption, and end-of-life,
- accounting focuses on an entity's economic, social, and environmental interactions and influences.

The diagram of accounting for sustainability suggested integrates recent ideas in this field of studies and employs the newest approaches to reach the goals of efficient ESG governance.

The proposed balance model for integrated reporting expanded the model of assets classification for new ESG accounting have been developed existing theories of all-encompassed balance (Suyc et al., 2024), key ideas of Integrated Reporting (IFRS Foundation, 2021) and Integrated Balance Sheet in Impact-Weighted Accounts (Impact Economy Foundation, 2022). Accounting evolution in the sustainability context remains one of the highly interesting and not enough explored topics and needs to be considered in further studies.

One more part of ESG info-sourcing is the shaping of data sets that are not covered by conventional accounting tools due to their specificity of the coverage of objects and the techniques used. This area of data collection includes environmental measurements, usually carried out by special technical units of enterprises, and the collection of information of a social nature, most represented in statistical reports. This part of measurements and assessments are usually provided by special departments or outsourcing structures, for example, ecological measurements dMRV Digital Measurement, Reporting, Verification (for the Voluntary Carbon Market), product characteristics measurements, and certification appraisals (e.g. Fairtrade, Organic), Social measurements (e.g., B Impact Assessment to overall score B-Corp organizational certification, developed by the B-Lab). This activity combines different levels of data collection and aggregation, from topic detail observations to the technologies of tracking influences and integral assessments. Thus, it could be logically divided into techniques of primary data collection and analytical investigations and considered as a part of accounting or analysis accordingly.

Organizational reporting performs information transfer, communicating and affecting markets and stakeholders' response. "Responsible" corporate reporting embraces a wide scope of the information transmitted while proceeding it structures the areas of managerial attention, risk assessment, and mitigation. The idea of non-financial reporting harmonization is still debatable, but it can be unequivocally stated that despite the reporting fatigue and the difficulty for reporting entities in choosing and applying appropriate frameworks, a wide information coverage makes it possible to better assess the current situation in the field of the ESG–agenda.

ESG reporting can be featured differently: according to the scope of "users (investors or all stakeholders), materiality meaning (financial, impact or dual materiality), nature of information (including quantitative, or qualitative data), considering industry specifics (universal or industry), coverage of topics (broad range of topics, or selected topics). We believe this list should be supplemented to define ESG-reporting models that have been formed for a moment. Firstly, it is a complex or block outcome, e.g., an integrated report is a complex model that indicates a company's ability to create value, while a larger part of sustainability/corporate responsibility reports provides information on different topic blocks. Afterwards, reports could differ by common logic and the possibility of results generalization in one integrable output. This possibility is inherent to integrated reporting unlike other frameworks' ESG-reports with findings cannot be summarized into an overall result or common inference" (Odintsova, 2024).

In this paper, the main features for ESG reporting classification were adjusted by the new ones and two main models of sustainability reporting were suggested. The difference in characteristics listed precisely allows us to distinguish two basic reporting models: sustainability reports, and integrated reporting, with either a few "bottom lines" set of ESG indicators or complex models of further value creation.

Sustainability reports assume comprehensive coverage of all aspects of the company's activities and assessment of their mutual influence. "This reporting is addressed to the wide scope of stakeholders and based mostly on the impact materiality principle – disclosing the organization's impact on nature and society. This approach with the same or less coverage of topics and indicators applies in many other frameworks' sustainability / corporate responsibility reports because they mostly use block logic with no integrated output. The drift to double materiality is obvious, and the combination of a few ESG-frameworks' requirements and ideas in one report. Integrated reporting is more focused on providers of financial capital. However, it gives a comprehensive vision of the parameters and prospects for the business, matches in coverage and integrity to the requests of a wide range" (Odintsova, 2023). However, relying on the financial materiality principle, this reporting system indicates relevant value-creation drivers. Integrated reporting is based on three key concepts: capital (financial, industrial, intellectual, human, social, natural) both involved and influenced by organizations, a business model that transforms resources into products and results, and the ability to create value under their influence. In terms of the International Framework for Integrated Reporting, an integrated report is a "concise communication about how an organization's strategy, governance, performance, and prospects, in the context of its external environment, lead to the creation, preservation or erosion of value over the short, medium, and long term" (IFRS Foundation, 2022).

Both ESG-reporting models have certain advantages that do not overlap, and both should be used in sustainability pro-active governance. There are a few focuses that can be considered while estimating ESG-reporting significance. First, being information and communicative practice, reporting carries double functionality, both in internal processes of data collection construction and in the implementation "client-oriented" external approach to govern stakeholders' and mainly market reaction to information supplied. It could be referred to as the Constructionist Methodology in accounting in the Interpretative paradigm, considering particularly the possibility of reality construction via information, linguistic concepts, and different roles of accounting and reporting. of ESG-data capture and proceeding shape parallel targeting sustainable-value creation and control linked risks. This practice highlights non-financial areas of managerial attention and platforms for value creation. It refreshes management semantics to transform business performance criteria to the impact on capital metrics and appropriate drivers. This approach enables us to predict the reaction of the market, society, institutions, and authorities and to highlight ESG governance and risk management areas.

The common feature of models we see initially inherent to reporting emphasis is to create value (in this case ESG-value), and clear financial intention to attract investors through reputation capitalization. This means that being non-financial, ESG reporting uses financial goals' designs. Moving this practice forward, one must avoid financial patterns originating with traditional reporting but use the idea of accounting as a social practice and interpretative paradigm. But to make reporting an instrument of sustainability management we must avoid financial stereotypes in its main idea. This can make ESG-reporting impact not reactive but proactive and use it to leverage sustainability governance incentives and main actors' responsible behaviour.

The quality of ESG and sustainability information is not guaranteed for many reasons. First by the heterogeneity of reporting standards and systems, the voluntary nature of reporting, and the absence of those procedures and rules that make financial reporting reliable. Clarity in accounting principles and procedures is a weighty guarantor of the quality of financial reporting, and this practice has been worked out for many decades. Moreover, the financial statements are under audit control, an additional important filter for the quality of the data provided to the user. As for ESG reporting, its verification is not mandatory. The ESG audit and assurance are voluntary, and the entities implementing it are audit firms and other organizations. As for ESG reporting, its verification is not mandatory, the audit and assurance are still voluntary, and the entities implementing it are audit firms and other organizations. Companies' mandatory ESG audit and assurance will complement existing information practices and increase the transparency, reliability, and reliability of information promoted. An analysis of the International Federation of Accountants indicates that although there continues to be a meaningful difference between ESG reporting and ESG assurance rates, the incidence of this audit and assurance is on an upward trend: 95 % of audit firms and 38 % of other assurance service providers applied Standard on Assurance Engagements ISAE 3000 (Revised) when including national assurance standards (such as the AICPA's attestation standards) this indicator grows to 99 % in 2021. The ISAE 3000 (Revised) remained the most widely used standard for ESG assurance engagements of audit firms (or their affiliates), while non-IAASB standards were most used by the other service providers. The International Sustainability Standards Board (ISSB), The International Auditing and Assurance Standards Board (IAASB), and The International Ethics Standards Board for Accountants (IESBA) collectively work to ensure their standards support high-quality sustainability disclosure and assurance (IFAC, 2023).

Corporate reporting information is aimed at a wide range of users, especially since the principle of dual materiality, which underlies a significant number of ESG reporting standards, assumes the usefulness of the information provided both for assessing the financial performance of a business and its impact on nature and society. To make further decisions based on this information, analytical practices are needed to assess the company's performance in the field of sustainability and form a set of indicators that are easy for decision-makers to use. Such practices include ESG rating, which is carried out, to an overwhelming extent, by special rating providers for green investment markets, and direct analysis, which does not result in scoring and ranking based on certain aggregates. Among them, one can note such well-known rating providers as Sustainalytics ESG, Bloomberg ESG data service, Thomson Reuters, Dow Jones Sustainability Indices, MSCI ESG Research, RepRisk, Moody's Corporate Knights Global 100, S&P 500 ESG (the Standards and Poor's), Institutional Shareholders Services (ISS), FactSet

Datasets and others. It has noted several problems in ESG rating industry in the study of Halper et al. (2022): the lack of standardized ESG disclosures or weighting of ESG factors coupled with the grouping (and subjective weighting), it reasoning that ESG ratings are 60% correlated, compared to a 99% correlation for credit ratings from the top three credit rating agencies; insufficient accordance between the E, the S, and the G, that calls for distinct scores for each, the divergence in ratings and variability in definitions makes them not reliable enough as a sole information source.

ESG control practice primarily supposes monitoring sustainability indicators of economic entities. Conventionally, the subjects of such monitoring are state structures or voluntary non-state entities, the functions of which include monitoring the achievement of sustainable development goals. Various mechanisms for tracking indicators of interest and diverse sources of information are used. However, the effectiveness is often quite low, the response time lag is quite long, and the response type is reactive.

The data used for the study was limited by incomplete access to the ESG reporting and ratings databases providing full information only on a paid basis.

Conclusions

Information and control practices called to provide sustainable governance comprise a wide scope of financial, governance, and information matters, not only information supplied for the decision-makers and a broad range of stakeholders. This led to new approaches providing sustainability governance, green value creation, and responsible investment, setting up integrated thinking and movement towards societal progress and a sustainable future.

The system of sustainability information and control provision can be considered as a chain of consistent and mutually ensuring targeted processes, including accounting for sustainability, ESG measurements, verification (assurance), rating, and analysis and while incorporating in this system the decision-making process, it can be considered as a sustainability governance loop. Given the importance of all the elements in this system of information and control sustainability management support, nevertheless we believe the key generating elements are accounting and reporting and it is to them that we paid the most attention in this writing.

Accounting in ESG-agenda is a chief swiftly developing interdisciplinary informational practice, linked with internal control, management analytics, and social and ecological measurements, which includes impact accounting, Sustainable Development Goals contribution accounting, integrated accounting, value chain and life-cycle accounting. Sustainability governance significantly impacts accounting, expanding its subject field, basic concepts, the scope of objects, criteria for their recognition, and making multidimensional the businesses' activity metrics.

Analysis of reporting systems revealed that the wide-spread ones could differ on many points (users, materiality meaning, detailing, topic coverage, etc.), but the most important distinction is in the basic informational reporting model including either a few "bottom lines" set of ESG-indicators or complex model of value creation. The common feature of both models we see is initially inherent to reporting emphasis to create value (this case ESG-value), and clear financial intention to attract investors through reputation capitalization. This means that even being non-financial, ESG reporting uses financial objectives designs. Moving this practice forward one must avoid financial patterns that originated with traditional reporting but use the idea of accounting as a social practice and interpretative paradigm. The analysis of two main ESG-reporting models reveals their certain advantages do not overlap and both should be used in sustainability pro-active governance. The approach recommended will enable not only to predict the reaction and behaviour of, the market, society, institutions, and authorities but to highlight areas of importance for ESG-governance and risk management.

The approaches suggested in this study should be developed in further research but can be useful for improving information practices to reach transparency and higher efficiency of sustainability governance.

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ECONOMICS AND CULTURE 21(1), 2024

DOI: 10.2478/jec-2024-0011

GREEN HORIZONS AHEAD: NAVIGATING CARBON NEUTRALITY IN EUROPEAN TRANSPORTATION BY SKY AND SEA

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Received 20 February 2024; accepted 30 May 2024

Abstract

Research purpose. As carbon neutrality gains momentum, industries worldwide are navigating the challenges and opportunities posed by sustainability goals. This article delves into the strategies undertaken by airlines and maritime companies to achieve carbon neutrality by 2050 in the European Union (EU). The aim of the research is to explore how the aviation and maritime industries in Europe can effectively transition towards carbon neutrality by 2050, considering their similar technological challenges and opportunities. The objective of this research was to identify and compare currently utilized sustainability initiatives in aviation and maritime companies. The focus is on new insight from airline and maritime companies concentrating on their sustainability practices. Common hurdles, innovative solutions, and shared opportunities in the pursuit of environmental sustainability are explored.

Design / Methodology / Approach. The selected research method was qualitative research, which was conducted with in-depth and semi-structured interviews and content analysis. Interviews were conducted with airline company and association representatives and maritime company, research, and education experts. The content analysis was based on sustainability reports and sustainability sections of annual reports. Key findings were synthesized into a theoretical framework and this research explores practical initiatives for a sustainable transformation process.

Findings. The call to reduce carbon emissions has been initiated by the EU affecting the transportation sector, particularly aviation and maritime industries where the path to achieving carbon neutrality is constrained by significant technical limitations. Despite these challenges, both sectors share a unified objective according to EU climate targets. Both the aviation and maritime industries face challenges on the path to carbon neutrality. Airlines struggle with the limitations of current aviation technology, hindering the feasibility of large-scale technological advancements. Similarly, maritime companies confront regulatory complexities and infrastructure limitations in the adoption of alternative fuels and emission-reduction technologies since the commonly used tactics of reducing fuel consumption by optimizing speed, routes and scheduling are no longer adequate ways and the energy needs of the shipping industry cannot be met only with battery technology.

Originality / Value / Practical implications. These challenges offer opportunities for innovation and collaboration. Investments in research and development are driving advancements in electric and hydrogen aircraft, while the maritime industry is also trying to find hydrogen-based solutions for greener development, but the technologies are not widely available. This leads towards combining bio-oils and technological innovations related to the fleet. Case study 1 sheds light on airline sustainability in Europe, revealing strategies and initiatives that European airlines are currently utilizing in their sustainable transformation journey. Case study 2 explores different means of achieving carbon neutrality in the maritime industry, in particular the potential of common reed (Phragmites australis) as a carbon offset tool for reaching net zero. Both industries are making significant strides towards carbon neutrality through a combination of technological innovation, operational efficiencies, and strategic partnerships. Towards green horizons as transport industries converge on the path to carbon neutrality.

Keywords: carbon neutrality, aviation, maritime, green transition, sustainable fuels.

JEL codes: Q5, R4.

Introduction

Air travel stands out as a prominent contributor to climate change, responsible for approximately 3.5% of the world's total CO2 emissions (Ritchie, 2020). With a commitment to achieve carbon neutrality by 2050, airlines are tasked with the formidable challenge of transitioning nearly three decades of operations towards sustainability. While the aviation sector often attracts significant attention, it is crucial not to underestimate the impact of the maritime industry on climate mitigation efforts. In 2022, global maritime transportation contributed roughly 2.8% to the total CO2 emissions worldwide, according to data from the International Maritime Organization (IMO, 2022). The maritime sector is slower to react and change than the aviation sector, also in terms of green transition. Renewable gasoline like biofuels or biogas are now good alternatives for fossil fuels since hydrogen is not yet a solution as the technology is not yet sufficiently developed that it would be commercially viable.

Acknowledging this significant impact, the IMO updated its emissions mitigation strategy to adhere to ambitious objectives aimed at attaining carbon neutrality in the maritime sector by 2050 (IMO, 2023). This commitment mirrors the emission reduction targets set by the EU, underscoring the maritime industry's significant role in global efforts to combat climate change. In parallel to aviation, the maritime industry also struggles with its environmental footprint. Ships release greenhouse gases and other harmful pollutants, further worsening climate change and marine pollution concerns (IMO, 2022). Like their counterparts in aviation, maritime companies are also actively pursuing strategies to achieve carbon neutrality according to the EU's carbon neutrality targets (European Commission, 2024).

The aviation and maritime industries were selected to represent the European transportation industries in this research as two of the authors have extensive backgrounds working in aviation and maritime companies as well as having a thorough understanding of the industries. The authors' professional interest and existing networks steered the perspective of the research to aviation and maritime industries and therefore other transportation industries were excluded from this research.

In this research, the authors investigate the impact of prominent phenomena and trends on the perspectives of the airline and maritime industries in Europe. SITRA is a Finnish, independent, research-oriented, and governmentally supported innovation fund, which creates a review of megatrends on a yearly basis. SITRA megatrends provide an exhaustive overview of the dynamic forces shaping change, including nature, people, technology, power, and economic factors, which collectively exert significant external pressures on both sectors (SITRA, 2024). Global warming emerges as a pivotal megatrend affecting both industries, aligning with international agreements such as The Paris Agreement and initiatives like the European Green Deal and Fly Net Zero by 2050 (Paris Agreement, 2015; Council of the EU and the European Council, 2024; IATA, 2024). From the maritime industry perspective, a significant regulatory body is the International Maritime Organization (IMO), while The Integrity Council for the Voluntary Carbon Market (ICVCM) plays a crucial role in voluntary offsetting efforts, particularly in the evolving landscape of emission offsetting (Integrity Council for the Voluntary Carbon Market, 2024). The aim of the research is to explore how can the aviation and maritime industries in Europe effectively transition towards carbon neutrality by 2050, considering their similar technological challenges and opportunities. The objective of this research, which was based on the two case studies, was to identify and compare currently utilized sustainability initiatives in aviation and maritime companies. The focus of the research is on new insight from airline and maritime companies, and this has influenced on selection of the interviewees and reports utilized. Calculating the carbon emission was not included in this research. Aviation industry initiatives were studied based on airline company and association representatives' interviews, sustainability reports, and sustainability sections of annual reports. The maritime industry-related general initiatives were studied based on literature reviews and maritime industry associations' reports. Through qualitative research encompassing semi-structured interviews with airline experts and thematic content analysis of sustainability reports; and a qualitative case study from the maritime industry based on expert interviews of the potential of utilization of common reed biochar as a voluntary credible and ethical carbon offsetting tool, this research aims to capture the complexities of sustainability initiatives in both aviation and maritime sectors. By synthesizing key findings into a theoretical framework, the research seeks to inform practical recommendations and tools to facilitate the sustainable transformation process. Ultimately, by adopting

a holistic perspective that encompasses both aviation and maritime industries, this study aims to provide a practical view of sustainability challenges and opportunities in European air and sea transportation.

The authors recognize that utilizing information based on the interviews of the company representative and companies' sustainability reports might create a bias. However, to reduce the bias an interview was conducted with a sustainability expert from the aviation association, confirming the findings from the other interviews. In addition, the aim of the research was not to evaluate the level of the carbon emissions produced by the European aviation or maritime industries, nor the level of sustainability of the companies, but to explore and compare the current sustainability initiatives utilized by the companies. The authors estimated that the best insights to produce this new information would be through the companies' sustainability representatives and reports. The selected maritime case company had already utilized the current mitigation methods available, and this study concentrated on the opportunities for achieving net zero through voluntary carbon offsetting with common reed. As the best practices for utilizing common reed are still under development the objective of the case study was to gain new knowledge. Accordingly, the selected research methods were in-depth and semi-structured interviews of the experts on the field from education and research, from public organizations and companies.

Reducing fossil fuel usage and finding alternative sustainable fuels to replace them is a key initiative for both sectors in achieving carbon neutrality. In addition, corporate social responsibility (CSR) and waste management are other significant areas of improvement for both sectors not only to enhance sustainability but also from the perspective of current cost-saving opportunities. (CSR Europe, 2024; IATA, 2024; IMO, 2023.) Furthermore, the integration of the United Nations Sustainable Development Goals (SDGs) into sustainability strategies has become essential in directing efforts toward global sustainability objectives encompassing social, economic, and environmental sustainability (Hajian & Jangchi, 2021). The SDGs offer a comprehensive framework that allows airline and maritime industries to align their sustainability initiatives with internationally recognized goals (United Nations, 2024). When delving into SDGs within the maritime industry, there is a linkage to the concept of the "Blue Economy," which pertains to the ocean or maritime economy striving to enhance human and societal well-being while concurrently mitigating risks to the environment. The idea is to align economic development with ocean health and focus on sustainable ocean areas. (World Bank and UN Department of Economic and Social Affairs, 2017).

By examining sustainable transformation efforts through challenges and opportunities, this study sheds light on the multifaceted approach required for both the airline and maritime industries. From the perspective of the airline industry, the focus is on CO2 emissions reduction, organizational development, and competitive advantage, while some in the maritime industry emphasize correct and ethical voluntary carbon offsetting, utilizing common reed. Drawing on research on climate change (Romm, 2022), Fiedler's contingency theory (Donaldson, 2001; Luthans & Stewart, 1977), Porter's competitive advantage (Porter, 1985), companies' understanding of the use of carbon credits (Trouwloon et al., 2023), technologies for achieving carbon neutrality (Xu et al., 2023; Wang et al., 2021), and consumers´ perspective on emission reduction and carbon offsetting (Roemer et al., 2023; Wang et al., 2020), the research aims to uncover valuable insights that can drive meaningful change for the European transportation industry.

Xu et al. (2023) analysed carbon neutrality research from 2000 to 2022, noting a significant increase in publications between 2020 and 2022. They found variations by region, with the US and China leading. Research focused on practical, technical, policy, and economic aspects, with renewable energy, carbon capture, and carbon conversion technologies as key areas of interest. Furthermore, Wang et al. (2021) examined technologies and strategies for attaining carbon neutrality. Their findings suggest that the current trajectory falls short of achieving the climate neutrality goal by 2050 unless crude oil and coal development ceases by 2021. Urgent action is required to overhaul the energy sector, necessitating cutting-edge research and interdisciplinary collaboration in technology, civil and environmental engineering, and the integration of bio- and nanotechnology.

Carbon neutrality goals set by companies globally have garnered attention as crucial measures against climate change. Trouwloon et al. (2023) investigated companies' comprehension of carbon credit utilization, emphasizing the importance of clarity and transparency. They identified three key

dimensions: understanding the purpose of carbon credits, comprehending the differences between carbon neutrality and net-zero claims, and discerning between achieved milestones and aspirational targets. Roemer et al. (2023) studied consumers´ views on emission reduction and carbon offsetting and discovered that consumers are willing to pay more for the lower carbon footprint of a service.

Previous research from Nyamdorj et al. (2021) supports the authors´ topic of the aviation industry achieving carbon neutrality. The study discusses the establishment of CORSIA and Airport Carbon Accreditation, which are programs that impose carbon management obligations on the aviation industry. The research by Nyamdorj et al. (2021) emphasizes the training product to be presented that will clarify how to go beyond mere compliance and exceed the carbon reduction requirements of these instruments by achieving carbon neutrality in operations. This is closely related to the authors' study on how the aviation industry can reach carbon neutrality by 2050. By adopting sustainable practices such as operational efficiency improvements, the use of sustainable aviation fuels, and investments in carbon offsetting projects, the industry can significantly reduce its carbon emissions.

Furthermore, the study from Brazzola et al., (2022) investigates climate-neutral aviation by jointly capturing the CO2 and non-CO2 effects of aviation and combining them with scenarios of demand and technological change. The research underscores the challenge of reconciling rapid aviation growth with climate goals post-COVID-19 and emphasizes the need to address both types of emissions for climate neutrality (Brazzola et al., 2022). This study concentrates on efforts on how the aviation sector can reach carbon neutrality by 2050, providing measurement insights that complement the strategies outlined in the authors' article on sustainable aviation practices.

Parallels can be drawn between sustainability challenges and initiatives in the maritime sector and those in the aviation industry. Like the aviation sector, maritime companies across Europe are increasingly acknowledging the imperative to tackle environmental issues and diminish their carbon footprint. Consequently, there has been a heightened focus on enhancing energy efficiency, embracing sustainable fuels, and investigating innovative technologies to accomplish emission reductions within the maritime industry. These efforts align with broader global sustainability goals and demonstrate the industry's commitment to mitigating its environmental impact while ensuring the efficient movement of goods across Europe's seas (European Commission, 2024; IMO, 2022).

In this study, the selected case company related to the maritime industry is already well advanced in sustainability initiatives and thus voluntary carbon offsetting is considered a solution for reaching entire carbon neutrality after all the mitigation has already been done using biofuels. According to Boyle (2021), voluntary carbon offsetting presents challenges as selecting offsetting as a key element for achieving the climate goals has led to according to a situation where polluters have been allowed to continue polluting by buying and selling permits to pollute, and due to that concentrating on cutting emissions has been neglected. Furthermore, it has been noted that misleading assertions have adversely impacted the reputations of companies, as highlighted by recent research (Trouwloon et al., 2023). Regarding voluntary offsetting, there is currently a lack of standardized regulations, with only recommendations in place. According to recent studies (Laine et al., 2021), credible and ethically sound emission offsets should adhere to internationally established criteria, encompassing elements such as additionality, a robust baseline, rigorous calculation methodologies, comprehensive monitoring and reporting mechanisms, stability, avoidance of carbon leakage, authenticity, transparency, certifiability, prevention of double counting, and mitigation of significant harm (Finnwatch, 2024; Laine et al., 2021). Additionally, like airlines, maritime companies also face pressure from regulatory bodies and consumer expectations for sustainable practices (European Commission, 2024).

Research Methodology

The research methodology for this study employed a qualitative approach. Qualitative research was chosen for its ability to offer valuable insights into real-world problems, exploring participants' experiences, behaviours, and perceptions (Brannan et al., 2017).

The research methodology for the airline case study comprised semi-structured qualitative interviews with airline sustainability experts. These interviews delved into areas such as CO2 emissions reduction,

organizational development, and competitive advantage through sustainability initiatives. Thematic content analysis was subsequently employed to analyse the interview transcripts, guided by theoretical frameworks including climate change theory (Romm, 2022), contingency theory (Luthans & Stewart, 1977), and competitive advantage theory (Porter, 1985).

Semi-structured interviews were conducted with airline sustainability experts to gather diverse perspectives and comprehensive data on the research topic. These interviews followed a predetermined set of questions and were facilitated in a participant-observer format to ensure open discussion while minimizing researcher influence. Three airline sustainability experts and one airline association sustainability expert were interviewed. These interviews were conducted between September 2023 and October 2023. The candidates contacted were selected based on their LinkedIn profile stating that they have sustainability roles either in European airline, airline group or airline association and the interviewees were selected based on voluntary participation. (Pimiä, 2023) The interviews were conducted virtually, with the interviewer maintaining reflexivity to mitigate bias. Ethical considerations were upheld, ensuring participant confidentiality and informed consent. Despite the limited number of interviews, data saturation was achieved, indicating the sufficiency of data for analysis. The findings contribute to understanding sustainability practices within the European airline industry. (Pimiä, 2023)

Additionally, two individual annual reports from Norwegian Air Shuttle and EasyJet were examined together with the sustainability reports from four major airline groups: the Air France - KLM Group, the IAG Group, the Lufthansa Group, and the Ryanair Group. These reports provided valuable insights into sustainability practices within the European airline industry. The purpose of the data sampling strategy was to collect as comprehensive sustainability information as possible from the majority of European airlines. Airline groups and individual airlines were selected by the author based on her knowledge of the airline industry. The airline sampling included different flagship and low-cost carriers, individual airlines, and airline groups from different European countries. (Pimiä, 2023)

A phenomenological approach was applied to investigate the effects of climate change on European airlines, aiming to comprehend these impacts from individual perspectives. Thematic content analysis was then employed to identify recurring themes in interview transcripts and sustainability reports obtained from European airlines. (Anderson, 2007) This analysis provided practical insights into sustainability initiatives applied across the industry. The data collected from interviews and sustainability reports were organized and coded manually in an Excel spreadsheet as datasets.

Furthermore, a maritime industry case study was incorporated, employing qualitative research methodologies (Mahoney & Goertz, 2006; Urponen, 2023), which allow for in-depth exploration of specific research problems. Individual cases are usually at the centre of the qualitative research method, (Eriksson & Kovalainen, 2016), making it suitable for investigating topics that cannot be adequately addressed through numerical data or large sample sizes. Given the innovative nature of the research topic and the limited expertise available in the selected region, qualitative methods were deemed appropriate for this study.

The interviewed participants for the maritime case study were selected based on their specific knowledge about the common reed, their interest in it, or their expertise in voluntary offsetting. The qualitative data collection methods used were semi-structured and in-depth interviews. The interviewees provided both organizational and corporate perspectives and came from various sectors: maritime, innovation, research, and offsetting. The organizations represented included the University of Turku, Turku University of Applied Sciences, John Nurminen Foundation, Business Turku, NGS Finland, and Meriaura Invest. The interviews were conducted in two phases. The first round took place face-to-face with three experts on April 24th, May 17th, and May 19th, using an in-depth approach.

The second round of interviews was held virtually via Teams from November 10th to 16th, 2023, involving six experts. These interviews were conducted in Finnish using a semi-structured approach, where the same set of predetermined questions was asked of each interviewee, though they had the freedom to discuss related topics as well. The questions were originally in Finnish, focusing on the interviewees' background with common reed and the arguments for using common reed from both offsetting and general perspectives. Each interview was recorded, transcribed into Finnish, and then

translated into English. During data processing, recurring themes emerged from the responses, which were coded to outline the main themes. (Urponen, 2023)

By examining both airline and maritime industries, this study aimed to provide a holistic understanding of sustainability efforts in European transportation in the selected industries. Overall, these research method approaches comprehensively examined sustainability efforts within both the airline and maritime industries, providing practical insights into organizational initiatives and industry trends.

Results

The research findings (Pimiä, 2023; Urponen, 2023) related to sustainable transformation based on European airline expert interviews or reports and maritime industry expert interviews unveiled significant challenges and promising opportunities. Common challenges, including technological limitations, regulatory pressures, and customer scepticism, posed hurdles to achieving carbon neutrality for both industries. However, initiatives such as Single European Sky (SES) implementation (European Commission, 2024) and investments in Sustainable Aviation Fuel (SAF) production offered solutions to reduce CO2 emissions for airlines, while similar measures regarding sustainable fuels and utilization of common reed as a tool for voluntary carbon offsetting were explored in the maritime sector. Collaborative efforts with stakeholders were found crucial in supporting both industries to meet sustainability targets. Despite challenges, numerous opportunities emerged, including the adoption of sustainable business models, transparent communication, and early investment in pursuing sustainability leadership. These strategies were seen as avenues to establish long-term competitive advantages in sustainability. Shared research findings from the contribution of the airline experts and reports (A), and maritime experts (M) can be seen below (Fig. 1).

RESEARCH RESULTS	THEME 1 CO2 Emissions	THEME 2 Organizational Development	THEME 3 Competitive Advantage
Initiatives	• Increase use of sustainable fuels (A, M) • Improvements in operational efficiency & fleet renewal (A, M) • New navigation technology (A) • Route and speed optimization (A, M)	• Sustainability partnerships (A, M) • Waste and recycling improvements, green energy utilization (A, M) • Carbon reduction vs. offsetting (A, M)	• Green fares and green ticket classes (A) • Diverse carbon offset schemes (A) and voluntary carbon offsetting in maritime (M) • SAF purchase options for airline customers (A)
Challenges	• Technological limitations (A, M) • Biofuel availability and high price (A, M) • EU emission restrictions affecting competitiveness of European transport companies (A, M)	• Constantly evolving and escalating EU sustainability rules and regulations (A, M) • Lack of sustainability related standardization (A, M) • External sustainability requirements from stakeholder and investors (A, M)	• Polluter stigma of air travel, flight shaming (A) • Sustainability communication challenges (greenwashing) (A) • Technology preventing substantial competitive advantage benefits from sustainability actions (A, M)
Opportunities	• Improvements in ATM system (A) • Biofuel investments in production and distribution (A, M) • Investments in new technological innovations including common reed utilization in maritime industry (A, M)	• Sustainability as part of company vision (A, M) • Transparent sustainability communication & marketing (A, M) • Sustainable transformation as part of organization´s strategy (A, M)	• Cooperation with regulatory bodies and industries, stakeholders and investors (A, M) • Pursue sustainability leadership (A, M) • Sustainability investments today, customers tomorrow (A, M)

Fig. 1. Airline and Maritime Common Research Findings (Source: Authors' compilation)

When analysing the combined research findings from the airline and maritime industries the authors were able to identify several common challenges and opportunities. Both sectors are increasing their usage of sustainable fuels as initiatives to reduce carbon emissions, while simultaneously striving to improve operational efficiency and renew their fleets. Efforts to optimize routes and speeds are being undertaken in both industries, alongside the acknowledgement of technological limitations as a barrier to sustainability progress. Challenges related to sustainable fuel availability and pricing, as well as the impact of European Union emission restrictions on competitiveness, are shared concerns for both sectors. Additionally, investments in sustainable fuel production and distribution infrastructure are being pursued to overcome these challenges. Both industries are also exploring innovative solutions, such as the utilization of common reed for the maritime sector, to enhance sustainability. Organizational development efforts include the formation of sustainability partnerships, implementation of waste management improvements, and integration of sustainability into company vision and strategy.

Collaboration with regulatory bodies, stakeholders, and investors is seen as essential for advancing sustainability goals and achieving leadership in sustainability practices. Overall, there is a recognition that investments in sustainability today may yield future benefits in terms of customer loyalty and revenue growth for both the airline and maritime sectors. (Pimiä, 2023; Urponen, 2023)

The research findings specific to the airline industry highlight the adoption of new navigation technology aimed at enhancing operational efficiency and safety. Investments in Air Traffic Management (ATM) systems are being made to improve air traffic flow and reduce environmental impact. Furthermore, airlines are implementing diverse carbon offset schemes and introducing green fares and ticket classes to incentivize sustainable travel choices among passengers. However, sustainability communication challenges, such as addressing concerns about greenwashing, remain prominent. Lastly, there is recognition within the industry that technological advancements may hinder the realization of substantial competitive advantages from sustainability actions, prompting a strategic focus on sustainability leadership as a long-term objective. (Pimiä, 2023)

In parallel, findings from the maritime industry case study echoed similar challenges and opportunities. Challenges such as technological constraints and regulatory pressures mirrored those faced by airlines. However, initiatives such as investments in alternative fuels and collaborative efforts with stakeholders presented opportunities for emissions reduction. The maritime industry case study concentrated especially on voluntary carbon offsetting as a possibility for achieving carbon neutrality. The criteria for credible and ethically sound offsetting were established through a review of the literature, emphasizing the importance of additionality (Cames et al., 2016), a solid baseline, a robust calculation method, monitoring and reporting, stability, avoidance of carbon leakage, authenticity, transparency, certifiability, avoidance of double counting, and avoidance of significant harm as fundamental aspects (Finnwatch, 2024; Laine et al., 2021).

When examining the potential of biochar from common reed as a tool for voluntary carbon offsetting the thematic analysis based on the expert interviews revealed that common reed biochar meets entirely the criteria for good compensation. Current challenges related to the high price and harvesting issues could be addressed through the development of relevant legislation and technologies. Unlike domestic forest-related compensation projects, biochar based on common reed would not encounter issues with double counting or additionality. Moreover, there is a biodiversity perspective to consider, as cutting common reed removes nutrients and reduces methane and CO2 emissions from the sea. In addition to benefiting the environment trying to achieve climate neutrality through deliberate offsetting could potentially enhance companies' competitive edge. (Urponen, 2023)

By examining both industries, this research provides practical insights into sustainable transformation efforts and highlights the importance of collaborative action across European transportation sectors to combat climate change.

Conclusions

In conclusion, this study aims to offer a holistic view of sustainability initiatives within European airlines and maritime industries, providing perceptions of the challenges and opportunities shaping the industry's sustainability landscape. Through qualitative interviews and content analysis, the study uncovered key findings that underscore the pressing need for sustainable transformation and collaboration across industries and regulatory bodies.

Table 1. Main Conclusions (Source: Authors´ compilation)

Conclusion	Key Insight
Conclusion 1	The study offers a practical and holistic view on sustainability initiatives within European airlines and maritime industries, highlighting the need for sustainable transformation and collaboration across industries, research institutions, regulatory bodies, and investors, especially in the field of technical development and new innovations.
Conclusion 2	European airline and maritime companies are experiencing persistent challenges in reducing CO2 emissions due to technological limitations, biofuel availability and high price. Sustainability communication is hindered by concerns of green washing.
Conclusion 3	Initiatives in route and speed optimization, waste and recycling improvements, utilizing green energy, including sustainability in company vision and strategy, adopting sustainable business models, fostering organizational development, and leveraging strategic sustainability partnerships, especially in carbon offsetting, were identified. Airline companies' specific initiatives include green fairs, customer SAF purchase options and diverse carbon offsetting schemes, whereas voluntary carbon offsetting is in this study related to maritime companies.
Conclusion 4	EU emission restrictions are strictest in the world, EU regulations are constantly evolving, lack of sustainability standardisation and external pressure from stakeholders and investors affect the competitiveness of European transportation companies.
Conclusion 5	Following principles of credible and ethically correct voluntary carbon offsetting based on internationally defined criteria is essential. Biochar from common reed meets these criteria and benefits biodiversity by reducing sea nutrients, with challenges addressable through future legislative and technological developments.
Conclusion 6	Limitations in qualitative research methods and utilizing information from company sustainability reports and experts were acknowledged. However, reliability was enhanced by interviewing external experts form fields of industry associations, research, and education. Furthermore, the aim of research was to explore current sustainability initiatives of airline and maritime companies and not to evaluate their level of sustainability in essence.

The research highlights the significant strides made by European airlines in embracing sustainability, while also illuminating persistent challenges such as reducing CO2 emissions and enhancing communication strategies. Moreover, findings emphasize the importance of adopting sustainable business models, fostering organizational development, and leveraging strategic partnerships to drive progress in the airline industry. (Pimiä, 2023) Importantly, it is essential to consider a maritime perspective when addressing sustainability challenges, given the shared environmental concerns and regulatory pressures faced by both industries. The study emphasizes the importance of following the principles of credible and ethically correct voluntary carbon offsetting based on internationally defined minimum criteria. Furthermore, it was concluded that biochar from common reed fulfils wholly these minimum criteria and is in addition able to positively affect biodiversity by reducing nutrients from the sea. The challenges related to its use could be tackled with future legislative and technological development. (Urponen, 2023) By aligning efforts between the airline and maritime sectors, synergies can be harnessed to accelerate progress towards common sustainability goals.

It is acknowledged that limitations to this research can be identified. The new insights into the sustainability initiatives related to the aviation and maritime industries were based on a qualitative study, interviewing company representatives, and utilizing the information gained from sustainability reports, which could affect the reliability of the information. To improve the reliability of the aviation part of the research, an external industry expert was interviewed to compare the findings from the companies, which were confirmed. In the maritime industry part, to increase the reliability of the research, by interviewing representatives from fields of research, education, and the public sector, in addition to the company representatives.

In the future, the impact of this research will be gauged by its capacity to catalyse constructive transformations within the airline and maritime sectors. Through encouraging collaboration and knowledge exchange, there is potential to spur innovation, diminish environmental footprints, and elevate sustainability standards across transportation industries in Europe.

In summary, this study underscores the importance of a holistic approach to sustainability, one that considers the unique challenges and opportunities facing both the airline and maritime industries. This study emphasizes the imperative of embracing a sustainability paradigm, tailored to the distinctive landscapes of both the airline and maritime sectors. By fostering unified action towards a sustainable future, the cultivation of the European transportation sector can be anticipated that is not only environmentally conscious but also prepared to meet the needs of generations to come.

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ECONOMICS AND CULTURE 21(1), 2024

DOI: 10.2478/jec-2024-0012

EXPERIMENTAL EVALUATION OF MOST SUSTAINABLE COMPANIES: IMPACT ON ECONOMIC GROWTH, RETURN ON EQUITY (ROE) AND METHODOLOGICAL COMPARISON

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Received 2 April 2024; accepted 30 May 2024

Abstract

Research purpose. The study aims to analyse, how the sustainable performance of the company impacts the economy and businesses' economic performance, and to build a model, using environmental, social, and financial indicators.

Design / Methodology / Approach. To achieve this goal such methods as the Pearson correlation, Multiple Linear Regression, Cook's distance method, K-nearest neighbour and COPRAS technique were implemented.

Findings. The results indicate no significant correlation between the sustainability activities of companies and the GDP of their respective countries, nor between companies' ROE and their sustainability performance. These findings suggest that conventional methods of evaluating corporate sustainability may not accurately reflect its economic impacts. Furthermore, discrepancies observed between the Corporate Knights rankings and those calculated using the COPRAS method highlight the critical need for a deeper examination of assessment methodologies. This outcome calls for a reassessment of sustainability practices and methodologies to better understand and leverage their benefits in the corporate and economic realms. While the study provides initial insights into the current sustainability assessments, further research should explore alternative evaluative models and their implications across different industries.

Originality / Value / Practical implications. Companies have a significant impact on the environment and society, and sustainability is important not only for ethical concerns but also for financial and economic reasons.

Keywords: sustainability, sustainable performance, sustainable companies, impact of sustainability, economy.

JEL codes: M15, M21.

Introduction

From pre-industrial times, the world's temperatures have risen by 1.1°C, according to the Intergovernmental Panel on Climate Change (IPCC). This increase is the result of greenhouse gas emissions from human activities, including business (IPCC, 2021). This suggests that every year the risks created by human activity will become an increasing concern both for society and for the state and businesses. Environmental hazards, including extreme weather events, biodiversity loss, and the failure of global climate action, are the most probable and significant dangers confronting the world in the coming ten years, according to the World Economic Forum's (WEF) Global Risks Report 2021 (World Economic Forum, 2021). Therefore, it is essential to conduct a thorough evaluation of corporate behaviour with the goal of proactively addressing the current consequences of human activity as well as mitigating the risks they pose.

The reassessment of a company's sustainable development concerns not only global environmental issues, but also social trends and inclusive management policies. According to the findings of the 2021 Edelman Trust Barometer, a global survey on institutional trust, 61% of respondents think CEOs should take the initiative on societal concerns rather than waiting for the government to impose change

(Edelman, 2021). Thus, companies now need to build a strong system of social responsibility to meet the needs of modern society.

Surveys show that companies have a significant impact on the environment and society and that sustainability is important not only for ethical reasons but also for financial and economic reasons. A study by Harvard Business Review found that companies that prioritize sustainability outperform their peers financially in the long run, with a 4.8% higher return on assets and a 5.4% higher return on equity (Nasdaq, 2019). By incorporating sustainable practices into their operations, companies can create new markets and new revenue streams, reduce costs, manage risk, and enhance their reputation. Moreover, they are better positioned to succeed in the long term and are more attractive to investors, employees, and customers. From a global perspective, the promotion and development of sustainable companies can have a significant impact on achieving an equitable future. According to the Business & Sustainable Development Commission, fulfilling the Sustainable Development Goals (SDGs) of the United Nations could open up $12 trillion in economic opportunities and generate 380 million new employments by 2030 (Development Commission, 2017).

Corporate sustainability refers to corporations taking on sustainability difficulties by integrating environmental and social considerations into their strategy, business model, and ultimately their business operations (Manninen & Huiskonen, 2022)**.** It means that the company invests in sustainable technologies and processes to manage resource efficiency, creates a fair and ethical working environment with respect to human rights throughout the company's supply chain and simultaneously generates revenue and maximizes profits.

In order to promote sustainable development, companies need to adopt a forward-thinking and comprehensive view on sustainability, which requires companies to consider the long-term impact of their actions on the planet and society and take steps to ensure that they operate in an environmentally responsible and socially conscious manner (Manninen & Huiskonen, 2022) This underscores the importance of measuring sustainability using a variety of indicators and considering their interrelationships, as this is supposed to help businesses make informed decisions that contribute to a more sustainable future. It was expected that the adoption of circular economy practices will drive companies towards greater sustainability, nevertheless, this impact could be unclear with stakeholder pressure, digitalization growth and other variables (Mora-Contreras et al., 2023).

Companies must conduct a thorough evaluation of their business strategies and sustainability efforts. The most frequently used definition measures a company's concentration and advancement in three areas known as the "triple bottom line": financial prosperity, environmental integrity, and social justice (Ajmal et al., 2017). The main goal of each company is to gain profit, which means that the economic sustainable performance is determined by the ability to generate it on a long-term basis. The performance of economic sustainability is typically evaluated by measuring long-term operational efficiency, effectiveness, and productivity. Such measurements are commonly disclosed through financial indicators in financial statements, including return on equity, return on assets, and economic value added. These key performance indicators can be particularly useful to investors, as they enable them to more accurately evaluate the risks and returns associated with their investments (Alsayegh et al., 2020). Due to the presence of various environmental issues on a global scale, such as ozone depletion and global warming, manufacturers are facing growing pressure from customers, governments, and non-governmental organizations to act responsibly towards the environment and future generations. These entities expect manufacturers to take into account the environmental impact of their activities (Ali et al., 2019). That’s why measuring the environmental sustainability of the company, it is essential to check the rates of emissions and resource productivity in the sustainability report. Social sustainability is no less important for the performance of the company in the market. Effective management strategies help fulfil the sustainability criteria of balancing social equity, promoting health, wellness, and the overall well-being of both the organization and its employees. These practices aid in achieving economic stability and environmental balance (Amrutha & Geetha, 2020). Additionally, it plays a crucial role in business reputation, which is a key to building a successful business and providing an attractive return on investment for shareholders. Based on the findings, to build a good reputation, companies need to create a long-term orientation culture that analyses how each business decision affects their employees (Kucharska & Kowalczyk, 2019).

Cecilia Van Der Steen in her study "The impact of Corporate Sustainability on Firm Value, using the Corporate Knights' Global 100 sustainable rankings Master Thesis Finance Tilburg School of Economics and Management" implemented the multivariate regression analysis to answer the question "What is the impact of corporate sustainability on firm value?". The author assessed the reaction of investors to companies appearing in Corporate Knights' Global 100 sustainable rankings. It was found that investors appreciate the companies published in the report more, and they react negatively when a company falls in its position in the list. The results, generally, represent that companies need to enhance their practices related to corporate sustainability to continue attracting investors (Van Der Steen, 2020). L. M. Schreijer conducted a study, which discovered that companies listed in the Corporate Knights Global 100 Sustainability Index have higher cumulative abnormal returns, which also indicates a positive relationship between sustainability performance and financial performance (Schreijer, 2020). Rashid Ameer and Radiah Othman in their article "Sustainability Practices and Corporate Financial Performance: A Study Based on the Top Global Corporations" received the statistical results, showing that businesses which prioritize sustainable practices exhibit better financial performance as evaluated by metrics such as return on assets, pre-tax profit, and cash flow from operations. Based on these studies, it can be assumed that the sustainable development of a company affects its economic performance (Ameer & Othman, 2012).

However, not all studies can confirm this. Robert Sroufe and Venugopal Gopalakrishna-Remani in the article "Management, Social Sustainability, Reputation, and Financial Performance Relationships: An Empirical Examination of U.S. Firms" were building a representative sample of top sustainable companies from such lists as Newsweek's rankings of green companies, The Corporate Knight's Global 100, 100 Best Corporate Citizens. The relationships between sustainability practices and financial performance were measured using structural equation modelling. There were no notable correlations discovered between social sustainability and either reputation or financial performance. Authors suggest that the accounting and financial metrics currently used may not be reliable indicators of how well social sustainability practices are being implemented in the future (Sroufe & Gopalakrishna-Remani, 2019). It means that the impact of sustainable performance could be measured not accurately due to methodology. Focusing on social and environmental responsibility, in combination with effective corporate governance, can contribute to creating value in a broader sense, but factors such as corporate size and available resources also play a significant role (Manninen & Huiskonen, 2022).

According to Ali Alshehhi, Haitham Nobanee, and Nilesh Khare methodologies of studies on the topic of sustainable development of companies can differ because of measurements for the dependent variable of corporate financial performance. Also, the results of studies are representative of the particular data, industry, company size, or market that was investigated. Authors conducted a review, in which it was found that 78% of articles reported a positive correlation between sustainability and financial performance. Only 7% of the articles reported no impact, while 6% of the articles reported a mixed relationship, where some sustainability practices had a positive impact, while others had a negative effect (Alshehhi et al., 2018).

Ahsan Anwar, Summaira Malik, and Paiman Ahmad "Cogitating the Role of Technological Innovation and Institutional Quality in Formulating the Sustainable Development Goal Policies for E7 Countries: Evidence from Quantile Regression" used uses the Stochastic Impacts by Regression on Population, Affluence and Technology (STIRPAT) model to find the link between sustainable development and macroeconomics factors. They suggest that governments should implement institutions, which will improve the effectiveness of rules and regulations related to sustainable development goals, in particular, environment-related policies (Anwar et al., 2022).

Galletta et al. (2022) use panel regression to find the relationship between gender diversity and corporate performance in the bank industry. They found that augmenting the representation of women in leadership roles within banks can enhance their value-generation capabilities and potentially enhance their financial and societal outcomes (Galletta et al., 2022).

Praveen Kumar and Mohammad Firoz applied eight different OLS multivariate regressions to analyze the connection between Environmental, Social and Governance disclosures and Corporate Financial Performance and discovered a positive relationship between those factors (Kumar & Firoz, 2022).

Evaluating sustainability is challenging due to the lack of a universally accepted definition of sustainability and the complex and multifaceted nature of the factors involved. There are plenty of methods how to assess sustainability, including sustainability reporting, environmental, social, and governance (ESG) ratings, corporate social responsibility (CSR) reporting, and others (Ioannou & Serafeim, 2019). However, there is no standardized approach for assessing the sustainability of a company. Evaluating the sustainability performance of various businesses and drawing conclusions about the wider economic ramifications of sustainable business practices may be problematic. Thus, the research problem of this study is how to evaluate the impact of corporate sustainability on the domestic economy, using regression analysis. The aim is to build a model, using environmental, social, and financial indicators of the specific company. To achieve this goal several tasks should be implemented during the work:

- To conduct a literature review and bibliographic analysis of the relevant literature on the topic of sustainability.
- To select and apply a suitable methodology to address the research questions.
- To perform the empirical analysis of the data, using the appropriate methodology.
- To synthesize the findings and draw evidence-based conclusions.

Bibliographical Analysis of Sustainable Development Regarding Company Financial Results

Materials and Methods

In the pursuit of understanding sustainability within the corporate sector and its subsequent impact on economic growth, Return on Equity (ROE), and the methodological approaches used for evaluation, we embarked on an extensive bibliometric analysis. Bibliometric analysis stands as a widely utilized and detailed approach for sifting through and understanding large amounts of scholarly data. Academics employ bibliometric analysis to track the latest trends and measure performance in scholarly articles and journals, discern patterns of collaboration among researchers, and dissect the foundational structure of a field as documented in the literature (Donthu et al., 2021). By reviewing literature from the past decade with the implementation of bibliographic analysis, Bartolacci et al. (2020) found a generally positive link between companies' sustainable practices and their financial success and competitiveness. Nobanee et al. (2021) used bibliometric methods to analyse literature related to sustainability practices and risk management, utilizing VOSviewer to identify critical concerns and contributions in the field, highlighting the growing importance of sustainability in managing risks within the corporate sector.

Drawing from the rich repository of the Web of Science Core Collection, our search strategy is intended to encapsulate articles that intersect the domains of corporate sustainability, company performance, and economic metrics. We focused on peer-reviewed articles published during the years 2021, 2022, 2023, and up to the present moment in 2024, representing the most recent and relevant research in the field. The search was refined to include only those articles that address "sustainability", "companies", and "economic" aspects in all fields, a combination poised to yield insights pertinent to the most sustainable companies. Our search resulted in a collection of 1475 articles, carefully filtered to include only those that address substantial research on sustainability's economic impact. This selection spans a broad spectrum of European contexts, ensuring a rich variety of sustainability practices are represented in our analysis.

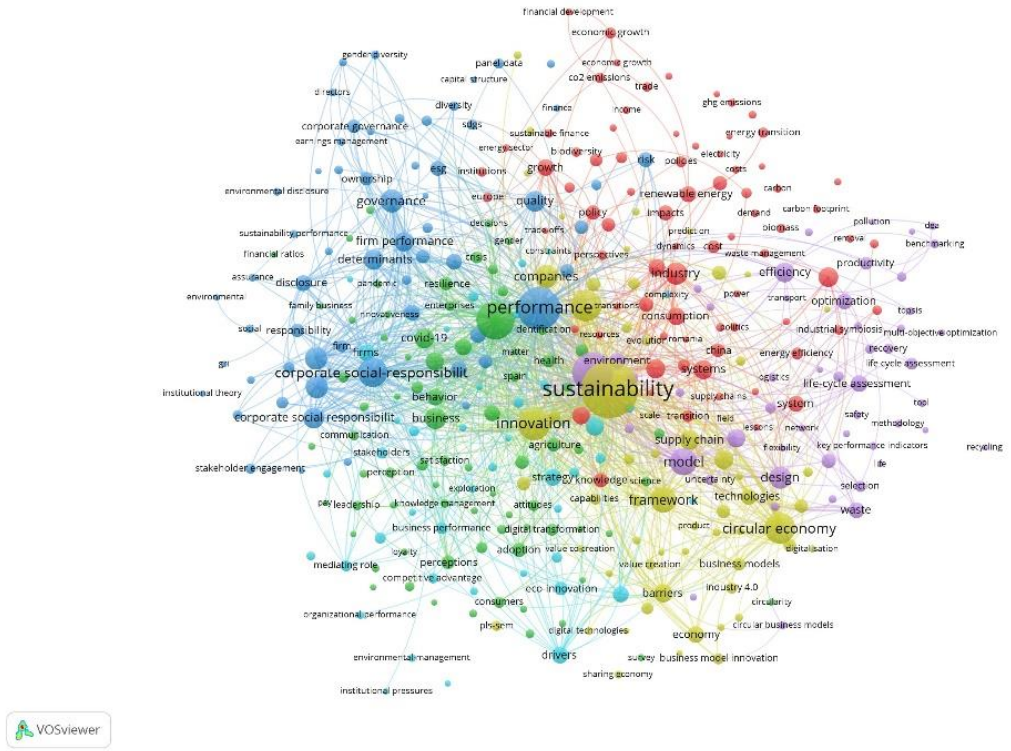

Fig. 1. VOSviewer Results of Total Link Strength (Source: Composed by the authors)

Utilizing VOSviewer, a visualization of the bibliographic data unveiled six distinct clusters, each representing a thematic concentration within the literature. These clusters provide a visual map of the interconnectedness of key concepts such as “corporate social responsibility”, “sustainability”, “performance”, “innovation”, “circular economy”, “environment”, and “efficiency” among others. The intricacy of these conceptual linkages reflects the multifaceted nature of sustainability evaluations and their influences on economic indicators like ROE.

The graph showcases various keywords and their corresponding link strength. reflects the total strength of the connections for each term. It's a measure that takes into account not just the number of links but also the significance of those links, providing an indication of how influential a term is within the cluster. “Sustainability” sits at the top, which suggests it's the most frequently discussed or most significant topic in the literature. It underscores the foundational role of sustainability as a concept that permeates all other areas. “Performance” and “financial performance” also feature prominently, indicating that much of the literature makes a direct connection between sustainability initiatives and financial outcomes. This may point to analyses that evaluate the return on investment for sustainability practices or assess how these practices affect profitability and value creation. “Corporate social responsibility” and “CSR” are significant, reflecting the growing trend of integrating social and environmental concerns into business operations and strategy. The high link strength of these terms indicates that the social and ethical dimensions of sustainability are frequently linked to corporate financial performance, possibly in terms of risk management, brand reputation, and customer loyalty. The distribution and weight of these keywords suggest that sustainability is not viewed in isolation. Instead, it is intricately linked to financial performance, management practices, governance, innovation, and supply chain management. This provides a comprehensive view of how embracing sustainability can lead to financial benefits and contribute to the long-term success of a company.

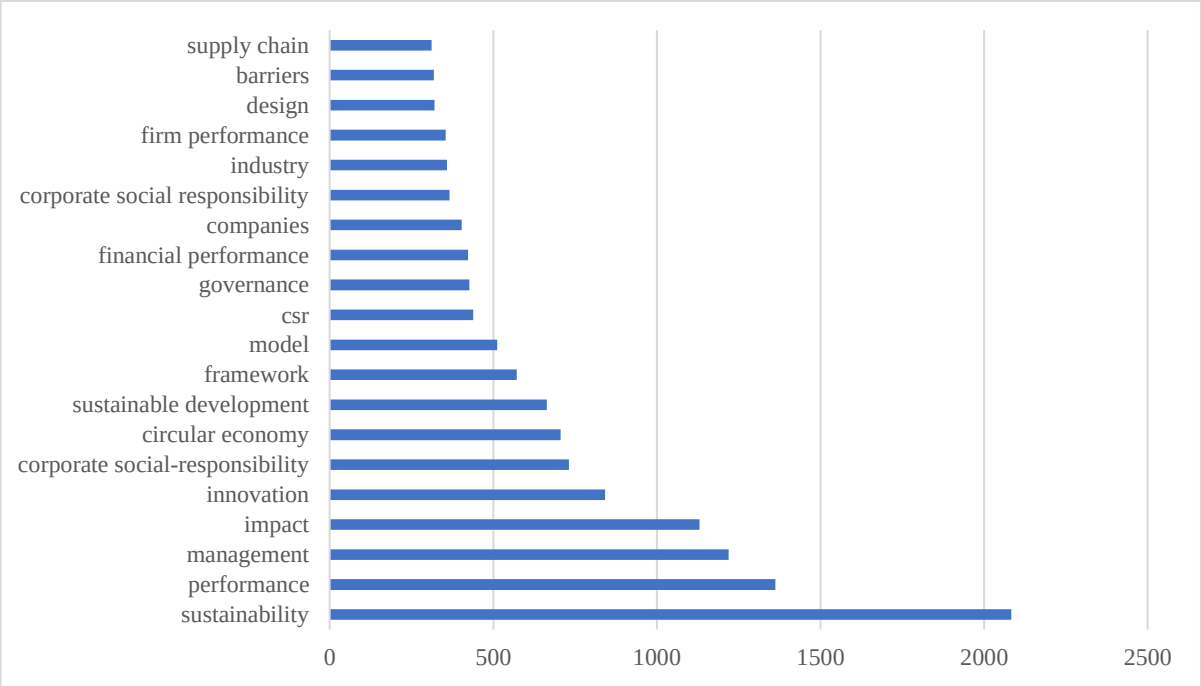

Fig. 2. Keywords with the Highest Link Strength (Source: Composed by the authors)

Table 1. Summary of the Most Related Keywords From 6 Clusters (Source: Composed by the authors)

Factor	Keyword	Cluster	Total link strength
Ecological	Consumption	1	212
	Energy	1	180
	Renewable energy	1	162
	Emissions	1	137
	CO2 emissions	1	81
	Energy efficiency	1	55
	Waste management	1	53
	Carbon	1	45
	Water	1	42
	Carbon footprint	1	37
	Electricity	1	32
	Greenhouse-gas emissions	1	32
	Resource efficiency	4	56
	Food waste	4	36
	Waste	5	208
	Cleaner production	5	64
	Pollution	5	39
	Recycling	5	15
	Sustainable production		47
Social factor	Health	2	88
	Ethics	2	82
	Networks	2	74
	Communication	2	65
	Employment	2	47
	Pay	2	44
	Gender	2	42
	Socioemotional wealth	2	40
	Employees	2	39
	Social responsibility	2	33
	Corporate social responsibility	3	731

	Women	3	80
	Diversity	3	77
	Gender diversity	3	77
	Safety	5	47
Financial factor	Trade	1	57
	Market	3	118
	Investment	3	115
	Stakeholder engagement	3	103
	Profitability	3	93
	Economic performance	3	76
	Volatility	3	35
	Investments	4	37
	Key performance indicators	5	42
	Business performance	6	120
	Stakeholders	6	96
	Economic performance	6	63

Cluster 1 is the most significant for ecological factors of sustainable development, containing the majority of the keywords such as “consumption”, “energy”, and “renewable energy”. These keywords also have high weights, indicating a strong link strength. Clusters 4 and 5 also contribute to the ecological factor but with fewer keywords. The keyword “waste” in Cluster 5 has a particularly high weight, suggesting a significant relevance to the ecological factor within that cluster.

The social factor is mainly addressed within Clusters 2 and 3. Cluster 3 has the highest weight by far for “corporate social responsibility”, indicating a very strong association with this factor. Other important keywords in the social factor include “health”, “ethics”, and “gender diversity”, spread across Clusters 2 and 3, with relatively high weights suggesting strong link strength.

Clusters 3 and 6 contain most of the financial factor keywords. Cluster 3 has several high-weight keywords such as “market” and “investment”, which are central to financial considerations. Cluster 6 includes “business performance” with the highest weight in this factor, implying it's a key keyword. “Stakeholders” and “economic performance” are also significant in this cluster.

The clustering of keywords reveals patterns that provide a conceptual framework for understanding the multi-dimensional impact of corporate sustainability on a company's financial results. Each cluster represents a compilation of themes and discourses that inform the intricate relationship between sustainable practices and financial performance. The diversity of focus areas across clusters signifies the breadth of sustainability's influence, encompassing environmental, social, and economic aspects, which has different implications for financial outcomes.

Table 2. Description of Each 6 Clusters (Source: Composed by the authors)

Cluster	Keywords description
Cluster 1	Ecologically focused, with the majority of high-weight keywords related to energy and emissions, suggesting significant attention to these topics in sustainability research.
Cluster 2	Centres on the social aspect, featuring keywords related to health, ethics, and employment, pointing to an emphasis on the human and ethical side of sustainability.
Cluster 3	Dominant in social and financial discussions, with a very high weight for 'corporate social responsibility', indicating a strong emphasis on the intersection of corporate actions and sustainability.
Cluster 4	Features ecological keywords such as 'resource efficiency', indicating discussions in the literature on efficient resource use within sustainable practices.
Cluster 5	Adds to ecological discussions, especially with the keyword 'waste', suggesting an emphasis on waste management and cleaner production practices.
Cluster 6	Significant for financial keywords, with 'business performance' having the highest weight, indicating a focus on sustainability's impact on business outcomes.

The keywords from the 6 clusters represent how the ecological, social, and financial factors contribute to the corporate framework. It shows that sustainability is not an isolated strategic ideal. As we extract insights from the latest research contained in articles published from 2021 to 2024, we gain clarity in the modern understanding that sustainable business practices are not just an ethical choice but are also increasingly recognized as catalysts for financial sustainability and competitive advantages in the corporate sphere.

The Pearson correlation coefficient gauges the degree of linear interdependence between two real-valued vector random variables. It was the initial established method of measuring correlation and continues to be one of the most frequently employed methods for assessing relationships. The equation of the Pearson correlation coefficient is presented below (1) (Zhou et al., 2016):

$$r_{xy} = \frac{\sum_{i=1}^{m}(x_i-\bar{x})(y_i-\bar{y})}{\sqrt{\sum_{i=1}^{m}(x_i-\bar{x})^2(y_i-\bar{y})^2}} \quad (1)$$

Where:

$\bar{x} = \frac{1}{n}\sum_{i=1}^{N} x_i$ refers to the mean of x;

$\bar{y} = \frac{1}{n}\sum_{i=1}^{N} y_i$ refers to the mean of y.

The range of the coefficient r_{xy} is between -1 and 1, and it remains unaltered by any linear modifications of the variables involved.

Multiple Linear Regression (MLR) is a statistical method that aims to anticipate the outcome of a response variable by employing several explanatory variables. The primary goal of MLR is to construct a model that describes the linear connection between the independent variables (x) and the dependent variable (y), which will be examined. The fundamental formula for MLR is (2):

$$y = \beta_0 + \beta_1 x_1 + \ldots \beta_m x_m + \varepsilon \quad (2)$$

In Regression Analysis, Cook's distance (Di) serves the purpose of identifying influential outliers among a group of predictor variables, meaning points that have an adverse effect on the regression model. It combines the leverage and residual values of each observation, and the Cook's distance increases as the leverage and residuals increase. The equation that calculates Cook's distance remains as follows (3):

$$\frac{\sum_{j=1}^{n}(\hat{Y}_j-\hat{Y}_{j(i)})^2}{(p+1)*\sigma^2} \quad (3)$$

K-nearest neighbour is a type of semi-supervised learning technique that necessitates training data and a pre-determined k value to locate the k closest data points based on distance calculation. When k data points have varying classes, the algorithm predicts that the unknown data point belongs to the majority class. The Euclidean distance, which is a metric used to compute the distance between two points, is calculated by the next equation (4) (Chomboon et al., 2015):

$$d_{st}^2=(x_s - y_t)^* (x_s - y_t)' \quad (4)$$

As a result of the multifaceted nature of sustainability goals and the intricate interplay of socio-economic and biophysical systems, there is an increasing trend in employing multi-criteria decision analysis

(MCDA) methodologies for sustainable decision-making (Raza et al., 2023). To evaluate the ranks of companies, based on sustainable performance, a COPRAS multi-criteria decision-making method in combination with the simple additive weighting technique has been employed for comparison (Zavadskas et al., 2008, 2009).

To apply the COPRAS technique, the normalized x values for the j criteria of the i alternative can be computed as follows:

$$\overline{x_{ij}} = \frac{x_{ij}}{\sum_{i=1}^{m} x_{ij}} \text{ if min is preferable or max} \quad (5)$$

Where:

$x_{ij}<0$, under conditions $x_{ij}<0$;

$x_{ij}>0$, under conditions $x_{ij}>0$.

To determine the optimality criterion Qi in the COPRAS approach, the following procedure can be adopted:

$$Q_i = \frac{S_{+i}+\left(\min_i S_i \cdot \sum_{i=1}^{m} S_{-i}\right)}{S_{-i}\cdot\left(\sum_{i=1}^{m} S_{-i}/S_{-i}\right)} \quad (6)$$

In this study, the list of the 100 most sustainable companies, was conducted by Corporate Knights. were used. The ranks were calculated based on the next approaches:

- The ranking is mainly based on data that is made public, such as financial statements, sustainability reports, and company websites.
- There is no requirement for companies to submit any payment or materials in order to be considered.
- Companies that are part of the Global 100 Universe are contacted to verify the data prior to the finalization of the project.
- The methodology includes a set of up to 25 key performance indicators (KPIs) encompassing aspects, such as resource management, employee management, financial management, sustainable revenue and investment, supplier performance (Corporate Knights, 2023).

Results

To address the research question of this study, a reliable sample of data should be built. The 2022 Global 100 Sustainable Companies report published by Corporate Knights was taken as a base of this analysis. Corporate Knights Inc. is a B Corporation that specializes in sustainable economy research and media. It was established in 2002 by Toby A. Heaps, Paul Fengler, and Peter Diplaros, with a focus on promoting an economic system that benefits both society and the environment. Corporate Knights' research department generates worldwide sustainability rankings, study reports, and financial product ratings that assess corporate sustainability performance. Their most prominent ranking is the Global 100 Most Sustainable Corporations in the World, which is published annually during the World Economic Forum. Information on fiscal and sustainability performance researchers are gathering by reviewing yearly reports, sustainability reports, and corporate websites, and occasionally using data from third-party sources. During the verification stage, companies supplied additional supporting documents and context to assist us in reflecting the most precise figures feasible (Corporate Knights, 2021). Rankings provided by Corporate Knights were based on publicly disclosed data and are enough diverse to cover the research aims.

Some challenges arose with the processing of the data sample. More than half of the collected factors were deleted from the data set, because of the strong correlation between them. Removing correlated

indicators is an essential step to avoid the potential problems with multicollinearity, which causes difficulties with the interpretation of the model. Some indicators didn't contain full data, which also was a reason to delete them from the sample. Only 12 independent variables remained for the regression analysis. Since some factors still contained empty values, the K-Nearest Neighbour (KNN) Algorithm was implemented. The process of k-nearest neighbour imputation involves filling in missing values of incomplete instances by using the average of the corresponding attribute of its K-nearest neighbours. This technique is effective in handling records with multiple missing values and considers the correlational data structure (Cheng et al., 2019).

A dependent variable was chosen based on the GDP of countries each company belongs to, to evaluate the impact of corporate sustainable results on the global economy. Also, Return on Equity was considered to measure the relationships between sustainable and economic performance (Balabanis et al., 1998).

The table below represents independent variables, which will be used for further analysis.

Table 3. Indicators of Company Sustainable Performance (Source: Composed by the authors)

Ecological factors	Financial factors	Social factors
Energy Productivity Score	Cash Taxes Paid Ratio	Injury Rate Ratio
Carbon Productivity Score	Clean Revenue Ratio	Employee Turnover Ratio
Water Productivity Score	Clean Investment Ratio	Non-male Boards Ratio
Waste Productivity Score	Purchasing Power Parity Revenue	Racially Diverse Among Boards Ratio

The correlation analysis for the GDP of each country and the sustainable performance of the company was made to investigate how sustainability results impact the global economy.

Results show that Clean Revenue Ratio (0.412), Clean Investment Ratio (0,224), Purchasing Power Parity Revenue (0,171), and Racially Diverse Among Boards Ratio (0,285) show positive correlations with GDP. Among these, the Clean Revenue Ratio shows the strongest positive correlation. It was found that there is no significant correlation between GDP and Carbon Productivity Score (-0,119), Water Productivity Score (-0,090), Cash Taxes Paid Ratio (-0,113), Injury Rate Ratio (0,088), Employee Turnover Ratio (-0,028) and Non-male Boards Ratio (-0,229). It means that there wasn't found significant impact of sustainable performance indicators on GDP. The table of correlation results is presented below:

Table 4. Pearson Correlation Results Between Sustainable Performance and GDP (Source: Composed by the authors)

Factors	Pearson correlation	p-value
Energy Productivity Score	-0,031	0,808
Carbon Productivity Score	-0,119	0,358
Water Productivity Score	-0,09	0,487
Waste Productivity Score	-0,191	0,138
Cash Taxes Paid Ratio	-0,113	0,382
Clean Revenue Ratio	0,412	<0,001
Clean Investment Ratio	0,224	0,08
Purchasing Power Parity Revenue	0,171	0,183
Injury Rate Ratio	0,088	0,495
Employee Turnover Ratio	-0,028	0,829
Non-male Boards Ratio	-0,229	0,073
Racially Diverse Among Boards Ratio	0,285	0,025
Cook's Distance	0,339	0,007

Since no correlation was found between sustainability and GDP, the evaluation of the relationship between sustainable indicators and the economic performance of the company will be made.

Before the correlation, it was checked if there were any exceptions in the data with the Cook distance methodology. The results show that in one line there was an exception. Apple Inc. was excluded from the analysis because its Cook distance was higher than 1.

The Pearson correlation was performed to analyse the relationship between ROE, as an indicator of the financial performance of the company, and factors of sustainable performance.

The results of the Pearson correlation analysis show that ROE has a positive correlation with Clean Revenue Ratio (r=0,113) and Clean Investment Ratio (r=0,160), but a negative correlation with Purchasing Power Parity Revenue (r=-0,122), Injury Rate Ratio (r=0,183), Non-male Boards Ratio (r=-0,088), and Racially Diverse Among Boards Ratio (r=-0,062). The correlations with Waste Productivity Score, Cash Taxes Paid Ratio, Carbon Productivity Score, Energy Productivity Score, and Water Productivity Score are not statistically significant ($p > 0.05$).

It is important to note that the statistical significance of the correlation coefficients was also tested using a two-tailed hypothesis test. The p-value for each correlation coefficient indicates the probability of observing such a correlation by chance, assuming that there is no true correlation between the variables. A p-value less than 0.05 is generally considered statistically significant, indicating that the correlation coefficient is unlikely to have occurred by chance.

In this case, the correlation coefficients for Clean Revenue Ratio, Clean Investment Ratio, Purchasing Power Parity Revenue, Injury Rate Ratio, Non-male Boards Ratio, and Racially Diverse Among Boards Ratio have p-values greater than 0,05, indicating that these correlations are not statistically significant. Therefore, it can be concluded that the observed correlations between ROE and these variables may be due to chance and not a true relationship between the variables. There is no statistically significant relationship between the ROE and sustainable performance factors.

Table 5. Pearson Correlation Results Between Sustainable Performance and ROE (Source: Composed by the authors)

Factor	Pearson correlation coefficient	Two-tailed p-value
Energy Productivity Score	-0,071	0,586
Water Productivity Score	-0,029	0,826
Carbon Productivity Score	-0,032	0,807
Waste Productivity Score	0,029	0,822
Cash Taxes Paid Ratio	-0,021	0,873
Clean Revenue Ratio	0,113	0,388
Clean Investment Ratio	0,16	0,219
Purchasing Power Parity Revenue	-0,122	0,351
Injury Rate Ratio	0,183	0,159
Employee Turnover Ratio	-0,052	0,691
Non-male Boards Ratio	-0,088	0,501
Racially Diverse Among Boards Ratio	-0,062	0,636

Since the data does not meet the assumptions of a Pearson correlation, Nonparametric Correlations (Kendal method) were performed. The Kendall's tau-b coefficients for ROE and each of the independent variables are generally small and not statistically significant at the 0,05 level, except for the Clean Revenue Ratio and Injury Rate Ratio. Clean Revenue Ratio has a positive correlation coefficient of 0,109, indicating a weak positive association with ROE, although the p-value of 0,219 suggests this association is not statistically significant. Injury Rate Ratio has a correlation coefficient of 0,147, indicating a weak positive association with ROE, and the p-value of 0,095 suggests this association may be marginally statistically significant. The results suggest that there may be some weak associations between ROE and certain independent variables, but these associations are generally not statistically significant at the 0,05 level.

In the next step, the regression analysis was performed. The results are as follows. The model has a low R-squared value of 0,09, which means, that the model is statistically insignificant. The regression is not

statistically significant, as the F-value of 0,398 is not significant. This suggests that the independent variables are not significantly related to the dependent variable. Only a few independent variables have a significant effect on ROE. The Waste Productivity Score has a positive coefficient of 19,550, indicating that it has a positive relationship with ROE. The Injury Rate Ratio also has a positive coefficient of 2,641. The regression analysis shows that the relationship between sustainability metrics and ROE is weak and not significant, which means that the model is not suitable for practical use.

Table 6. Regression Model Summary of Sustainable Performance and ROE (Source: Composed by the authors)

Model Summary					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	0,301	0,09	-0,137	29,99431	1,922

To increase the statistical significance of the model the decision to exclude the economic factors from independent variables was made since the correlation between ROE and economic indicators of sustainability performance was discovered.

The results did not change drastically, as the correlation between the economic performance of companies and social and environmental factors remains insignificant. The results of the regression analysis will be put in the table below:

Table 7. Regression Model Summary of Sustainable Performance and ROE Without Economic Indicators (Source: Composed by the authors)

Model Summary					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	0,249	0,062	-0,08	35,10776	1,827

R-squared suggests that the significance of the model became even worse after the exclusion of economic variables. Since the results of correlation and regression analysis are extremely low, the COPRAS technique was utilized to revise the methodology of the company's sustainable performance evaluation. Firstly, the normalisation of the data was done, and then the new ranks were calculated to compare them with the Corporate Knights list.

Table 8 provides the results of the COPRAS method. Each company and country were included in the table. The new ranks were calculated based on normalised dependent factors (ROE, GDP) and independent variables (Energy Productivity Score, Water Productivity Score, Carbon Productivity Score, Waste Productivity Score, Cash Taxes Paid Ratio, Clean Revenue Ratio, Clean Investment Ratio, Purchasing Power Parity Revenue, Injury Rate Ratio, Employee Turnover Ratio, Non-male Boards Ratio, Racially Diverse Among Boards Ratio). Also, the Corporate Knights ranks was added.

Table 8. Ranking with COPRAS Method (Source: Composed by the authors)

Company	Country	Qi	Ui	Rank	Previous rank
Vestas Wind Systems A/S	Denmark	0,013581	28,70381	40	1
Chr Hansen Holding A/S	Denmark	0,015024	31,75346	28	2
Autodesk Inc	United States	0,022387	47,3152	8	3
Schneider Electric SE	France	0,023368	49,38851	7	4
City Developments Ltd	Singapore	0,01134	23,96708	51	5
American Water Works Company Inc	United States	0,019859	41,97274	13	6
Orsted A/S	Denmark	0,014037	29,66719	37	7
Atlantica Sustainable Infrastructure PLC	United Kingdom	0,014637	30,93499	31	8
Dassault Systems SE	France	0,017503	36,99303	20	9
Brambles Ltd	Australia	0,013815	29,19824	38	10

Sims Ltd	United States	0,020969	44,31781	11	11
Johnson Controls International PLC	Ireland	0,013173	27,84129	42	12
Kering SA	France	0,017337	36,64325	21	13
Koninklijke KPN NV	Netherlands	0,017541	37,07276	19	14
McCormick & Company Inc	United States	0,018363	38,81095	15	15
Schnitzer Steel Industries Inc	United States	0,01603	33,87974	25	16
Transcontinental Inc	Canada	0,016233	34,30969	23	17
Stantec Inc	Canada	0,011805	24,95047	49	18
Cascades Inc	Canada	0,009832	20,7802	58	19
Evoqua Water Technologies Corp	United States	0,028058	59,30136	2	20
Beijing Enterprises Water Group Ltd	China	0,018329	38,73956	16	21
Banco do Brasil SA	Brazil	0,017553	37,09975	18	22
Sekisui Chemical Co Ltd	Japan	0,010476	22,14225	55	23
Engie Brasil Energia SA	Brazil	0,012105	25,58464	47	24
Neste Oyj	Finland	0,014513	30,67439	32	25
Iberdrola SA	Spain	0,014319	30,26292	33	26
Xerox Holdings Corp	United State	0,011176	23,62004	52	27
Salesforce.Com Inc	United State	0,025129	53,11082	4	28
Cisco Systems Inc	United State	0,022243	47,0116	9	29
Alstom SA	France	0,013165	27,82516	43	30
Legrand SA	France	0,014248	30,11371	36	31
Eisai Co Ltd	Japan	0,010172	21,4997	57	32
Ecolab Inc	Italy	0,013772	29,10815	39	33
Canadian Pacific Railway Ltd	Canada	0,012169	25,71935	46	34
Novozymes A/S	Denmark	0,010613	22,43051	54	35
Alphabet Inc	United States	0,027482	58,08448	3	36
Verbund AG	Austria	0,011123	23,50966	53	37
Workday Inc	United States	0,018174	38,41236	17	38
SunPower Corp	United States	0,014266	30,15111	35	39
Metso Outotec Corp	Finland	0,009061	19,15111	61	40
IGM Financial Inc	Canada	0,013152	27,7967	44	41
Xinyi Solar Holdings Ltd	China	0,01306	27,60352	45	42
Sprouts Farmers Market Inc	United States	0,011408	24,1121	50	43
TSMC	Taiwan	0,023944	50,60658	5	44
Vitasoy International Holdings Ltd	Hong Kong SAR	0,009708	20,5192	59	45
Samsung SDI Co Ltd	South Korea	0,013219	27,93835	41	46
LONGi Green Energy Technology Co Ltd	China	0,014973	31,64587	29	47
Apple Inc	United States	0,047314	100	1	48
Telus Corp	United States	0,014722	31,1149	30	49
HP Inc	United States	0,010206	21,56996	56	50
Atea ASA	Norway	0,016066	33,95701	24	51
Tesla Inc	United States	0,02046	43,2434	12	52
Konica Minolta Inc	Japan	0,008989	18,99902	62	53
Hewlett Packard Enterprise Co	United States	0,02115	44,70036	10	54
SAP SE	Germany	0,015126	31,96845	27	55
Storebrand ASA	Norway	0,023501	49,66984	6	56
Sun Life Financial Inc	Canada	0,014277	30,17537	34	57
Koninklijke Philips NV	Netherlands	0,015892	33,58765	26	58
Arcelik AS	Turkey	0,016994	35,91713	22	59
Citrix Systems Inc	United States	0,019771	41,7869	14	60
UniCredit SpA	Italy	0,012014	25,39285	48	61
Commerzbank AG	Germany	0,009075	19,17988	60	62

The results of the COPRAS method suggest that the ranks of Corporate Knights calculated here are absolutely different, except for two cases. Sims Ltd. from the United States represents the 11th place in both methodologies. Also, McCormick & Company Inc., a US company, placed 15th rank in the new ranking as well as in the previous one.

Such different results indicate that the methodology for assessing the sustainability of the company is still challenging. It is needed to investigate in greater depth the impact of social, ecological, and economic factors on a company's sustainable performance and how to evaluate it.

Conclusions

To proactively address these consequences and mitigate the risks, companies need to reassess their sustainable development practices, including environmental and social considerations. In this case, it is important to understand, how different factors of sustainable performance impact the economy and performance of the company. In this publication, the regression and correlation analysis were performed to evaluate how the sustainability of the company influences the economy. The analysis also was implemented to find out how sustainable performance impacts the financial performance of the company. Also, the COPRAS method was utilized to compare the calculations with the methodology of Corporate Knights on evaluating the sustainable performance of companies based on ecological, social, and economic indicators.

The study analysed the data from the 2022 Global 100 Sustainable Companies report published by Corporate Knights and used the K-Nearest Neighbour algorithm to fill in missing data. Based on the results presented, it can be concluded that there is no significant correlation between the sustainable performance of companies and the GDP of the countries they belong to. The relationship between sustainable performance indicators and the economic performance of companies was investigated by analysing the Return on Equity (ROE) and factors of sustainable performance. The Pearson correlation analysis showed that there is no statistically significant relationship between the ROE and sustainable performance factors. Therefore, based on the results obtained using the selected indicators in this analysis, it can be concluded that a significant correlation between ROE and sustainable performance indicators was not established. This conclusion does not imply that such a relationship is universally absent, but rather, it reflects the specific context and methodologies applied in this study.

Sustainable performance may not always directly impact financial performance. There could be difficulties in accurately measuring both sustainability and financial performance. Sustainability encompasses a wide range of practices and impacts that are not always easily quantifiable or directly linked to short-term financial metrics. Similarly, financial outcomes influenced by sustainability may be obscured by other economic factors. While the analysis did not incorporate company size, it is acknowledged that this factor could play a critical role in understanding the relationship between sustainable performance and financial performance (Ihsani et al., 2023). This conclusion suggests the need for further research, possibly incorporating company size, to discern the dynamics of this relationship more accurately.

Additionally, normalization of data was done, and new ranks were calculated based on normalised dependent and independent factors. The results of the COPRAS method suggest that the ranks of Corporate Knights and calculated ranks are absolutely different except for two cases. It means that the methodology of calculations differs. Since it is important to investigate the methodology more. The differences in the rankings between the COPRAS method and Corporate Knights observed in this study could be attributed to several methodological variations, particularly in indicator selection and weighting impact of the assessment outcomes. This suggests a need for further research to conduct sensitivity analyses to understand which indicators most influence the rankings and to explore the effects of varying these weights. Additionally, comparing different sustainability assessment methodologies will help identify and mitigate the inherent biases and assumptions that each may introduce. Altogether, these areas of investigation will provide more comprehensive insights into improving the accuracy and reliability of sustainability assessments in future studies.

These results underscore the nuanced and context-dependent nature of the relationship between sustainability and financial performance. Methodological differences, such as the choice of indicators, the industry focus, company size, and market conditions, are critical factors that can influence outcomes. Furthermore, inconsistencies and a lack of transparency in corporate reporting can make it challenging to assess the relationship between sustainability practices and financial performance. Considering all

these factors is crucial for further research to accurately understand the relationship between sustainability practices and financial performance.

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ECONOMICS AND CULTURE 21(1), 2024

DOI: 10.2478/jec-2024-0013

METHODOLOGICAL ISSUES IN THE STUDY OF PLACE MARKETING IN SMALL VILLAGES

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Received 28 March 2024; accepted 20 May 2024

Abstract

Research purpose. Natural and economic changes in recent years have led Hungary to emphasise boosting domestic tourism. There has also been an increase in property prices in settlements near large cities, indicating an increase in the number of people wishing to settle there. These effects are putting increasing demands on municipalities, and municipal administrations need economic, management and marketing skills that are often lacking in the administration of Hungarian cities. In our previous systematic literature review, we identified four clusters of literature on publications in place marketing and place management published between 2018 and 2022. The present research aims to discuss the methodologies related to the research themes in each cluster. We aim to explore the research methods associated with each cluster and highlight the potential of methods that may have yet to be used. Our study aims to develop a methodological model that shows which areas are coupled with which methods and which ones could be used to extend research in the future.

Design / Methodology / Approach. Our research is meticulously grounded in a thematic clustering of literature selected from two reputable databases, WoS and Scopus. We conducted a systematic methodological analysis from this database, ensuring a comprehensive and unbiased view of the research landscape. We categorised the articles into thematic and methodological groups, revealing the research methods employed by the authors in each cluster. This rigorous analysis culminated in the development of a conceptual model, which provides an easily interpretable overview for future researchers.

Findings. Our results show that the research that emerges in each cluster is mainly investigated by researchers who use traditional marketing research tools. Particular emphasis is placed on interview and questionnaire research methods, as well as content analysis in the online space. Little space is given to other non-traditional methods that may also be useful. There is no correlation between the different areas and research methods. Researchers do not adapt their methodology to the field of study; instead, the methodological background of the research is determined by the problem at hand, their research framework, or their methodological knowledge.

Originality / Value / Practical implications. The methodological extension based on our study's results and the model allows researchers to move away from the most common and traditional methods of investigation and explore the field from a new perspective and with new methods. As a result of this new approach, it is possible to explore and interpret new types of results.

Keywords: place marketing, place management, research methodology.

JEL codes: M31, B41.

Introduction

Changes in recent years have led countries to focus on boosting domestic tourism. As a result, people living in large cities have turned to destinations further afield in the country rather than visiting cities and attractions close to home. The municipalities are increasingly competing to attract tourists (Petruzzellis, 2017). Due to economic difficulties and inflation, a significant increase in house prices has been observed in Europe over the last ten years (Eurostat, 2024). In addition, it has been noted that

house prices have increased in rural municipalities. One of the reasons for this is that property prices in the big cities have shifted some demand towards rural settlements.

These effects are increasing demands on local government and the need for economic, management and marketing skills that often need to be improved in small village management. The main reason is that political power relations and personal contacts are more important in the electoral process than professional skills. Thus, the small-scale management of a municipality is often forced to cope with everyday tasks, strategic decisions, project organisation, etc., without management and economic expertise. To carry out their work effectively, the management of small municipalities would need external consultancy assistance covering the areas of management, marketing, finance, strategic planning, etc. However, the fees for such consultancy services are very high, and the financial situation of small settlements needs to allow for their financing (Ott, 2022).

This research aims to map the methodological background of the research of the international studies published between 2018 and 2022. After a systematic literature review, we conducted a text analysis of the articles using NVivo software. After collecting the methodological background of the studies, we carried out single-variable statistical analyses to get a more complete picture of how the methodology of scientific studies is applied. Further visual analyses were carried out with the support of VOSviewer. Our results show that it is difficult for researchers to deviate from traditional primary research methods. Interviewing and questionnaires are still among the most common methods. However, systematic literature review, web page analysis and, in some cases, the use of models are also emerging.

Literature Review

Place marketing encompasses many different dimensions and perspectives. These include place branding, geographic and legal characteristics, and emotional attitudes (Grech, 2019). Settlement marketing is critical to attracting tourists, businesses, and investment, stimulating economic activity, and contributing to regional and urban development. It plays a significant role in sustaining infrastructure and economic growth (Maheshwari et al., 2015). Place marketing and place branding research faces many challenges. Several authors have revealed that studies are often poorly theoretically grounded, the study areas are fragmented, explanatory articles are few or incomplete, and the range of stakeholders is incomplete (Adamus-Matuszyńska & Dzik, 2023; Vuignier, 2017).

Digital marketing plays a vital role in place marketing as a modern marketing theory and methodology. It exploits the potential to influence consumer behaviour and stimulate and explore consumer opinions. Critical strategies for successful place marketing campaigns include understanding the essential characteristics of each stakeholder group. However, special attention should be paid to the fact that different marketing strategies may be appropriate in different regions (Bansal, 2023). Place marketing significantly impacts local economies. Local advertising has a positive correlation with tourism expenditures. Hotels in such locations achieve better economic results than their counterparts without external marketing support (Petrina et al., 2023). Research in any field must comply with specific ethical guidelines. These principles should be applied in the six phases of research, from the conceptualisation of the research to the evaluation of the results and the communication of the results (Ajuwon, 2020).

Research methods include the tools, processes, and techniques to answer a research question (Grech, 2019). They involve steps such as observation, questioning, hypothesis formulation, hypothesis testing, and data analysis to conclude. Several types of research methods are distinguished. We can talk about basic research and applied research. Basic research only sometimes produces results that are immediately applicable at the practical level. Primary research is driven by curiosity and the desire to expand knowledge in a particular field of research. Applied research aims to solve specific problems so that applied research results have direct practical consequences. The best way to describe the differences between applied and basic research is that basic research looks at individual cases without generalising and recognises that other variables are in constant flux. Conceptual research does not involve practical experiments. It is based on observation and analysis of existing concepts and theories. In contrast, in empirical research, the conclusions of the study are drawn strictly from concrete empirical, i.e., "testable" evidence. This empirical evidence can be gathered through quantitative and qualitative market research methods (Fairbrother, 2014).

Research methods determine the accuracy and consistency of a research instrument, such as a questionnaire, which is critical to ensuring valid and reliable results (Miller et al., 2023). Researchers have tremendous freedom in formulating hypotheses, designing, conducting, analysing, and reporting research. This can have an impact on the validity and reliability of research findings. Awareness of these choices is crucial to ensure the quality of research (Milewski & Roszak, 2023). In addition, cognitive biases and publication pressures can undermine scientific research's reliability, emphasising methodological rigour's importance (Campos & Pfister, 2023). Careful design and adherence to study protocols, including selecting appropriate methodology, is essential to prevent biased research results and false conclusions (Stapleton, 2019).

Research methods commonly used in settlement marketing research include both qualitative and quantitative approaches (Gonzalez-Padron et al., 2015; Helmold, 2022). Qualitative research methods contribute significantly to place marketing research by providing in-depth insights into consumers' behaviours, perceptions and attitudes towards specific places or destinations (Rauhut & Rauhut Kompaniets, 2020). Qualitative methods, such as field studies, are the preferred methodological approaches in marketing research and provide necessary suggestions for researchers interested in this field (Malodia et al., 2023). The use of qualitative techniques (case studies and qualitative interviews) in marketing research has increased, reflecting the growing interest of marketing professionals in consumers' deeply held opinions and attitudes (Frisbee & Sommers, 2013). Mixed methods research combines quantitative and qualitative approaches, thus providing a deeper and broader understanding of multifaceted phenomena (Adu et al., 2022).

Several research challenges and limitations exist in municipal marketing research. These include the need to understand the complex and dynamic world of marketing, the difficulty of understanding consumer behaviour, and the limitations of standard research methods in identifying the complex factors that influence consumer behaviour (Hailey & Ryan, 2015).

Research Methodology

The methodological basis for our research was a systematic literature review, which provides a reasonable basis for building a literature database with a consistent narrowing technique appropriate for the research objective (Xiao & Watson, 2019). In this research, only literature that meets the study criterion was considered. Based on this, the study was published between 2018-2022 in English, in the field of economics, in a journal listed in WoS or Scopus or as a full paper in a conference publication, open access and was found for the following keywords (based on clusters):

- place marketing - branding
- place marketing - destination
- place marketing - management
- place marketing - tourism.

The previous section of our research takes a unique approach to classifying studies in place marketing, identifying four major clusters: branding, destination, management, and tourism (Kádár et al., 2023; Reicher et al., 2023). Notably, we found that the topic of sustainability is not a separate cluster, but rather, it permeates all clusters (Kolnhofer-Derecskei et al., 2023). Building on these findings, our present study focuses on the last 5-year interval covered by the survey (2018-2022), examining the methodological background of published papers.

We formulated the following research questions and hypotheses:

Q1. Which research methods are used, and which target groups are studied by the researchers?

H1. Questionnaire research is the most common research method

H2. In most cases, the target group of the research is the consumer as a tourist.

Q2. Do researchers use one or more methods to explore the problem under investigation?

H3. In most research, a single method is used to investigate the area.

Q3. Does the chosen method (s) depend on the studied cluster?

H4. The methodology of researchers' studies does not depend on the cluster under study.

Three independent researchers conducted the query and evaluation in parallel. Where discrepancies had been found, they were discussed and resolved.

The first query identified 428 references in the two databases. After reviewing titles, keywords, and subject areas, 60 references were excluded from further analysis. Thus, 368 references that met the criteria listed above were identified. In the next step, it was examined whether the settlement sizes examined met the criteria. On this basis, studies dealing with metropolitan areas, cities and towns were excluded. Thus, 258 papers were published from the two databases in the four clusters. After excluding duplicates, 121 papers remained in the database due to overlap between the two databases for some journals and overlap in the keywords examined. This provided the sample for the analyses, so in the next step, the full text of the literature was downloaded and used for further analysis. For the 121 kinds of literature, the following information was collected: 1) year of publication, 2) title of journal or publication, 3) research aim, 4) research question, 5) cluster/field, 6) target population of the research, and 7) research methods used. Three researchers separately extracted information from the articles for cross-checking. After reviewing some articles together, the researchers reached a consensus on what to extract from the articles.

The analyses were conducted using NVivo 12 Plus software, which used automatic coding to analyse the abstract texts. VOSviewer software was used to perform a visualisation analysis of the 121 literature reviews. Due to the nature of the data, further analysis of the characteristics collected from the studies was carried out using MS Excel and SPSS 29 software, using simple descriptive statistical methods.

Results

Most of the literature meeting the criteria will be published in 2020 and 2022. The decline in 2021 is the effect of COVID-19, as this is a complex area to research from afar (Fig. 1).

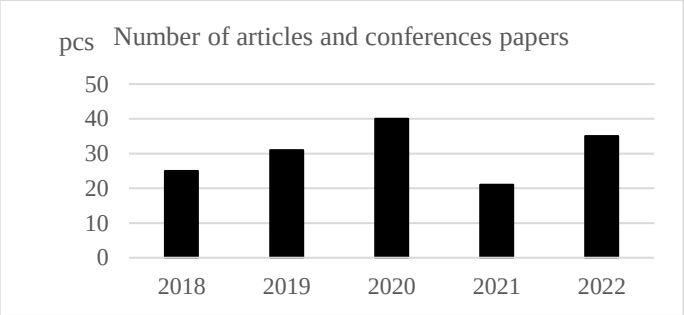

Fig. 1. Number of Articles and Conference Papers (Source: Compiled by the authors)

Most publications examined were in business and tourism journals. Eighteen journals include tourism in their titles, 7 include management, and 6 include business. This shows that the researchers mainly work in these fields and that this is the focus of their research (Table 1).

Table 1. Number of journals (Source: Compiled by the authors)

Journal Title	**pcs**	**%**
Tourism Management	11	18%
Annals of Tourism Research	9	15%
British Food Journal	7	11%
Revista Brasileira De Marketing	7	11%
Tijdschrift Voor Economische En Sociale Geografie	7	11%
Journal of Destination Marketing and Management	6	10%
Journal of Place Management and Development	6	10%
Cities	5	8%
Current Issues in Tourism	5	8%

Journal of Business Research	5	8%
Tourism and Hospitality Research	4	7%
Journal of Product and Brand Management	3	5%
Journal of Travel Research	3	5%
Marketing and Management of Innovations	3	5%
Tourism Geographies	3	5%
Environment and Planning C: Politics and Space	2	3%
International Journal of Culture, Tourism, and Hospitality Research	2	3%
International Journal of Religious Tourism and Pilgrimage	2	3%
International Journal of Tourism Cities	2	3%
International Review on Public and Nonprofit Marketing	2	3%
Internet Research	2	3%
Journal of Brand Strategy	2	3%
Journal of Creating Value	2	3%
Journal of Nonprofit & Public Sector Marketing	2	3%
Journal of Retailing and Consumer Services	2	3%
Proc. IEEE Commun. Strategy. Digit. Soc. Semin., Comsds	2	3%
Psychology & Marketing	2	3%
Scandinavian Journal of Public Administration	2	3%
Text & Talk	2	3%
Academy Review	1	2%
Apuntes	1	2%
Asia Pacific Journal of Tourism Research	1	2%
Asia-Pacific Journal of Business Administration	1	2%
Baltic Journal of Economic Studies	1	2%
Business History	1	2%
Economy of Regions	1	2%
European Journal of Tourism Research	1	2%
European Planning Studies	1	2%
Ibima Business Review	1	2%
Informacijos Mokslai	1	2%
International Journal of Sports Marketing and Sponsorship	1	2%
International Journal of Tourism Research	1	2%
Journal of Business Research	1	2%
Journal of Enterprising Communities	1	2%
Journal of Enterprising Communities-People and Places in The Global Economy	1	2%
Journal of Hospitality and Tourism Technology	1	2%
Journal of International Commerce Economics and Policy	1	2%
Journal of Knowledge Management	1	2%
Place Branding and Public Diplomacy	1	2%
Proc. Int. Bus. Inf. Manag. Assoc. Conf., Ibima: Educ. Excell. Innov. Manag. Vis.	1	2%
Proc. Int. Conf. Tour. Res.	1	2%
Qme-Quantitative Marketing and Economics	1	2%
Qualitative Market Research	1	2%
Scandinavian Journal of Hospitality and Tourism	1	2%
Springer Proc. Bus. Econ.	1	2%
Teoria E Pratica Em Administracao-Tpa	1	2%
Total Quality Management & Business Excellence	1	2%
Tourism Management Perspectives	1	2%
Tourism Review	1	2%
Tourist Studies	1	2%
Turyzm/Tourism	1	2%

The 121 literature included studies from several countries. The literature review and model testing studies were not linked to any country. The studies based on primary research presented marketing research in small towns in the following countries (Table 2).

Table 2. Regions and Countries in the Research (Source: Compiled by the authors)

Armenia	Colombia	Germany	Italian	Netherlands	Russia	UK
Austria	Croatia	Greece	Japan	Norwegian	Scandinavian region	USA
Brazil	Espanol	Hong Kong	Malaysia	Pakistan	Slovakia	Vietnam
Central Europe	European cities	India	Mexico	Poland	Sweden	
China	France	Indonesia	Montenegro	Portugal	Switzerland	

Of the 121 papers filtered, 20 (16%) were published in management. 33 (27%) publications are in the destination cluster, 11 (9%) works are in the tourism cluster, and 57 (47%) articles are in the branding cluster. We used the fractional counting method to plot co-occurrence using VOSviewer (Fig. 2). The chosen method differs from the complete counting method only in the strength of the association, which divides the strength of the association by the number of authors for multiple-author articles. The figure shows that the four main clusters are well identified in the 121 literature sources. In addition, some methodological elements appear, suggesting from the first study that segmentation, theoretical studies, qualitative research, and model application will be the most common analysis methods. The figure shows that three target groups stand out after the primary studies: tourists, stakeholders, and consumers.

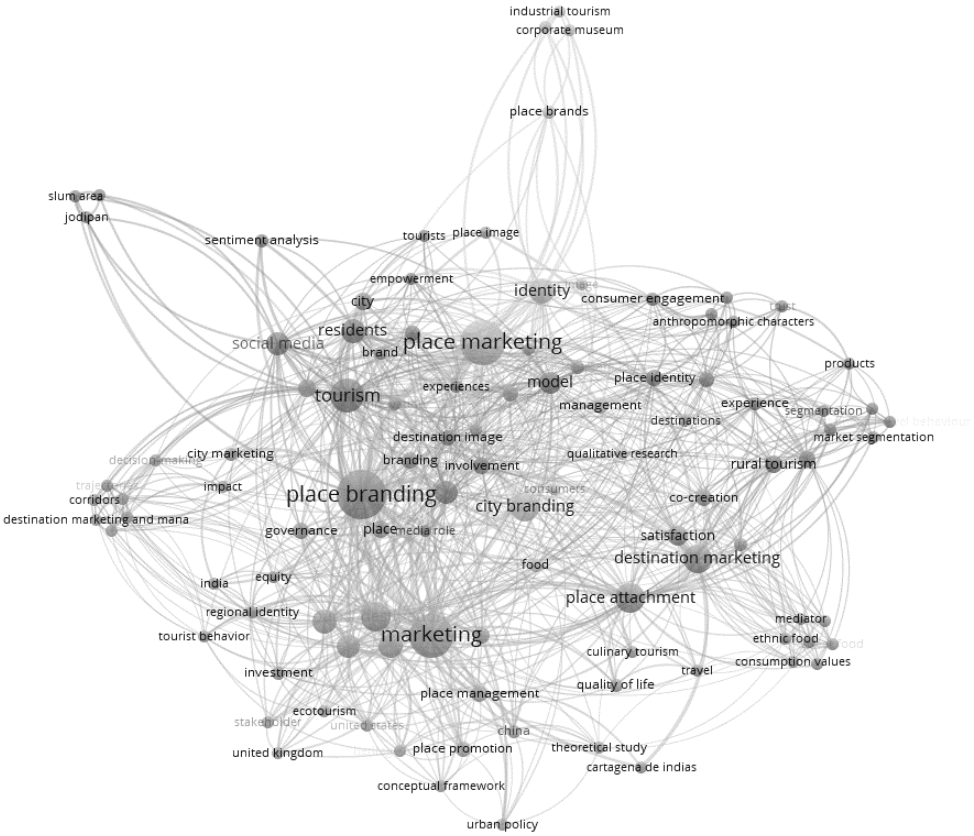

Fig. 2. Co-occurrence with Fractional Counting Method (Source: Compiled by the authors via VOSviewer)

After reviewing the studies, we can identify ten different methodologies researchers have used over the five years under review. Most of the studies had some form of literature review as their primary objective. Of the quantitative analyses, questionnaires were the most frequently used. In the last five years, researchers have paid much attention to analysing the content of different online platforms, such as social media platforms or websites and blogs, focusing on analysing consumers' opinions. Despite the emergence of the term segmentation in co-occurrence research, only three articles among the methods have tried the cluster analysis technique to search for research results (Table 3).

Table 3. Number of applied methods (Source: compiled by the authors)

Applied methods	pcs	Applied methods	pcs
Literature review	27	Expert interview	13
Questionnaire	26	Systematic literature processing	4
Content analysis	21	Factor analysis	3
Case study	18	Focus group	3
Semi-structured interview	17	Cluster analysis	2

In order to test hypothesis H1, a one-simple-proportion test was conducted, the results of which showed a significant difference in the variance of the proportions of values across the methodologies tested (p=0.01). That is, the methodologies tested have an element or elements that appear in significantly higher proportions in the research than the others. According to hypothesis H1, the questionnaire was likely to be the most common survey instrument, and the results showed that it was among the most common instruments. The significance level of the Z test confirmed the existence of a prominent group; the hypothesis was considered to be confirmed.

It was then examined how different methodologies intersect within the research and whether any methodology stands out in particular areas. It was found that over half of the 121 articles examined, 73 articles used one methodology (p=0,042). For 21 articles, the methodology used was not transparent. In the remaining 27 articles, the authors used at least two methodologies to investigate the research topic. These methodological pairings mainly include qualitative interviews, focus groups and quantitative questionnaire studies. However, content analysis and systematic literature review were sometimes combined with some qualitative methods (Table 4).

Table 4. Number of More Applied Methods (Source: Compiled by the authors)

Combination of research methods	Case Study	Semi-Structured Interview	Questionnaire	Literature Review	Expert Interview	Systematic Literature Processing	Content Analysis	Blank	**Sum**
Semi-structured interview	2		2						**4**
Focus group		2			1				**3**
Questionnaire	1	3			2		1		**7**
Cluster analysis			2						**2**
Content analysis	1	1			3				**5**
Factor analysis			3						**3**
Case study				1	2				**3**
Blank	11	7	12	19	5	4	15	21	**94**
Sum	**15**	**13**	**19**	**20**	**13**	**4**	**16**	**21**	**121**

We have examined the proportion of research methodologies in each cluster and found that the proportion of research using more than one methodology is equal to that of clusters. 43% of the studies in the brand cluster used more than one research methodology. The tourism cluster accounted for 8%, the management cluster for 18%, and the destination cluster for 29%, which appeared to be the most methodology. The composition of methods used was also proportionally similar across clusters. We also examined research that used stand-alone methods but again found similar proportions. We, therefore, found that researchers need to specify methods by area. Cluster affiliation did not influence the appearance of research methods. Thus, we considered hypothesis H4 to be confirmed.

We also examined the abstracts of the studies using text analysis. The analysis of the content related to the methodological term revealed that the abstracts of the articles do not contain explicit knowledge about the research methodology. However, we can still see some critical word-trees in the glossary, such as qualitative and quantitative research methods, analysis, case studies, and modelling (Fig. 3).

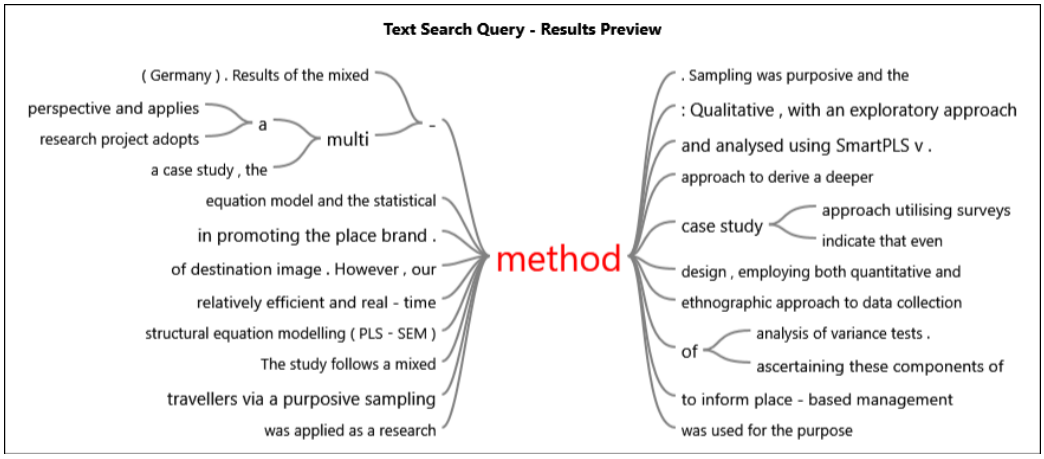

Fig. 3. Word Tree (Source: Compiled by the authors via NVivo)

We further investigated the target population. First, we looked at the target groups that appear in each study (Fig. 4). Of the 121 publications examined, 91 had a target group that could be identified. The remaining 30 publications used a literature review methodology, and one case study was associated with this methodology, where the case study dealt explicitly with athletes. In almost 45% of the cases, the studies also dealt with tourists or tourists. Only 20% of the cases asked the local population, and the same number focused on the service sector. Only 10% interviewed experts with a high professional knowledge of the subject; the exact number dealt with policymakers and municipal leaders.

Fig. 4. Target Group of Research (Source: Compiled by the authors)

While it is true that most studies focus on tourists, there is no significant difference in the distribution, so hypothesis H2 is only partially accepted (p=0.09).

Conclusions

Economic changes have led to a renewed interest in smaller settlements. The growth of domestic tourism has been a significant challenge for local leaders. However, small village leaders need more professional support and are often not well-versed in economic and management issues. Municipal marketing plays a vital role in supporting economic activities and their effectiveness. It also contributes to the municipality's infrastructural development. The study of this field offers a wide range of methodological possibilities, which can be used to examine the promotion of the development and sustainable operation of small settlements from several angles. The research focuses on consumer behaviour and attitudes. This mainly refers to the consumer behaviour of tourists, often ignoring the needs of the local population, the potential of the settlement, and the opinions of experts and settlement leaders (Bansal, 2023). According to the literature, the most commonly used qualitative research methods and tools are interviewing, focus groups, and content analysis. Content analysis draws on the potential of digital

marketing to focus on consumer content generated on websites, blogs, and social media. Researchers are increasingly interested in consumers' opinions and attitudes. However, mixed methods research provides a more profound understanding (Adu et al., 2022).

In our research, 121 literature reviews were conducted using the WoS and Scopus databases. Our analysis examines the methodological background of studies on small settlements from 2018 to 2022. Based on our research results, researchers still prefer interviewing as a qualitative methodology and questionnaires as a quantitative methodology. In addition, there is a very high proportion of literature reviews for different periods and research purposes. We saw two different methodological applications in just over half of the studies, and only a few used three different techniques. The target group is still the tourists, and minimal emphasis is placed on the opinions and needs of the local population, policymakers, or stakeholders.

Examining our preliminary hypotheses, we conclude that the methodology of researchers' studies does not depend on the cluster under study (hypothesis H4 accepted). Our research shows that place marketing does not have a specific methodology. Most studies use a single methodology to investigate the area (hypothesis H3 accepted). The most common research method is questionnaire research (hypothesis H1 accepted). In most cases, the survey's target group is the consumers as tourists. However, the difference is insignificant here, so hypothesis H2 was only partially accepted.

Based on the review of the studies, it is recommended to combine different methods and examine the issue from different perspectives. It is worthwhile to include different stakeholders in the field to consider as many aspects as possible when examining the issue.

Further studies are needed to review the models presented in this research. Additional analysis could explore the effects and interrelationships of variables that case studies can identify, which may impact municipalities' functioning.

Acknowledgements

The research was supported by the Centre of Excellence for *Sustainability Impacts in Business and Society* at the Budapest Business University.

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ECONOMICS AND CULTURE 21(1), 2024

DOI: 10.2478/jec-2024-0014

HOW ARE THE SMEs COMMITTED TO THEIR LOCAL COMMUNITIES IN THE TERM OF SUSTAINABILITY?

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Received 23 April 2024; accepted 21 May 2024

Abstract

Research purpose. Local communities play a crucial role in the entrepreneurship ecosystem. The role and massive influence of the local environment raise several questions. This paper aims to answer the following questions: (1) how and why the local communities affect SMEs' sustainability, (2) which pillar of sustainability plays a stronger role in this matter, (3) which internal and external motivators drive a firm's sustainability actions, and (4) whether company and personal characteristics have a significant effect on local patronage.

Design / Methodology / Approach. A representative sample of leaders (n=300) from the Hungarian SME sector was investigated through a validated survey. The survey explored activities, motivations, organizational characteristics, and leadership factors in CSR and sustainability in the SME sector. Both Likert scaled statements and reasonings for open-ended questions were examined using qualitative and quantitative methods.

Findings. SMEs regularly support various organisations, and communities, mainly if those are in the close region of the enterprise. They regularly promoted culture, education, youth, sport, and vulnerable groups in their local area. Moreover, businesses feel an obligation to support the local communities in which they operate. This activity seems to be divided into a conscious and a hidden part. When we asked for the reason for activities, most answerers expressed that donating to healthcare organisations or education institutes is an obvious civic duty (i.e., pressure from society) but in terms of local communities, the motivation is rooted in personal engagement (i.e., an essential part of social sustainability).

Originality / Value / Practical implications. SMEs poorly express their sustainable activities; they adopt more informal strategies in comparison with large companies. SMEs' social sustainability lies in engagement and close links with local communities, where companies are targeted towards supporting charitable projects in their surroundings. Even though these actions are less formalised or strategically planned, that is why this research provides a better understanding of the integration of environmental and social concerns of sustainability reflecting all of those benefits.

Keywords: sustainability and responsibility, entrepreneurship ecosystem model, SME, local environment.

JEL codes: Q01, Q56, M2, L26.

Introduction

According to the Charities Aid Foundation Report, 69% of the public believed that businesses have a strong obligation to support the local communities in which they operate but from the FTSE 100 companies (largest 100 companies in the UK by full market review), only 7 large companies reported that they support projects that impact local communities and only Tesco noted that they support local communities directly where Tesco operates (CAF, 2023). Meanwhile, Generali and SDA Bocconi (2021, 2022, 2023) showed that in 2021, an average of 48% of the European SMEs supported local communities. Taken that around 400 million global SMEs are crucial in promoting a sustainable planet and should not be overlooked in terms of environmental responsibility. Small and medium-sized enterprises (SMEs) play a crucial role in regional development and adopting sustainability, which results in benefaction for local communities (Salimzadeh & Courvisanos, 2015). At the same time, there is still a lack of understanding of sustainability and its conscious connection to local communities (Klewitz & Hansen, 2014).

The purpose of this paper is to answer (RQ1) how and why the local communities influence the SMEs' sustainability (RQ2) which pillar of sustainability plays a stronger role in this matter (RQ3) and internal and external motivators drive an SME's sustainability actions. Finally, (RQ4) whether company and personal characteristics have a significant effect on local patronage. Therefore, an extended quantitative analysis on a representative sample, as well as a qualitative analysis were carried out.

Literature Review

An SME's entrepreneurial ecosystem includes several stakeholders, but various theoretical models describe these domains differently (Maleck, 2018). Numerous research indicate that environmental management practices are also influenced by various stakeholders, including legislators, environmental groups, financial institutions, suppliers etc. differently (Saveanu et al., 2021).

It is revealed that each theory includes local communities as a strong domain of stakeholders. Extended observation of local and regional levels is essential, as Tolstykh et al. (2021) emphasized regional sustainable development is concerned with ensuring a sufficient level of quality of life in the region where the firm operates. Only if this is ensured, sustainability can be related to sustainable development goals (SDGs) at the supra-regional (national and global) level. Smith et al. (2022) also underlined that SMEs may be the link between global and individual sustainability, while SMEs view sustainable development as a "neighbourliness" that empowers local communities to address social and environmental needs. Therefore, sustainability may be possible access to the global market for them. It seems to be required in this sector to establish and maintain a more formalised and structured strategy, all for environmental, social, and economic sides (Khan et al., 2023).

Regarding the stakeholder theories in CSR (Jamali & Carroll, 2017), local communities can be treated as an essential domain. The interactions between companies and local stakeholders and the importance of local norms/values lead to inherent power dynamics and relationships in future applications of CSV. Although, the authors reflected here on the large companies. In sum, small and medium-sized enterprises (SMEs) are also crucial development agents and economic contributors to local, they contribute to productivity, employment, and support the local communities (Smith et al., 2022). At the same time, they also have significant impacts on the environment and society collectively (Artin, 2022). As for our first research question (RQ1), the international literature lists several ways and reasons, how and why SMEs and local communities are bonded in order to ensure sustainability. Regarding Smith et al. (2022) findings, the best way for SMEs to promote sustainability within local communities is to build a strong engagement with local stakeholders like mayors, residents, civil society, NGOs, or the local population. This engagement includes fields like training on sustainability, networking with local communities and effective collaboration with other stakeholders. Training programs should include materials on general sustainability-oriented issues, such as best practices, and how to implement these issues into management systems.

Networking with trade associations, environmental agencies, local government, and employee organizations can help SMEs identify and tackle their problems, while collaboration with external

stakeholders can help SMEs solve common problems mutually and find joint opportunities. But this collaboration hides a so-called back-and-forth effect. SMEs should proceed to encourage sustainable actions in a 'power to' and at the same time in a 'power within' and 'power with' way in order to advance their collective impact on sustainability. Not only the SMEs have an impact on local communities, but communities also have strong effects (pressure) on SMEs like through legislative regulations.

Consequently, the literature review shows a well-defined interaction between the SMEs and the local communities. Meanwhile, the various pillars of sustainability should be also considered (this session is related to our second research question, RQ2). Literature (Purvis et al., 2018) identifies three main pillars of sustainability, namely economic, environmental, and social. Eikelenboom & de Jong (2019) studied SMEs' ability to three pillars of sustainability and found that SMEs are able to simultaneously address social, environmental, and economic goals, whereby leaders can act as drivers of all three pillars. However, as results showed (Lawrence et al., 2006), most enterprises do not have formal reporting of their social and environmental practices.

Surman and Böcskei (2023) studied which pillar SMEs are currently ranking as most relevant in Hungary. Hungarian SMEs primarily prioritize economic and environmental goals, and social goals appear the least in their operations. They concluded that Hungarian SMEs feel the need to add value to social aspirations only indirectly, through the detection of economic and environmental goals. Carroll (2021) emphasized that global CSR differs from local ones so cultural traditions and local characteristics and events are crucial, that is why researchers' interest in CSR will turn to small and medium enterprises linked with growth in developing countries. This paper might be one of these pioneer studies.

The third research question's (RQ3) purpose is to discover the motivators and drivers of both sides. Even though, as Ernst et al. (2022) found close employees' and communities' pressure reduces controlled corporate sustainability motivation within SMEs. So, the question is given which drivers move SMEs in the direction of strategy-driven, conscious sustainability or whether it remains just a must-do activity or a simple civic duty? Seemingly, the external factors indicate a both-way reaction and reverse pressure between the participants.

However, the drivers of sustainability practices depend on the context of SMEs, such as their sector, region, or the special interests of their stakeholders (Yadav et al. 2018). Gadenne et al. (2008) summarized the influences on environmental awareness and practices for SMEs because the increasing awareness of environmental issues has led to a growing demand for environmentally friendly business practices. The study identified three different processes affecting environmental outcomes in SMEs: legislation, environmental attitudes, and support for environmental organizations. The moderating variables are listed as follows: owner-manager characteristics, environmental information, time, and financial resources. In this paper, the first variable is going to be broadly investigated aligned with our last research question (RQ4).

As a part of this, individual beliefs, attitudes, and environmental principles were also found as relevant, especially the owner's or manager's personal beliefs, attitudes, and moral values are reported as key factors, both preventing, when absent, or favouring, when present, the adoption of sustainability initiatives (Generali & SDA Bocconi, 2023). Strong social identity and deep involvement in local communities are reported as being another strong driver shaping SMEs' attitudes towards stakeholders. They promote positive impacts on society, including employees as part of the social community, and the local environment. Although altruism is not a stable explanation factor as Pinto et al. (2019) stated. They studied motivations for sustainable behaviour and found mixed results regarding pure altruism (cooperation) or competitive altruism (status). De Dominicis et al. (2017) stated that environmental concerns are crucial for sustainable and pro-environmental behaviours based on egoistic or biospheric psychological foundations. The dominant approach in pro-environmental behaviour lies in supporting others or nature, rather than appealing to self-interest. Self-interested individuals behave more pro-environmentally when the behaviour results in personal benefits, while altruistic individuals engage in pro-environmental behaviours when there are environmental benefits rather than personal benefits. Artin's (2022) study reveals that SMEs are more likely to engage with sustainability if their owners/managers create a business culture that promotes environmental and social improvement.

Gender differences might also have a significant impact on this. Graafland (2020) highlighted the importance of the impact of gender diversity on environmental responsibility in SMEs. The findings suggest that increasing women's representation in management leads to more equal opportunities and a wider societal contribution by improving sustainability. Last, but not least, the literature review established evidence for all research questions, which are empirically studied in the next chapter.

Research Methodology

Survey Analysis

The study aimed to assess the responsibility of SME entrepreneurs concerning sustainability. A modified adapted questionnaire was obtained. A pilot testing phase (involving 8 sample members and 2 experts) allowed us to assess the questionnaire under real survey conditions. The final version was executed using a split-halves design for the two statement sections. Meanwhile, Cronbach's alpha was used to measure reliability and internal consistency. Its value was for the whole survey 0.629 (n = 32 items). This value indicates an acceptable or good reliability. The questionnaire was divided into five parts, including a free word association about responsibility in relation to sustainability, statements and questions on CSR and sustainability activities, motivations, organizational characteristics, management factors in the SME sector, business practices, and a section assessing basic demographic features.

In this paper, the following statements and questions were selected and investigated:

- The regularity of supportive actions in the direction of the local communities.
- The reason, why the firm supports and promotes local communities (open-ended question).
- Two statements, which judge the pillars of sustainability and measure the pressure from local communities. Both statements should be applied to the firm. They were measured on a 7-item scale where 1 means Definitely not … 4 refers to Possibly … 7 reflects Definitely.
  a. There is a serious expectation from local communities to support local social organizations.
  b. There is a strong expectation from local communities to assume responsibility for environmental issues.

The questionnaire was queried by the IPSOS market researcher company via telephone calls with a representative sample of Hungarian SME leaders in May 2023. Stratified random sampling was used, a random sample was taken from identifiable groups (strata) that are homogeneous for three desired characteristics, namely (1) company size based on the number of employees; (2) region; and (3) economic activity classification. So-called strata weights were calculated and applied for economic activities where a subsample was over- or underrepresented. As far as the demographic background of the respondents is concerned: 121 females and 178 males participated (one refused to answer), with an average age of 49.67 years. Representativeness was normally distributed, but items measured on ordinal scales required nonparametric tests to compare measures of central tendency across subsamples.

Expert Interviews

As an essential part of the survey, those participants who regularly support local communities were asked about what motivates them to support local communities regularly. Freely given answers or first associations (n=66) were analysed using the content analysis method. Finally, two Hungarian expert interviews were conducted. The first interview was with a small local flower shop owner (female, 47 years old) whose represented company works in decoration and events, in the local region. The second interview was with a regional CFO of a medium-sized trailer seller company (male, 48 years). His represented company is in trailer sales, international. Both companies operate in the same regional area. Interviewees were asked for the reasoning of local versus global sustainability supports given by their firms. Both texts were automatically translated from Hungarian to English.

Results

Survey Analysis

As for the regularity of supportive activities in the direction to local communities, most companies (n=205) support at least once a year their local communities, and ninety do it annually, or yearly basis

(Fig.1). People who rated themselves higher on the environmentally conscious scale tended to support more often, there was a modified relation between the two variables (Pearson's r = 0.119 with p = 0.042). Additionally, the position and regularity of support also showed a significant correlation (nominal by nominal Phi = 0.352 with p = 0.042) whereby owners tend to be more supportive.

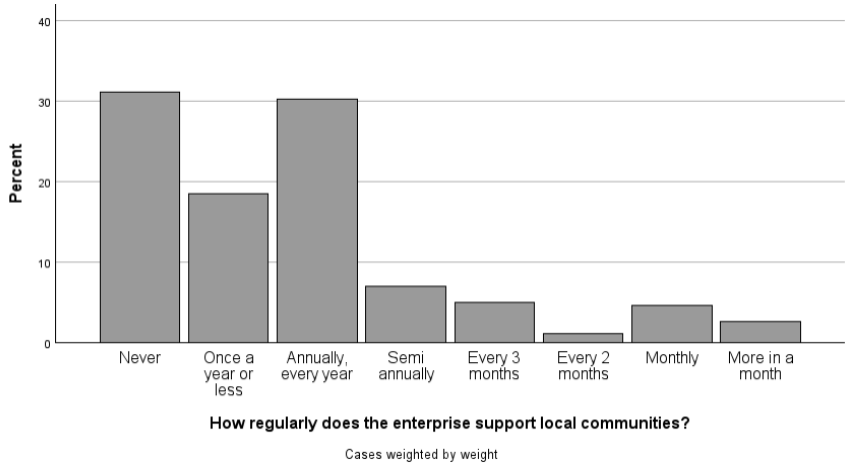

Fig. 1. How Regularly does the Enterprise Support Local Communities? (Source: Own elaboration)

Regarding expectations (i.e., pressure) from local communities, the two statements' descriptive statistics reflect a surprising difference. While the arithmetic means are close to each other (in the case of social organizations, the mean is 3.41 and Std. Dev 1.971, and for environmental issues, the mean was 3.77 and Std. Dev. 2.028), the mode (most frequently picked value) was 1 for the social organizations and 5 for the environmental issues. Seemingly, the environmental pillar matters more than social. That raises the question of whether any of the demographical or company characteristics may cause this difference. By environmental issues, gender showed a significant impact (females' mode is 5 and males' is 4, Mann Whitney U = 9239.00, Asymp. Sig 2-tailed = 0.013).

Seemingly, the larger companies (i.e., middle-sized) feel a stronger pressure from the local communities regarding environmental issues, notably middle-sized companies support rarer local communities in terms of social sustainability but feel a significant pressure from the locals in terms of environmental issues, as Table 1 proves.

Table 1. Opinions Regarding Net Total Revenue (Source: Own elaboration)

Net Total Revenue / Turnover		**How regularly does the enterprise support local communities?**	**There is a serious expectation from local communities that we support local social organizations.**	**There is a strong expectation from local communities to assume responsibility for environmental issues.**
Less than 2 million EUR	Mean	2.97	3.31	3.59
	N	153	152	152
	Std. Deviation	1.958	1.980	2.085
	Median	3.00	3.00	3.00
2-10 million EUR	Mean	2.51	3.24	3.70
	N	89	88	89
	Std. Deviation	1.521	1.893	2.067
	Median	3.00	3.00	4.00
10-50 million EUR	Mean	2.27	3.65	4.05
	N	21	21	21
	Std. Deviation	1.186	2.017	1.623
	Median	2.00	3.57	5.00
	Mean	3.00	4.78	4.80

Over 50 million EUR	N	6	6	6
	Std. Deviation	1.756	1.546	1.249
	Median	3.00	5.00	5.00
NA	Mean	2.18	3.99	4.53
	N	29	28	28
	Std. Deviation	1.536	2.102	1.837
	Median	2.00	4.00	5.00
Total	Mean	2.71	3.41	3.77
	N	298	295	297
	Std. Deviation	1.763	1.971	2.028
	Median	3.00	3.00	4.00

The number of employees also had a significant difference in the two statements (in the first case Mann Whitney U = 4529.5 and Asymp. Sig. = 0.044, and second case Mann Whitney U = 4229 and Asymp. Sig. = 0.029), which means that in both cases, larger firms indicated stronger pressure (Small firms' mode 3 and 4, respectively and Middle firms' mode 4 and 5 respectively). In sum, the size of the company matters in case of the sustainability regarding local communities.

Expert Interviews

The answerers discussed their company's approach to community involvement, focusing on charity, social sensitivity, altruism, local patronage, and personal reasons. Some of them have worked in the social sector for years and believe that is why, their companies support local communities, particularly school nursery communities. The SME leaders also emphasized the importance of personal involvement and the desire to help local interests. They believe that their companies support local organizations for the sustainability of the microenvironment and maintain a good reputation. They also emphasized the importance of taking social responsibility and supporting associations based on friendship and acquaintance. Finally, they believed that the main feature of cooperation in municipalities is joint cooperation. They emphasize the importance of taking social responsibility and the need for people to know them and know what is important. They also underlined the importance of personal connections and the importance of leadership vocation. The importance of good contacts and the importance of supporting local communities were also listed, as they live in a region and are among them. They believe that their company's presence and support are morally important and that their community needs to be supported. The text was also auto-coded, where frequently mentioned expressions (with synonyms) are listed in Table 2.

Table 2. Frequently Used Expressions (Source: Own elaboration)

Word	Count	Weighted Percentage (%)	Similar Words
Support	18	4,93	support, supported, supporting, supports
Community	18	4,93	communication, communities, community
Local	18	4,93	local, locally
Important	12	3,29	importance, important
Personal	11	3,01	personal
Help	10	2,74	help, helped, helping
Live	10	2,74	live, living
Social	10	2,74	social
Good	8	2,19	good
Need	7	1,92	need

The answers can be grouped into the following main sections:

- Intrinsic motivation or leaders' personal engagement: „It's more of an individual motivation, my own. We always help people in need. It is more genetic than strategic." "This is the natural" "I just want to help, there is an emotional attachment to them." "The leadership's expression of will. My company supports it because I want to support it." "Management perception and ownership expectation."

- They realized a problem, so they helped: “Because we see the problems local organisations face in becoming more mainstream” “Providing assistance to those in need” “The fact that the state doesn't support these”
- Local patronage or local commitment: „This is their living space and it's obvious that they need to be supported.” „We live here, we belong here”
- Pressure: „This is where we live, this is where our company is, this is where we support those we come into contact with on a daily basis, those in need.” “It's a social expectation.”
- Region as (labour)market or firm’s involvement: „We consider it essential that where we operate, people know us and know what is important.” “Because they look after local interests”
- Personal previous experiences: “I have worked in the social sector for 20 years, so I know what it is like, and I support it.” “There are more teachers among my acquaintances, because of this”
- For the reputation: “To maintain a good reputation” “Local and personal connections”

The highest number of examples in the first section (i.e., intrinsic motivation or leaders’ personal engagement) proves the importance of managers’ personal involvement where best practice seems to be leading by example. The mood and tone of the texts are positive, emotionally we can discover pride and happiness.

It is also interesting how the expression “local” was settled in the area of other expressions (Fig. 2). Local personal networks and strong collaborations with local communities may have an important influence on sustainability. Usually, the expression is connected to an action verb (bring, link, answer).

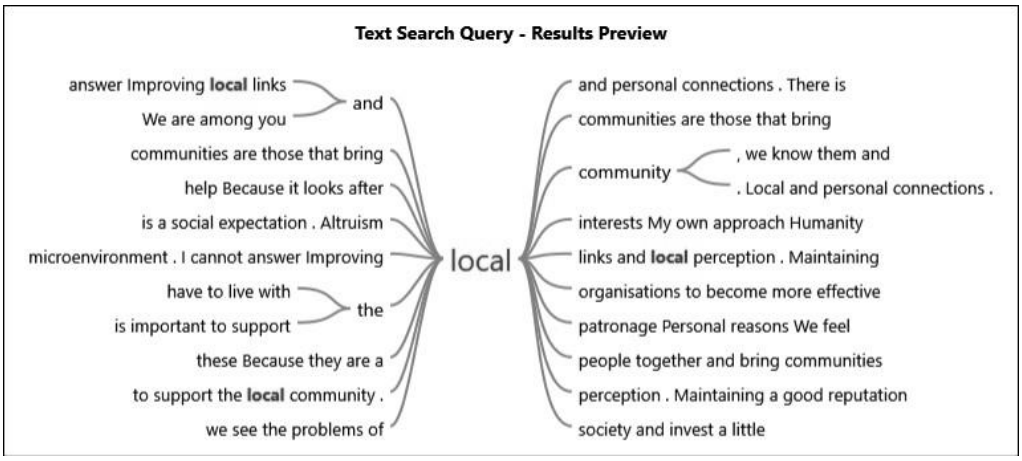

Fig. 2 How the Local as a Word was Connected with Other Expressions? (Source: Own elaboration)

Finally, two interviews were conducted, where a small, local firm’s leader/owner and a medium-sized, international company’s regional CFO reasoned why they support different communities. The first interviewee shared best practices and examples of how routines are going and how a small firm can support local communities and for a sustainable future as a nice example of local patronage. She, as an economist, takes responsibility for her flower store in her village, educating the community about appropriate and sustainable practices. She sells special selections from local artisans and artists, fostering a small community building. The store also welcomed mentally disabled people, who live in a local centre for disabled adults in the village. The firm takes responsibility for the store's selective garbage collection, involving a deaf-mute person who only mimics and as a response, the employees help him out with the math and flowers. Other disabled individuals, like a disabled man who collects selective trash and picks out plastic from paper, are also involved in the process. The firm's approach to addressing the needs of the disabled community is a testament to the importance of community and responsibility in achieving success. The store serves as a beacon of hope and support for the disabled community in the village.

On the contrary, the regional CFO gave a short but compact answer, namely „The bigger the company, the more socially insensitive it is. The manager may personally support local communities, but it is not part of the company's corporate culture to help out the local butcher and buy him something for 1 million

forints. Big companies need hype and publicity." Obviously, the size matters. The larger firms, the more formalized approach to sustainability is adopted. Due to their size, these businesses often have greater financial and human resources to devote to sustainable initiatives. In addition, because of their size, they may face a wider customer base or stricter regulatory scrutiny, which may force them to prioritize sustainability in a different way. Conversely, smaller SMEs, often operating with tighter margins and limited resources, may see sustainability as a secondary consideration. Moreover, SMEs are deeply rooted in their social region.

Discussion

Seemingly, these sustainable actions are not thoughtfully promoted nor purposely carried out. This activity seems to be divided into a conscious and a hidden part. When we asked for the reason for activities, most answerers expressed that donating to healthcare organisations or education institutes is an obvious civic duty (i.e., pressure from society) but in terms of local communities, the motivation is rooted in personal engagement (i.e., an essential part of social sustainability). As a result, sunk sustainability or implicit CSR phenomena are happening, whereas SMEs do more for sustainability than they are aware of (Matten & Moon, 2008). This could lead to the so-called mismatch problem (Chowdhury & Shumon, 2020) when stakeholders' expectations and SMEs' ability to social sustainability do not match due to internal issues (e.g., lack of resources) and external issues (e.g., absence of a tailored institutional support).

However, the lower level of sustainability visibility does not necessarily mean less sustainable and less responsible operations than in the case of large companies. Since SMEs operate along different logic resulting in different stakeholder relationships, responsibility performance and communication. Of course, there are some limitations to our study. The need to comply with scholarly research is a bias that needs to be acknowledged openly. Additionally, there is a need for further research to explore new countries to expand our samples. It is worth examining, what kind of roles other stakeholders play.

SMEs still struggle to integrate sustainability concerns into their business practices due to barriers such as limited awareness, lack of time and resources, and lack of skills and expertise. Journeault et al. (2021) found that stakeholders (local communities among others) play five complementary roles: trainer, analyst, coordinator, specialist, and financial provider. These roles help SMEs overcome different barriers to the integration of sustainability practices by providing critical and essential resources that are not easily available to SMEs. Stakeholders may support SMEs adopt sustainability practices by compensating for a lack of available time, human and financial resources, as well as limited skills and knowledge around the benefits associated with sustainability. Additionally, internal factors like engaging employees, training, and incentives hide great opportunities for fostering sustainable activities (Langwell & Heaton, 2016).

Conclusions

Somehow, SMEs seem to give faster and closer reactions to sustainability-related actions, due to their closer relationship with local communities or local stakeholders compared to the bigger companies. However, SMEs' approach to sustainability is less structured than in the case of large firms. Small companies rarely use the theories or even jargon of CSR (Corporate Social Responsibility) but adopt less formal strategies which may lead to stronger informal cooperation with the local communities where they operate. For example, their employees are from the region, or the targeted clients/buyers live there. Small firms' activities are strongly embedded in the local region resulting in a closer link with the local community. In return, SMEs target supporting and actively promoting sustainable projects in their surrounding areas as a form of reciprocal altruism. Another reason may lie in different motivational and incentive systems. The individual beliefs values, and personal attitudes of leaders (usually, they are also owners at the same time) might be smoother and more in a direct way expressed and implemented into everyday market activities.

Regarding the research questions, it can be observed that (1) the local communities have a strong influence on the SMEs' sustainability both through pressure and their willingness due to the closer connections and roots (2) the environmental pillar of sustainability plays a stronger aware role than

social pillar (3) besides the pressure from local stakeholders, the leaders' and managements' personal engagement and values serve as examples for the region (4) the size of the company significantly impacts the connections with local and the gender may have an influence on local patronage, as well.

Acknowledgement

This research was supported by the Ministry of Innovation and Technology of Hungary from the National Research, Development and Innovation Fund, financed under the Tématerületi Kiválósági Program 2021 (TKP2021-NKTA) funding scheme (Project no. TKP2021-NKTA-44).

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ECONOMICS AND CULTURE 21(1), 2024

DOI: 10.2478/jec-2024-0015

PERSONALITY TRAITS CORRELATION WITH PROFESSIONAL BURNOUT OF EMPLOYEES FROM THE ADVERTISING INDUSTRY

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Received 3 April 2024; accepted 6 May 2024

Abstract

Research Purpose. The aim of the research is to study and clarify the level of professional burnout, personality traits, their interrelationships, and the impact of personality traits on professional burnout in the advertising industry to make recommendations to advertising company managers.

Methodology. The method of quantitative data collection was a 128-item questionnaire, a combination of the Latvian Personality Survey (LPA-v3) (Perepjolkina & Reņģe, 2013); the Maslach Professional Burnout Survey (Maslach & Jackson, 1981) adapted version in Latvian (Vaine, 2019). Data: N=148 respondents, data collected electronically via Google Forms, ensuring respondent confidentiality.

Findings. Advertising employees have high emotional exhaustion, moderate levels of depersonalization or cynicism, and high levels of personal achievement reduction. The highest indicators of general personality traits are as follows: openness to experience, conscientiousness, and honesty - humility, while lower indicators are for extroversion, neuroticism, and agreeableness. Emotional exhaustion has a strong positive correlation with neuroticism and a negative correlation with extroversion; depersonalization has a positive correlation with neuroticism, a positive correlation with agreeableness and a negative correlation with extroversion. Decreased achievement or work efficiency has a strong negative correlation with neuroticism, a strong positive correlation with extroversion, and a positive correlation with openness to experience. Burnout dimensions also have very close positive and negative correlations with the sub-traits. There are statistically significant regression models between professional burnout scales and sub-traits: depressiveness and sociability have the greatest impact on emotional exhaustion; the greatest impact on depersonalisation is for depressiveness; joyfulness; friendliness; the greatest impact on changes in performance is for stress intolerance; joyfulness; creativity.

Practical implications. With at least 50% of advertising employees experiencing high levels of burnout, it is recommended to organise individual and Team Supervision sessions to prevent burnout and identify the triggering factors in a specific organization. This format ensures that both employees and managers are equally accountable for the outcome and through a focused process promotes overall employee engagement, problem-solving, conflict resolution, understanding of diversity, empathy, and role clarity. No less important, the knowledge of the most common personal traits of Advertising Industries employees will help company managers to make more informed hiring decisions.

Keywords: professional burnout, personality traits, advertising industry.

JEL codes: N34.

Introduction

Professional burnout and its relationship to various factors have become a hot topic recently. Moreover, burnout is relevant because it directly affects employees' mental and physical health and reduces their long-term effectiveness, impacting the future of different organizations and industries. According to a 2023 study by KANTAR, 41% of employees in Latvia have experienced professional burnout.

Therefore, employers should prioritize employee well-being, including offering mental and physical health benefits (KANTAR, 2023).

However, it is worth noting that there is no available data on the level of professional burnout among Latvian advertising workers, and this is worrying because Nando Malmelin reported that the advertising industry is highly dynamic and in constant flux. It is also plagued by intense internal competition, which drains resources and energy from advertising professionals (Malmelin, 2010). Furthermore, the industry faces challenges due to the transformation of traditional media and the rise of digital advertising, and the impact of these uncertainties on advertising professionals has been significant. For example, authors Lee and Lau noted that these uncertainties can lead to infighting and confusion (Lee & Lau, 2019). On the other hand, previous research on the advertising industry has focused directly on business management, marketing development and advertising effectiveness, and less on the meaning of employees. For example, Hirsh et al. (2012) studied how people with different personality traits perceive different advertising messages. On the other hand, the advertising industry's cornerstone concepts of 'creativity' and 'innovation' have been studied in depth. For instance, Granot (2011) studied how creative managers in advertising agencies integrate creativity into the management process and how it can be adapted to the B2B service segment.

At the same time, not enough studies have been done on the effects of stress on workers' mental health and physical well-being, how the dynamic and demanding advertising industry affects its employees, and whether there are specific personality traits that characterize them. However, that is not the case in other fields. For example, Froutan with others studied the relationship between personality traits and resilience among emergency medical workers and found that resilient workers perceive less stress in a stressful work environment, which may be mistakenly associated with burnout (Froutan et al., 2018).

It is important to note that studies investigating burnout and personality traits are focused on helping professions. For example, research has been conducted on personality traits and burnout in primary care physicians (Brown et al., 2019), anaesthesiologists (Wal et al., 2016), and teachers (Unaldi et al., 2013). While there have been studies on the association of personality traits with professional burnout in hotel workers (Zopiatis et al., 2010), other occupations and sectors have not been studied as extensively concerning burnout in different conceptual models.

Literature Review

In 2019, the World Health Organization (WHO) included burnout in the International Classification of Diseases, 11th Revision (ICD-11) under the category 'Problems related to work and unemployment' with the following definition: 'Burnout is a syndrome resulting from chronic workplace stress that has not been successfully managed.' The ICD-11 classification (WHO, ICD-11, 2020) emphasizes that burnout is specific to the occupational context and should not be used to describe experiences in other areas of life. Occupational burnout triggers can be divided into two groups: those related to the person's personality and those related to the working environment (Cihanović et al., 2011). Burnout triggers can be categorized into job-specific, organizational, and individual personality-related (O'Driscoll & Cooper, 2002). Maslach also differentiates based on the occupational field and suggests that industry specificity may contribute to occupational burnout (Maslach et al., 2001).

Research studies have shown that certain personality traits are correlated with an increased risk of experiencing burnout, such as high levels of neuroticism and perfectionism. Other personality traits, such as introversion, agreeableness, and conscientiousness, can have correlations with professional burnout (Almén, 2021). Research on the Big Five personality traits has shown that neurotic personality traits are commonly associated with all three dimensions of burnout (Maslach et al., 2001; Wal et al., 2016; Unaldi et al., 2013; Zopiatis et al., 2010). Moreover, individuals who score high on neuroticism tend to be more prone to experiencing negative emotions and are more likely to become overwhelmed by stressors in the workplace, which can increase the likelihood of developing burnout (Naidoo et al., 2020). On the other hand, emotional exhaustion may be related to conscientiousness and agreeableness, depersonalization may also be related to agreeableness (Brown et al., 2019; Zopiatis et al., 2010) and conscientiousness (Zopiatis et al., 2010), while performance decrement may be related to conscientiousness (Brown et al., 2019; Zopiatis et al., 2010). In addition, a strong need for achievement

and pessimism can trigger burnout (Angelini, 2023; Scott, 2020). Furthermore, individuals with a strong need for achievement may constantly push themselves to meet high standards and goals, often at the expense of their well-being (Edú-Valsania et al., 2022).

Introverted individuals may be more susceptible to burnout as introverts tend to internalize stress and may have difficulty seeking support from others, which can lead to chronic emotional exhaustion and ultimately contribute to burnout (Alarcon et al., 2009). In contrast, research has also suggested that individuals with high levels of agreeableness and conscientiousness may be at a lower risk of experiencing professional burnout as they are more cooperative and adaptable, which can help them navigate workplace challenges more effectively.

Similarly, individuals with high levels of conscientiousness are often organized, self-disciplined, and able to manage their workload, reducing the risk of burnout effectively (Swider & Zimmerman, 2010). Personality traits such as agreeableness and conscientiousness can be protective factors against professional burnout (Barrick et al., 2001). Other authors mention that the relationship between personality traits and professional burnout is complex and can be influenced by various situational factors. For example, (Lu et al., 2022) while high levels of neuroticism have been associated with an increased risk of burnout, the presence of strong social support networks and effective coping strategies can mitigate the impact of neurotic tendencies on burnout risk. There are other similar statements, (Edú-Valsania et al., 2022) that it is important to note that the relationship between personality traits and professional burnout is complex and influenced by various factors such as work environment, stress levels, workload, and available support systems.

Research Methodology

The research aims to study and clarify the level of professional burnout, personality traits, their interrelationships, and the impact of personality traits on professional burnout in the advertising industry to make recommendations to advertising company managers. The conceptual model of the research (Fig.1) shows that the independent variables are the personality traits neuroticism, conscientiousness, extroversion, honesty-humility, agreeableness, openness to experience and their sub-traits. The dependent variables are the professional burnout scales: emotional exhaustion, depersonalization, and achievement reduction. The study investigates the characteristics of the variables as well as their relationships and influences. According to the conceptual model (Fig.1), the research questions were: Q1- What are the most common personality traits of advertising employees? Q2- What is the level of professional burnout in advertising companies? Q3- What is the correlation between personality traits and professional burnout in advertising employees? Q4- Which personality traits impact professional burnout in advertising employees?

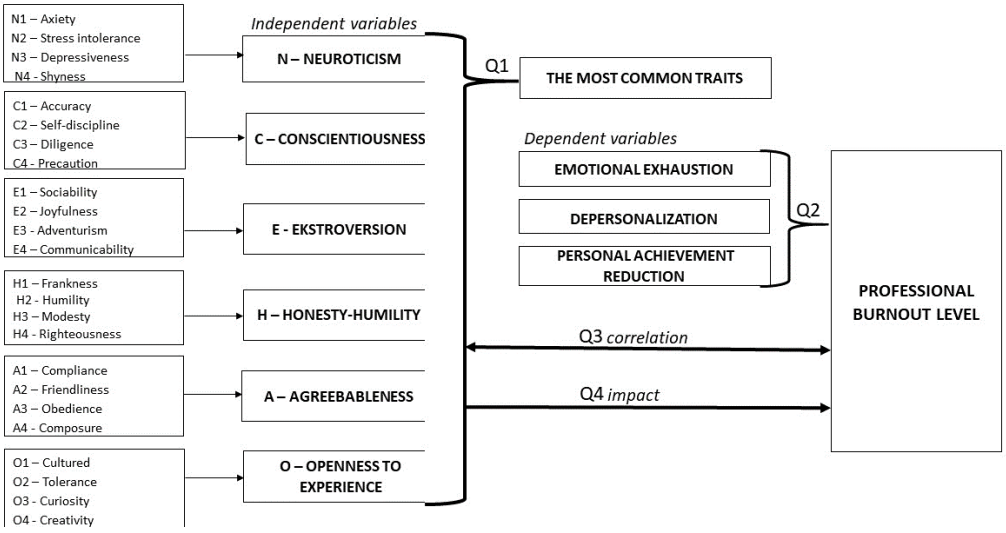

Fig. 1. Conceptual Model of the Research (Source: Created by the authors)

This research is a quasi-experimental, combined cross-sectional, descriptive, and correlational study. The questionnaire included the Maslach Professional Burnout Survey (Maslach & Jackson, 1981) adapted version in Latvian (Vaine, 2019), the Latvian Personality Survey (LPA-v3) (Perepjolkina & Reņģe, 2013), and demographic questions and was distributed electronically. A non-probability sampling was used to select the respondents and a convenience sample was drawn. The selection criterion was the current place of work - media company or advertising agency. In total, the questionnaire was distributed among 10 media companies, 25 advertising agencies and 42 members of the Latvian Advertising Association. There are no precise statistics available on the number of people working in the Latvian advertising industry. According to the Latvian State Revenue Service (VID) (www.vid.gov.lv, 2024), the projections for 2023 by NACE sector code and the average amount of workplaces per month are as follows: 1) NACE (73) *Advertising and market research services* average holds 5 433 workplaces and NACE (60) *Radio and television programme production and broadcasting* companies have 1 882 workplaces. Data in the sector are fragmented as there are different disciplines, both media and advertising agencies - outsourcing is very common in this sector. Based on the VID data (www.vid.gov.lv, 2024), there could be more than 7,000 workers in the advertising sector in Latvia. A total of 153 respondents were surveyed and 148 questionnaires (n=148) were deemed valid and included in the data analysis, which was conducted using Microsoft Excel and PSPP software.

The cumulative age distribution indicates that 49.32% of the respondents were 35 years old or younger. When analysing the respondents by length of service, the most common length of service among the respondents was '5 years or more' (n=67, 45.27%), while the least common length of service was 'up to 1 year' (n=15, 10.14%). The survey asked respondents to indicate their salary level. The results show that the most frequently mentioned salary range was '1000-1500 EUR', accounting for 42.57% of cases. Additionally, the cumulative salary share figures indicate that 64.19% of advertising workers surveyed have a monthly salary of up to EUR 1500. The highest level of remuneration, '2000 EUR or more,' was noted by 18.92% of respondents. Regarding the job category of the surveyed population, 71.72% of respondents are classified as 'employees,' and 28.38% of respondents are classified as 'managers.'

The three scales of the Maslach Professional Burnout Questionnaire were measured with a 7-point Likert scale, where 0 was never, and 6 was every day. K-S Test results showed that Emotional exhaustion sig=0.742, Depersonalization sig= 0.297, and Personal achievement reduction sig= 0.889. For the Latvian Personality Survey (LPA-v3) scales, a Likert scale of 5 denominations was used, where 1 is not applicable, and 5 is applicable. In addition, the K-S Test results done for the independent variables found that: "N-Neuroticism" has a sig= 0.626; "E-Extroversion" has a sig= 0.103; "O-Openness to experience" has a sig= 0.517; "C-Conscientiousness" has a sig= 0.427; "A-Agreeableness" has a sig= 0.774, and "H-Honesty-Humility" has a sig= 0.127. In general, the data follow a normal distribution, as the significance (sig) value of all variables used in the surveys is greater than 0.05 ($p \geq 0.05$). Parametric tests were used to analyse the data further: Pearson correlation test and Linear regression. Descriptive statistics were used to determine the level of burnout and the most pronounced personality traits.

The Maslach burnout test scales measured emotional exhaustion, depersonalization, and personal achievement reduction. Additionally, Cronbach's alpha coefficients for the emotional exhaustion, depersonalization, and personal achievement reduction scales were 0.89, 0.76, and 0.80, respectively. These coefficients indicate that all three scales and their items are reliable and were used for further analysis. The Cronbach's Alpha coefficients for the Latvian Personality Survey (LPV) scales are provided: "C-Conscientiousness" α=0.85; "N-Neuroticism" α=0.90; "H-Honesty-Humility" α=0.72; "E-Extroversion" α=0.80; "O-Openness to experience"α=0.77 and "A-Agreeableness" α=0.77, and these data were considered reliable and were used for further analysis.

The research was conducted within a specific industry, so the data on personality traits and professional burnout can be used to describe the specifics of the advertising industry. Interpreting them within the framework of another sector may be misleading. The suggestions for reducing burnout can be applied to other business organisations where burnout has been identified in employees.

Results and Discussion

Personality Traits of Advertising Professionals

Figure 2 shows the personality trait ratings for the general traits and their sub-traits, forming the personality trait structure of advertising employees (Fig.2.). The highest scores are for the general traits: O - Openness to Experience (M=55.32), C - Conscientiousness (M=54.91), and H - Honesty-Humility (M=50.84), while the lowest scores are for E-Extroversion (M=49.81), N-Neuroticism (M=47.32), and A-Agreeableness (M=46.97). The results confirm Perepjolkina's (2014) point that the overall traits can be assessed when interpreting the results, and the ratio of high and low scores of the sub-traits should be considered. Furthermore, the most striking difference in subscale scores is in the N-Neuroticism dimension (as shown in Figure 2), where relatively high scores are N-Anxiety (M=13.64) and N-Shyness (M=13.02), showing that advertising workers are multidimensional. In contrast, the lowest score in the Neuroticism dimension is N-Stress intolerance (M=9.65), which indicates emotional stability and ability to function under increased stressful conditions.

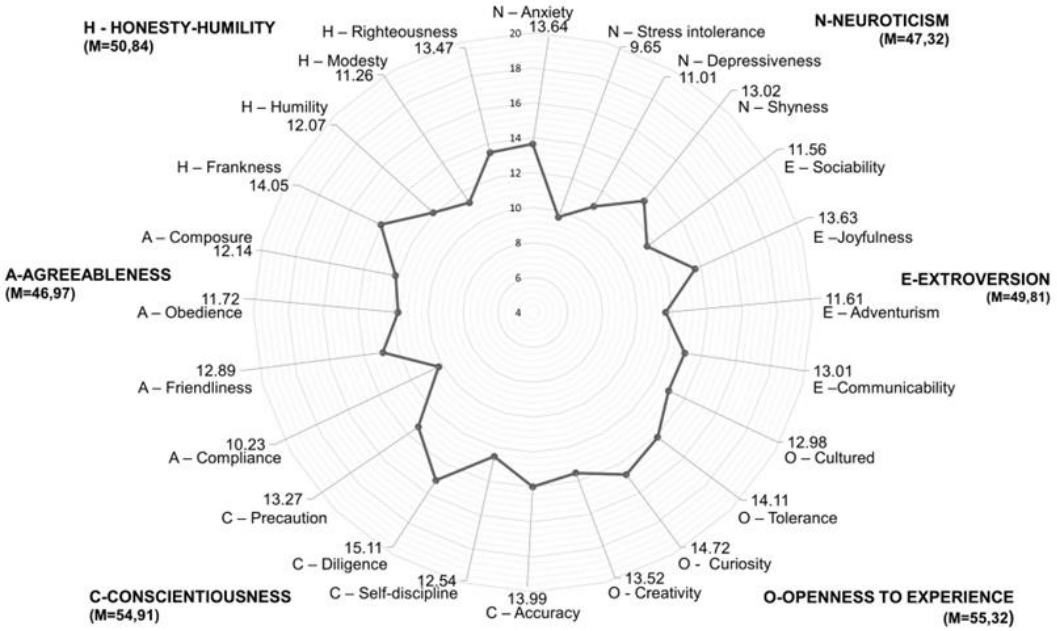

Fig. 2. Personality Structure of Advertising Employees (N=148), Mean Scores (Source: Created by authors)

As shown in Figure 3, advertising workers do not have extremely high or low scores on personality traits - they are balanced and proportionate. In the Latvian Personality Survey (LPA v-3), the maximum possible total score for the subscales is 20, and the minimum is 4 (Perepjolkina & Reņģe, 2013). The survey does not offer a scale to determine high/low scores cut-off. When interpreting the data, high - and low-scores were compared. Among advertising industry employees, the lowest score is for the *stress-intolerance* sub-trait (M=9.65), which is desirable and indicates a person's ability to be collected, confident, and cope well under stress (Perepjolkina, 2014). The highest score (M=15.11) is for *diligence*, which is desirable because people with this trait are motivated to succeed and perform their duties well. However, high *diligence* scores may also indicate perfectionism, which can interfere with work effectiveness (Perepjolkina, 2014).

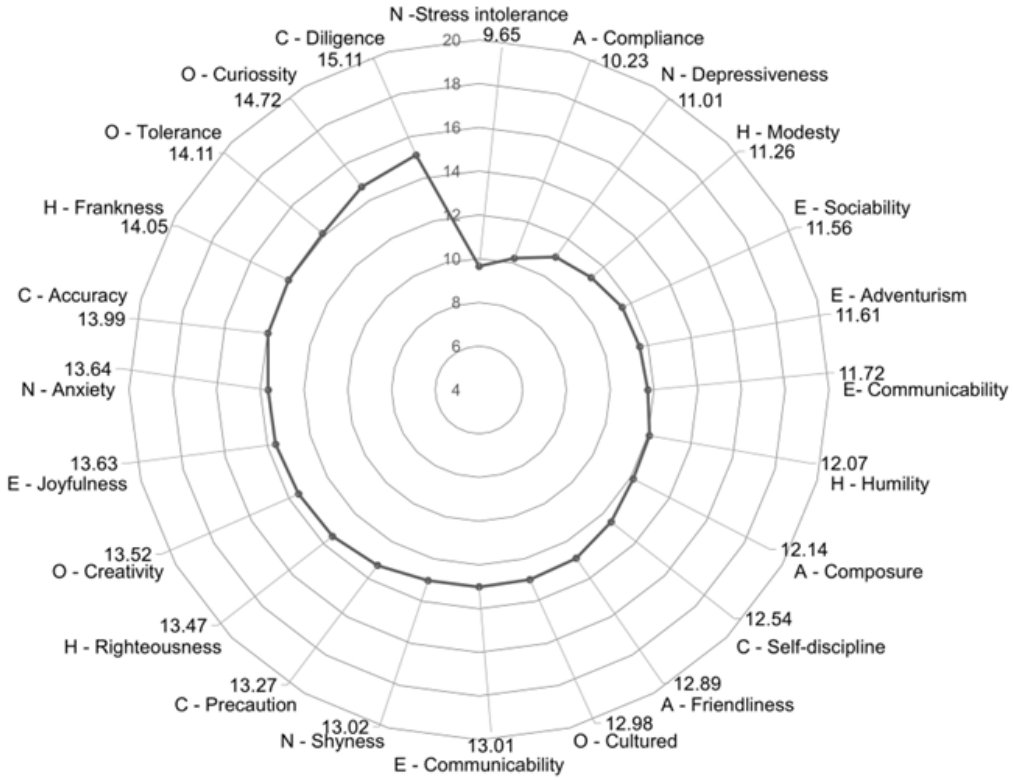

Fig. 3. Sub-traits Mean Scores Ranked, High – Low Score Dynamics (N=148) (Source: Created by authors)

The eight personality sub-traits (Fig.3.) of advertising industry employees with the highest scores are as follows: *diligence* (M=15.11), *curiosity* (M=14.72), *tolerance* (M=14.11), *frankness* (M=14.05), *accuracy* (M=13.99), *anxiety* (M=13.64*), joyfulness* (M=13.63), and *creativity* (M=13.52).

Higher *diligence* scores are characteristic of ambitious people who are driven to succeed, set high standards, and develop themselves. *Curiosity* points to the person having a wide range of interests and a willingness to learn; people with these traits might be easier to train from an employer's perspective. *Tolerance* scores show that people working in advertising are tolerant of differences and broad-minded. In addition, high *openness to experience* scores are desirable in any industry because they indicate that employees are willing to learn (Barrick & Mount, 1991). At the same time, high *anxiety* scores indicate nervousness, tension, rumination about failures, and increased worry, which can interfere with constructive action. Scores for *joyfulness* indicate the ability to feel positive emotions, such as joy and excitement; such people are optimistic. *Creativity* is the eighth most common trait and comprises the ability to think outside the box and express oneself creatively. Such a person is comfortable in a job requiring ingenuity and out-of-the-box approaches relevant to the advertising industry.

The eight sub-traits with the lowest scores are *stress intolerance* (M=9.65), *compliance* (M=10.23), *depressiveness* (M=11.01), *modesty* (M=11.26), *sociability* (M=11.56), *adventurism* (M=11.61), *obedience* (M=11.72) and *humility* (M=12.07). A low score for *stress intolerance* indicates that advertising employees are emotionally stable under stress, able to remain calm, make decisive decisions, and solve problems independently. In any industry, it might be preferred that employees have lower or moderate scores on *neuroticism* subscales. However, these need to be assessed carefully, as too low scores may indicate phlegmatism (Perepjolkina, 2014). For those working in advertising, the lower *stress intolerance* scores balance well with the higher *anxiety* scores. Lower *compliance* scores indicate self-confidence and a desire to be proved right. On the other hand, the *depressiveness* score (M=11.1) may indicate a stable emotional background but does not exclude that some people may be depressed. Lower *modesty* scores indicate a sense of superiority, arrogance, and a desire for recognition. Reduced *sociability* indicates a preference for solitude, but the lower scores for this trait can also be explained by people becoming tired of dynamic environments and consciously choosing tranquillity. Lower

obedience scores may indicate strong individual opinions, a desire to act as they see fit, and rebellious attitudes. Lower *humility* scores show that social status and financial wealth are important to people working in advertising.

In conclusion, this set of personality traits cannot be attributed to a specific individual, as it describes the advertising workforce as a whole. Additionally, traits are quite subjective, and people may express the same traits in different ways and contexts (Bourne & Russo, 2001). It should also be mentioned that the research and theoretical aspects of the personality traits approach to date are highly controversial. However, personality traits provide trends and help predict employee behaviour (Matthews, 2018), which can be considered by advertising industry company managers when recruiting new employees, forming teams, improving, and developing the organization's culture and microclimate, and making strategic management decisions that affect employees.

Professional Burnout among Employees of Advertising Companies

Employees in advertising companies have high (M=26.96) *emotional exhaustion*, medium (M=9.86) *depersonalization* or cynicism, and high (M=30.40) *personal achievement reduction*, which indicates low work efficiency (Maslach & Jackson, 1981a). When evaluating professional burnout by scales and percentage distribution among respondents, it was found that high *emotional exhaustion* was among 57,47% of respondents (M=37,76), high *depersonalization* was among 42,58% of respondents (M=17,46), and high *personal achievement reduction* was among 50,67% of employees (M=22,50) of respondents.

Correlation between Professional Burnout and Personality Traits

To investigate whether and how burnout is related to the personality traits of employees in the advertising industry, a Pearson Correlation Test was conducted on both - the general personality traits and the subscales (Table 1). The results show that on the dimensions of general traits, *emotional exhaustion* has a strong positive correlation with *neuroticism* (r=0.53; sig=.000) and a strong negative correlation with *extroversion* (r= -0.41; sig=.000); *depersonalization* has a strong positive correlation with *neuroticism* (r=0.33; sig=.000), a negative correlation with *agreeableness* (r= -0.19; sig=.021) and a negative correlation with *extroversion* (r= -0.25; sig=.002*). Achievement reduction*, or work efficiency, has a strong negative correlation with *neuroticism* (r= -0.44; sig=.000), as well as a strong positive correlation with *extroversion* (r= 0.43; sig=.000) and a positive correlation with *openness to experience* (r= 0.20; sig=.014, p>0.05).

Also, other studies have confirmed that *neuroticism* is commonly related to burnout all three dimensions: emotional exhaustion, depersonalization, and achievement reduction (Maslach et al., 2001; Unaldi et al., 2013; Wal et al., 2016; Zopiatis et al., 2010), and there is also support that *depersonalization* may be related to *agreeableness* (Brown et al., 2019; Zopiatis et al., 2010). As per other researchers (Mheidly et al., 2020) in the advertising industry, professionals with high levels of neuroticism may be more prone to experiencing burnout due to their tendency to experience negative emotions and ruminate on stressful situations. In contrast, the correlations of *depersonalization* and *achievement reductions* with *conscientiousness* (Brown et al., 2019; Zopiatis et al., 2010) were not statistically significant in the present study. Others (Edú-Valsania et al., 2022) discuss that certain personality traits, such as *neuroticism, conscientiousness, agreeableness*, and, to some extent, *extroversion*, and *openness to experience*, might correlate with professional burnout, but it is important to note that the relationship between personality traits and professional burnout is complex and influenced by various factors such as work environment, stress levels, workload, and available support systems.

Table 1. Burnout Dimensions Correlations with Personality Traits (N=148) (Source: Created by authors)

PERSONAL TRAITS & SUB-TRAITS	EMOTIONAL EXCHAUSTION	DEPERSONALIZATION	PERSONAL ACHIEVEMENT REDUCTION
N – NEUROTICISM	,53**	,33**	-,44**
N1 - Anxiety	,48**	,29**	-,34**
N2 — Stress intolerance	,35**		-,40**
N3 - Depressiveness	,55**	,37**	-,39**
N4 – Shyness	,32**	,25*	-,30**
E – EXTROVERSION	-,41**	-,25*	,43**
E1 – Sociability	-,47*	-,22*	,30**
E2 – Joyfulness	-,34**	-,31**	,44**
E4 – Communicability	-,25*	-,21*	,32**
O- OPENNESS TO EXPERIENCE			,20*
O2 – Tolerance		-,24*	
O4 – Creativity			,28**
C1 – Accuracy	-,24*		
C2 – Self-discipline	-,31**	-,22*	,18*
A - AGREEABLENESS		-,19*	
A1 – Compliance	,27**		-,19*
A2 – Friendliness	-,17*	-,32**	
A4 – Composure			,26**
H – HONESTY- HUMILITY			
H1 – Frankness		-,22*	
H4 – Righteousness		-,19*	

Sig (2-tailed).= p>0,05, p>0,001***

Regarding the sub-trait dimensions, *emotional exhaustion* has a robust positive correlation with *anxiety* (r=0.48; sig=.000), *stress intolerance* (r=0.35; sig=.000), *depressiveness* (r=0.55; sig=.000), *shyness* (r=0.32; sig=.000), and *compliance* (r=0.27; sig=.001). Also, *emotional exhaustion* has a negative correlation with *joyfulness* (r= -0.34; sig=.000) and *self-discipline* (r= -0.31; sig=.000). *Depersonalization*, or cynicism, has a very strong positive correlation with *anxiety* (r=0.29; sig=.000) and *depressiveness* (r=0.37; sig=.000), and a negative strong correlation with *joyfulness* (r= -0.31; sig=.000) and *friendliness* (r= -0.32; sig=.000). On the other hand, *personal achievement reduction* or work effectiveness has a positive correlation with *sociability* (r=0.30; sig=.000), *joyfulness* (r=0.44; sig=.000), *communicability* (r=0.32; sig=.000), *creativity* (r=0.28; sig=.001), and *composure* (r=0.26; sig=.001). Meanwhile, *personal achievement reduction* has a negative correlation with *anxiety* (r= -0.34; sig=.000), *stress intolerance* (r= -0.40; sig=.000), *depressiveness* (r= -0.39; sig=.000), and *shyness* (r= -0.30; sig=.000). As shown in Table 1, there are statistically significant, but weaker (p>0.05) correlations between professional burnout scales and other 12 sub-traits. Summing up, there are various variations of personality trait correlation and interrelationships with burnout. Renzo Bianchi (Bianchi, 2018) has noted, that personality traits are accounted for about 60% of the variance in burnout. To discuss this more, there are needed more research done on sub-trait correlations with burnout.

Impact of Personality Traits on Professional Burnout in the Advertising Industry

Since the Pearson correlation test showed statistically significant correlations of burnout with *extroversion, neuroticism, agreeableness,* and *openness to experience*, a linear regression analysis was conducted to determine which sub-traits impact professional burnout, and Figure 4 shows the impact of different sub-traits on the dimensions of professional burnout (Fig.4.).

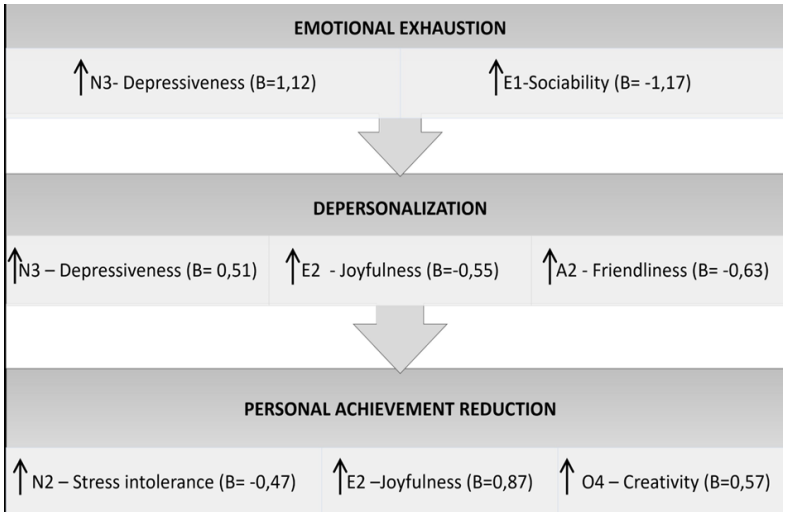

Fig.4. Statistically Significant Linear Regression Results of Effects of Different Sub-Traits on Dimensions of Professional Burnout (sig=.000; p>0.05) (Source: Created by the authors)

Overall, *neuroticism* traits explain 31% (adjusted R2=0.31) of the changes in *emotional exhaustion*, while *extroversion* traits explain 24% of the changes in the emotional exhaustion dimension (adjusted R2=0.24). Also, Bianchi (2018) has found that there is evidence that burnout is more strongly associated with neuroticism and concluded that this association is even stronger than with any of the work-contextualized factors. Among the *neuroticism* sub-traits, *depressiveness* (B=1.12) has the greatest (t=-4.15; sig=.000, p>0.05) and most statistically significant (t= -5.02; sig=.000) effect on changes in *emotional exhaustion*, while among the *extroversion* sub-traits, *sociability* (B= -1.17) has the greatest (t= -5.02; sig=.000) and most statistically significant effect.

Changes in *depersonalization* also have statistically significant regression patterns (sig=.000; p>0.05) with *neuroticism*, *extroversion*, and *agreeableness* features. For example, *neuroticism* traits explain 14% (adjusted R2=0.14) of the total *depersonalization* change in advertising employees, and the greatest statistically significant (t= 3.11; sig=.002) impact is for *depressiveness* (B= 0.51). On the other hand, *extroversion* traits explain 10% (adjusted R2=0.10) of the total change in *depersonalization* and the strongest statistically significant (t= -3.04; sig=.003) effect is for *joyfulness* (B= -0.55), indicating that as the *joyfulness* trait increase, *depersonalization* decreases. Meanwhile, *agreeableness* traits explain about 11% (adjusted R2=0.11), and the statistically significant (t= -3.95; sig=.000) greatest effect of *depersonalization* change is for *friendliness* (B= -0.63).

On the other hand, *personal achievement reduction* has statistically significant regression models (sig=.000; p>0.05) with *neuroticism*, *extroversion*, and *openness to experience* (sig=.013; p>0.05). *Neuroticism* traits explain 19% of the total change in *personal achievement reduction* (adjusted R2=.19), and *stress intolerance* has the most statistically significant (t= -2.45; sig.=0.015) and negatively greater (B= -0.47) effect on *personal achievement reduction*. Since *Personal achievement reduction* explains work efficiency, the more intense the stress intolerance trait is, the lower the work efficiency becomes. *Extroversion* traits explain 21% (adjusted R2= 0.21) of the total change in *personal achievement*, and the greatest statistically significant (t= 4.28; sig= .000) effect is for the sub-trait *joyfulness* (B=0.87*). Openness to experience* explains about 6% (adjusted R2= 0.06) of the total change in *personal achievement*, and the statistically significant (t= 3.10; sig=,002) positive effect (B=0.57) on the change in work effectiveness is for the *creativity* sub-trait. There is a need for more research on sub-trait-specific impacts on burnout to have a wider discussion on this topic.

Conclusions

Advertising employees in Latvia do not show extreme values in the personality trait scores assessed. The eight highest-scoring sub-traits are *diligence, curiosity, tolerance, frankness, accuracy, anxiety, joyfulness,* and *creativity*. In contrast, the lowest-scoring sub-traits are *stress intolerance*, *compliance*,

depressiveness, modesty, sociability, adventurism, obedience, and humility. For company managers, it is recommended to use a personality test when recruiting new applicants. The most suitable candidates for advertising companies are those who score higher on the general personality traits: *openness to experience, conscientiousness, and honesty - modesty,* and lower or average scores on *extraversion, neuroticism,* and *agreeableness*. When assessing the results, attention should also be paid to the sub-traits, as they give a more precise insight into the personality structure. For employees of an advertising company, lower scores on the following sub-traits are desirable: *anxiousness, stress intolerance, depressiveness, shyness, and agreeableness*. Higher scores in the sub-traits of *cheerfulness, contentment, self-discipline, social activity, creativity,* and *self-restraint*.

Since at least 57% of advertising employees are burnt out at a high level of emotional exhaustion dimension and 50% have reduced work efficiency, it is recommended to attract consultants, such as professional supervisors, organisational psychologists, or other related specialists to identify professional burnout triggers in a specific organization or team, which would help prevent burnout it in future. This format ensures that employees and managers are equally accountable for the outcome. A focused process promotes employee engagement, problem-solving, conflict avoidance, understanding of diversity, empathy, and role clarity which usually are the main organisational triggers for burnout. To deal with the individual depersonalisation or cynicism factors which is high at 42.58%, it is recommended to introduce an Employee Assistance Programme and provide individual supervision sessions or other related consulting services, to support specific employee needs and prevent individual burnout factors.

There are statistically significant interrelationships between sub-traits and burnout dimensions. For example, *emotional exhaustion* has a robust positive correlation with the sub-traits: *anxiety, stress intolerance, depressiveness, shyness, and compliance* - the more pronounced these traits are, the higher the *emotional exhaustion i*s. Also, there is a very strong negative correlation between *emotional exhaustion* and joyfulness and self-discipline, meaning that the stronger these traits are, the lower the emotional exhaustion is in the individual. On the other hand, *depersonalization* has a robust positive correlation with *anxiety* and *depressiveness,* and this means that the more severe they are, the more severe the *depersonalization,* or cynicism in attitude and behaviour is. Additionally, a strong negative correlation exists between *depersonalization* and *joyfulness* and *friendliness*, indicating that *depersonalization* decreases when *joyfulness* and *friendliness* are more pronounced. Additionally, *personal achievement reduction* (or work effectiveness) has a robust positive correlation with *sociability, joyfulness, communicability, creativity,* and *composure*. Hence, the stronger these traits are, the better the work effectiveness is. There is a very strong negative correlation between *achievement reduction* with *anxiety, stress intolerance, depressiveness,* and *shyness* - the stronger *anxiety, stress intolerance, depressiveness,* or *shyness* trait a person has, the more work efficiency is reduced.

Some sub-traits have a statistically significant impact on professional burnout. For example, *emotional exhaustion* is most significantly affected by *depressiveness* and *sociability - depressiveness* increases *emotional exhaustio*n, while *sociability* decreases *emotional exhaustion*. The largest effects on *depersonalization,* or cynicism, of advertising employees are *depressiveness, joyfulness,* and *sociability*. This means that *depersonalization* is increasing directly under the influence of *depressiveness,* while *joyfulness* and *friendliness* traits are *decreasing*. The greatest effects on changes in *personal achievement* are *stress intolerance, joyfulness,* and *creativity,* meaning that *job performance* is negatively affected by *stress intolerance,* while it is enhanced by *creativity* and *joyfulness* traits.

In order to prevent or reduce professional burnout, it is recommended to develop, maintain and stimulate personality traits of *joyfulness, creativity, stress intolerance, friendliness* and *sociability* as they directly affect burnout. A creative work environment, balanced work tasks and a positive team microclimate would contribute and can be achieved through general stress management programs by attracting well-being consultants to help organizations.

As the most significant influence on changes in personal achievement is for the *neuroticism* sub-trait *stress intolerance,* it is recommended to educate employees to specifically understand and master stress management and emotional self-regulation in the work environment. Regular training or coaching on this specific subject would help reduce burnout. To sum up, the sub-trait *creativity* has the largest

statistically significant impact on work performance and also a statistically significant, strong positive correlation between work performance and *creativity*: as *creativity* increases, work performance increases. In order to prevent professional burnout, it is recommended to develop, maintain, and stimulate the trait of *creativity* in employees: by providing a creative working environment; a creative approach to work tasks; the opportunity and freedom to generate ideas; and the encouragement and inspiration to approach everyday work issues with ingenuity and out-of-the-box approaches.

Organizations need to consider a holistic approach that recognizes the impact of personality traits and focuses on creating a supportive work environment, providing resources for stress management, and promoting a healthy work-life balance to address the risk of burnout in the workplace effectively. Furthermore, fostering a culture of open communication and support can aid individuals in seeking assistance when facing burnout or high stress levels.

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Economics and Culture 2024, Volume 21, Issue 1

ISSN 2255-7563; e-ISSN 2256-0173

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The publication of the journal is financed by the EKA University of Applied Sciences, Pernavas 62, Riga, LV1009, Latvia

Publisher

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