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Is Europe Ready for Digital Transformation? A Comparative Analysis in the Field of Digitalization

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Abstract: *The Covid-19 pandemic has significantly accelerated digital transformation, compelling economic actors to rapidly adapt to evolving conditions. In response, the European Union has set ambitious digital targets for 2030 as part of its vision for Europe's Digital Decade, aiming to empower businesses and individuals to exploit the benefits of digitalization. The Digital Economy and Society Index (DESI) serves as a valuable tool for identifying the key drivers and challenges in achieving the EU's digital transformation goals. This research focuses on comparing EU member states across various dimensions of digitalization, including digital skills, infrastructure, business transformation, and the digitalization of public services, using DESI indicators. It is hypothesized that significant disparities exist between member states, which may be correlated with their levels of innovation performance. By employing multivariate statistical methods, the comparative analysis seeks to highlight the strengths, weaknesses, opportunities, and threats associated with digital transformation in Europe.*

1. INTRODUCTION

In the era of the Fourth Industrial Revolution, the Covid-19 pandemic has significantly accelerated the diffusion of new technologies. Digital solutions have become integral to the economy, online communication, e-commerce, and hybrid work now widely adopted. These advancements demand the continuous development of digital infrastructure, the enhancement of digital skills, the adaptation of businesses to digital technologies and the digitalization of public services. In response to the accelerated diffusion of new technologies, the European Union has developed a human-centric and sustainable vision for 2030, known as Europe's Digital Decade, to support exploiting the benefits of digitalization. This comprehensive framework serves as a guide for all actions related to the digital transformation of EU Member States. Since 2014, the European Commission has been monitoring the digital progress of Member States through the Digital Economy and Society Index (DESI). DESI includes 35 indicators grouped into four categories: digital skills, digital infrastructure, digital transformation of businesses, and the digitalization of public services. This comprehensive measure helps identify the key drivers and challenges in achieving the EU's digital transformation goals.

This research aims to compare the performance of EU Member States in the different fields of digital economy and society using DESI index. It can be assumed that there is a strong positive relationship between the innovation performance and the development of digital economy and society. Therefore, innovation performance groups created by Summary Innovation Index can be compared in DESI dimensions. Using multivariate statistical methods and simple time-series comparison there can be significant differences in several areas of digitalization among countries.

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Hypothesis One: Significant disparities exist between EU member states primarily in the soft factors of digital transformation, such as digital skills which are harder to change compared to infrastructure and these disparities may correlate with their levels of innovation performance.

Hypothesis Two: Countries with more advanced digital skills and digital infrastructure tend to perform better not only in innovation but also in overall economic performance. In contrast, the digital transformation of businesses and the digitalization of public services show significant variation among countries, facilitating faster catching-up processes for some.

2. THE THEORETICAL BACKGROUND OF THE RESEARCH

Nowadays, digitalization is a key driver of innovation and economic growth. Several studies emphasize that the widespread adoption of information and communication technologies (ICTs) generates structural changes in economies. Zherlitsyn et al. (2025) conducted a bibliometric analysis and statistical evaluation of digital transformation trends across EU countries. Their findings revealed a significant positive correlation between digital inclusion and GDP growth, with correlation coefficients of 0.9043 for actual and 0.8955 for lagged GDP growth metrics. This indicates that higher levels of digital inclusion, such as increased digital skills and internet access, are linked to greater economic growth. Ivanová and Grmanová (2023) applied DEA models using DESI dimensions as inputs and the ICT sector's GDP share as output to evaluate digitalization efficiency across EU countries, finding that while countries like Bulgaria, Romania, Greece, and Malta have low DESI scores, they perform efficiently; moreover, Malta stands out as consistently efficient across all model variations. Matthess and Kunkel (2020) conceptualized the relationship between structural change and digitalization, highlighting differences between developed and developing countries in the ability to exploit the benefits of digitalization. The authors argue that digitalization accelerates structural transformation by fostering productivity and innovation, but unequal access to digital technologies can exacerbate existing inequalities. Małkowska et al. (2021) assess the impact of digital transformation on EU countries, focusing on three dimensions: society (Society 4.0), economy (Economy 4.0), and companies (Companies 4.0). Using cluster analysis and the TOPSIS method, their findings highlight significant differences in technological development across EU countries and reveal the digitalization gap.

Human capital plays a crucial role in economic growth and innovation. In line with this, several studies highlight that digital skills are a critical factor in maximizing the benefits of digitalization. Grigorescu et al. (2021) focus on Central and Eastern European countries, showing that investments in education and digital skills significantly enhance performance across DESI dimensions. Tran et al. (2023) expand on this by categorizing digital skills into basic and advanced, finding that advanced digital skills have a stronger positive impact on GDP growth compared to basic digital skills. In addition, they found a strong, positive correlation between deploying ICT specialists and ICT development levels in the EU countries. According to the authors' analysis, human capital has a significant role both in economic and ICT development in the digital economy. Despite this, there is a huge gap in human capital between the EU Member States. Liu (2022) revealed that the EU's best-performing countries also achieve high scores in DESI indicators, highlighting that a more advanced digital economy and society are associated with better economic performance. Hunady et al. (2022) conducted a comprehensive analysis of digital readiness across EU member states, revealing that Nordic countries exhibit the highest levels of digital readiness, while newer member states, particularly from South-Eastern Europe, lag in areas such as e-commerce, and social media usage, and cloud computing adoption. Olczyk and Kuc-Czarnecka's (2022) found that fast and intensive digital transformation can close or eliminate the gap between poor and rich

countries in the European Union, further underlining the importance of the development of digital infrastructure and digital skills. Kovács et al. (2022) pointed out that between 2016 and 2020, there was convergence among EU Member States based on the DESI. However, the rate of convergence varied. According to the authors' analysis, the Matthew effect tends to exist, as both the growth rate and variance of the DESI index increased significantly during this period leading to a widening gap between countries. It can be concluded that Member States with better digital infrastructure and digital skills can exploit better the opportunities offered by digitalization. Borowiecki et al. (2021) similarly highlighted a convergence among EU Member States in the development level of the digital economy and society, including its four core components. Pisar et al. (2024) found that the COVID-19 pandemic partially improved digital readiness in some less developed EU countries—such as Latvia and Slovenia—though significant disparities remained, underscoring the need for stronger EU-level actions to bridge the digital divide. Georgescu et al. (2022) used output-oriented Data Envelopment Analysis to assess digital transformation efficiency during the COVID-19 pandemic and found that only 8 of 27 EU countries were efficient, suggesting these could serve as benchmarks for others.

Imran et al. (2022) explore the relationship between digitalization and sustainability, highlighting a correlation between DESI scores and sustainable development indicators. They conclude that the digital economy significantly contributes to sustainable development. Similarly, Harangozó and Fakó (2024) found a mostly positive relationship between the digital economy and society (DESI) and the sustainable development goals index (SDGI). Their analysis, which focuses on the Visegrad Group (V4) countries, highlights that the V4 countries lag in digitalization and are around the average in sustainability. This suggests that digitalization alone cannot guarantee the realization of sustainable development. Wysokińska (2021) highlights that digital transformation—especially through ICT development—can significantly support the achievement of Sustainable Development Goals (SDGs) in the EU, but warns that unequal access to innovation may limit its inclusive impact. This perspective aligns with findings from Nosratabadi et al. (2023), who conducted an empirical study on the social sustainability of digital transformation (SOSDIT) across EU-27 countries. Their research indicates that countries with higher levels of digital inclusion and digital skills tend to perform better in achieving SDGs. Moreover, they found an inverse relationship between income inequality (measured by the Gini coefficient) and SDG performance, suggesting that reducing income disparities can enhance the positive impact of digital transformation on sustainable development.

In conclusion, there are digital disparities as highlighted by Bánhidi et al. (2020), and skill gaps within the European Union, which can be limited with an adequate strategy. Jarzębowski et al. (2024) demonstrate that higher levels of digitalization—measured through DESI, GII, and R&D intensity—are positively correlated with national competitiveness across 10 selected European countries using data from 2017 and 2022. Fidan (2024) examines the digitalization levels of European countries between 2017 and 2022 using the Digital Economy and Society Index (DESI), identifying five clusters—Digital Leaders, Digital Risers, Digital Trackers, Digital Developers, and Digital Startups. Similarly, Pinto et al. (2023) clustered EU-27 countries based on three key dimensions - digital empowerment, business digitalisation, and broadband access - highlighting distinct digital transformation profiles: Digital Access Leaders, Digital Transformation Champions, Digital Empowerment Laggards, and Empowerment-Driven Disparities. These categorizations follow the same logic as the innovation performance groups based on the Summary Innovation Index and highlight the common features and differences among countries at varying levels of digital development.

3. MEASUREMENT FRAMEWORK, METHODOLOGY AND EMPIRICAL RESULTS

Digitalization has emerged as a transformative force, reshaping economies and societies worldwide. In 2014, the European Union (EU) introduced the Digital Economy and Society Index (DESI) to measure the Member States' digital progress. DESI serves as a tool to evaluate countries' performance in digital transformation. In 2021, the EU announced a comprehensive framework, Europe's Digital Decade Strategy, designed to help countries fully leverage the benefits of digitalization by 2030. The strategy outlines measurable targets in four key areas: digital skills, digital infrastructure, the digital transformation of businesses, and digital public services. DESI measures digital progress using 35 indicators (see details in Appendix 1). Five of these relate to digital skills, while digital infrastructure and the digital transformation of businesses include 11 indicators. The digitalization of public services is measured by 8 indicators. However, there are missing values for 2 indicators (5G SIM card share of the population and e-commerce turnover) due to a lack of measurements in some countries. As a result, only 33 DESI variables are included in this analysis, which aims to compare the performance of EU Member States across different fields of the digital economy and society.

Based on relevant literature, a strong positive correlation is assumed between innovation performance and the development of the digital economy and society. As a first step in the analysis, a correlation analysis is conducted to identify the relationship between the Summary Innovation Index (SII) and DESI. If a strong relationship is identified, EU Member States can be categorized into innovation performance groups based on their overall innovation performance using the Summary Innovation Index. Subsequently, the Kolmogorov-Smirnov test is applied to assess the normality of DESI variables for further analysis. If normality is confirmed, homoscedasticity must be tested to determine the suitability of running ANOVA and t-tests. If normality is not confirmed, the Kruskal-Wallis test and Mann-Whitney U test can be used to compare DESI indicators across innovation performance groups. These statistical methods help to highlight significant differences in DESI fields between the innovation performance groups.

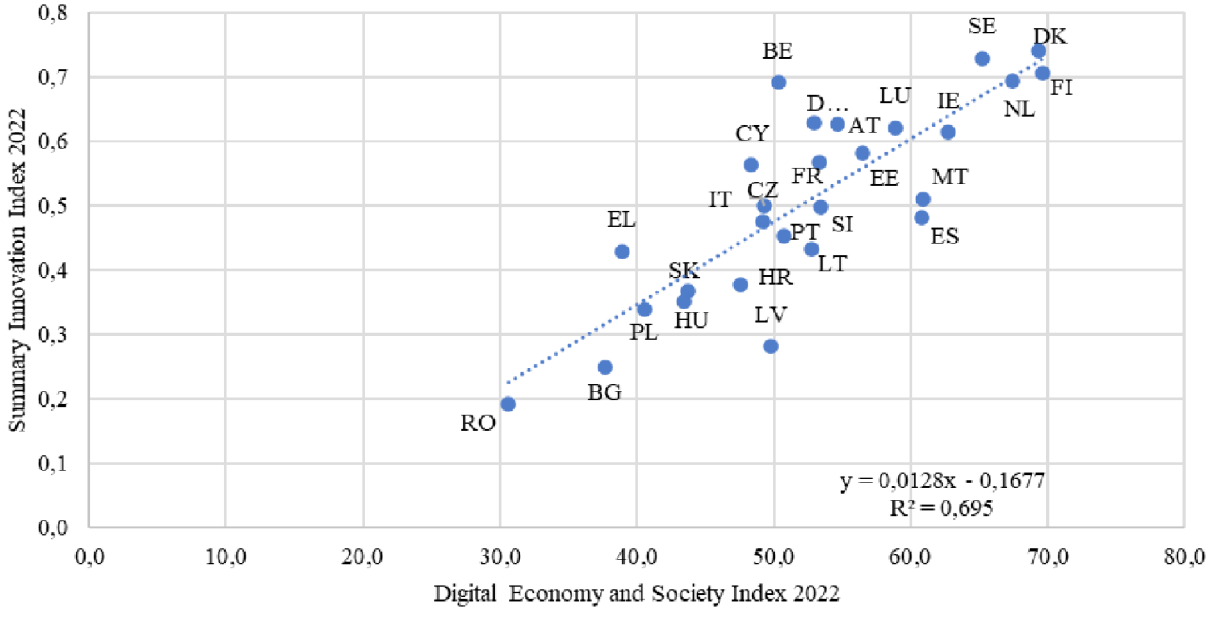

Figure 1. The relationship between Summary Innovation Index (SII) and Digital Economy and Society Index (DESI)

Source: Own calculation based on EIS (2024) and DESI (2022)

To examine the relationship between innovation performance and digital development, a correlation analysis was conducted between the SII and DESI. It should be noted that the comprehensive DESI index was only calculated up to 2022, so the correlation analysis was performed using 2022 data for both indicators. The Pearson correlation coefficient of 0.8337 indicates a strong positive relationship between these variables. The scatter plot is presented in Figure 1.

Figure 1 illustrates the relationship between the development of the digital economy and society and innovation performance in the European Union. This means that countries performing better in the digital economy and society indicators – such as digital infrastructure, digital skills, digital transformation of businesses, and digitalization of public services – tend to achieve higher levels of innovation performance. The strong correlation between these variables confirms the importance of digital development in the EU's strategy. There is no clear cause-and-effect relationship; the negative intercept parameter of the linear regression function indicates that digitalization alone is not sufficient for innovation. The scatter plot also indicates that promoting digital transformation of the economy significantly contributes to innovation.

Based on the strong positive relationship, EU Member States can be categorized into four innovation performance groups based on the Summary Innovation Index (EIS, 2023) for further analysis, as follows:

- *innovation leaders (4):* Denmark, Sweden, Finland, Netherlands
- *strong innovators (8):* Belgium, Austria, Germany, Luxembourg, Ireland, Estonia, France, Cyprus
- *moderate innovators (9):* Malta, Slovenia, Italy, Spain, Czechia, Portugal, Lithuania, Spain, Croatia
- *emerging innovators (6):* Hungary, Slovakia, Poland, Latvia, Bulgaria, Romania

The next step of the analysis involves testing the normality of DESI variables using the Kolmogorov-Smirnov test. The results show that 11 variables do not follow a normal distribution, indicating that non-parametric tests can be used to compare DESI indicators between the innovation performance groups of the EU. The Kruskal-Wallis test is an appropriate method for comparing DESI indicators across the four innovation performance groups. If the p-value is below 0.05, it can be concluded that there is a significant difference in the field of the digital economy and society. The results of the test are presented in Table 1.

In Table 1, it can be seen that in all four dimensions of the digital economy and society, indicators show significant differences; in total, this is observed in 18 out of the 33 variables examined. The greatest similarity between the innovation performance groups is found in the area of digital infrastructure, while the most significant differences are observed in the digital transformation of businesses. This may be attributed to EU funding and standards that have promoted consistent infrastructural development among Member States. In contrast, the digital transformation of businesses is more influenced by each country's economic structure, regulatory environment, and the technological readiness of local businesses. Regarding human resources, the smallest differences between Member States are observed in internet use, while the largest gap is seen in the above basic digital skills. In this regard, Bulgaria, the lowest-performing country, has a rate of 7.73%, compared to the highest-performing country, the Netherlands, with 54.53%. This means that the gap between countries widens as we move toward higher-level digital skills, leading to inequalities in leveraging digitalization opportunities. In the case of digital infrastructure, differences between Member States are moderate in overall internet take-up and mobile broadband take-up, but significant disparities exist in 5G coverage. In Romania, 32.75% of households have 5G coverage, while this rate reaches 100% in Cyprus, Denmark, Malta, and the Netherlands. The EU average is 89.3%. Interestingly, the laggards are not exclusively emerging innovators, as Belgium has a low rate of 40.35%, and the ratio is below the EU average in Estonia,

Ireland, Croatia, and Slovenia. The digital transformation of businesses is a unique field, as there are significant gaps between Member States. The values of the variables are typically high in innovation-leader countries, but the rates vary. In the case of e-commerce, Ireland, Czechia, and Hungary perform well, while unicorns are primarily associated with strong innovators, such as Germany and France. It can be concluded that in the field of digital transformation of businesses, the relationship with innovation performance is less pronounced, as the highest values are not necessarily observed in the innovation leaders. In the digitalization of public services, Romania lags significantly behind. While innovation leaders perform best in e-government users, their dominance is not observed in other areas with significant differences. Digital public services for citizens are fully implemented in Malta, which has a score of 100, followed by Estonia and Luxembourg. The smallest differences in mobile friendliness are observed among EU Member States, except for Romania.

Table 1. The results of Kruskal Wallis test

Dimension	Variable	Chi-Square	Asymp. Sig.
DIGITAL SKILLS	*Internet use*	*16,880*	*0,001*
	At least basic digital skills	*15,259*	*0,002*
	Above basic digital skills	*13,566*	*0,004*
	ICT specialists	1,427	0,699
	ICT graduates	3,136	0,371
DIGITAL INFRASTRUCTURE	*Overall internet take-up*	*11,198*	*0,011*
	Share of fixed broadband subscriptions >= 100 Mbps	3,420	0,331
	Share of fixed broadband subscriptions >= 1 Gbps	5,535	0,137
	Fixed Very High Capacity Network (VHCN) coverage	2,972	0,396
	Fibre to the Premises (FTTP) coverage	1,338	0,720
	Mobile broadband take-up	*16,136*	*0,001*
	Overall 5G coverage	*12,111*	*0,007*
	5G coverage in the 3.4–3.8 GHz band	5,190	0,158
	5G spectrum	2,272	0,518
	Edge nodes	4,430	0,219
DIGITAL TRANSFORMATION OF BUSINESSES	*SMEs with at least a basic level of digital intensity*	*10,649*	*0,014*
	Electronic information sharing	*13,692*	*0,003*
	Social media	*15,418*	*0,001*
	Data analytics	0,650	0,885
	Cloud	*11,860*	*0,008*
	Artificial intelligence	*14,699*	*0,002*
	E-invoices	*8,951*	*0,030*
	AI or Cloud or Data analytics	*11,571*	*0,009*
	Unicorns	*11,599*	*0,009*
	SMEs selling online	1,781	0,619
DIGITALIZATION OF PUBLIC SERVICES	*e-Government users*	*13,439*	*0,004*
	Digital public services for citizens	*8,259*	*0,041*
	Digital public services for businesses	5,860	0,119
	Pre-filled Forms	*7,353*	*0,061*
	Transparency of service delivery, design and personal data	3,211	0,360
	User support	4,787	0,188
	Mobile friendliness	*12,968*	*0,005*
	Access to e-health records	0,628	0,890

Source: Own calculation based on DESI (2024)

Table 2. The results of the Mann-Whitney U test for pairs of innovation performance groups

Dimension	Variable	*Innovation leader and strong innovators*		*Strong and moderate innovators*		*Moderate and emerging innovators*	
		Mann-Whitney U	Exact Sig.	Mann-Whitney U	Exact Sig.	Mann-Whitney U	Exact Sig.
DIGITAL SKILLS	Internet use	1,500	0,008	9,000	0,008	26,000	0,955
	At least basic digital skills	2,000	0,016	28,000	0,481	7,000	0,018
	Above basic digital skills	2,000	0,016	31,000	0,673	9,000	0,036
	ICT specialists	12,000	0,570	31,000	0,673	25,000	0,864
	ICT graduates	14,500	0,808	24,000	0,277	18,500	0,328
DIGITAL INFRASTRUCTURE	Overall internet take-up	5,000	0,073	18,000	0,093	27,000	1,000
	Share of fixed broadband subscriptions >= 100 Mbps	7,000	0,154	30,000	0,606	18,000	0,328
	Share of fixed broadband subscriptions >= 1 Gbps	4,000	0,048	23,500	0,236	20,500	0,456
	Fixed Very High Capacity Network (VHCN) coverage	6,000	0,109	31,000	0,673	21,000	0,529
	Fibre to the Premises (FTTP) coverage	8,000	0,214	32,000	0,743	22,000	0,607
	Mobile broadband take-up	1,000	0,008	14,000	0,036	23,000	0,689
	Overall 5G coverage	8,000	0,214	33,500	0,815	2,000	0,002
	5G coverage in the 3.4–3.8 GHz band	10,000	0,368	30,000	0,606	9,000	0,036
	5G spectrum	15,000	0,933	34,500	0,888	16,000	0,224
	Edge nodes	12,500	0,570	30,000	0,606	18,500	0,328
DIGITAL TRANSFORMATION OF BUSINESSES	SMEs with at least a basic level of digital intensity	11,000	0,461	36,000	1,000	3,000	0,003
	Electronic information sharing	3,000	0,028	35,000	0,963	7,000	0,018
	Social media	7,000	0,154	24,000	0,277	3,000	0,003
	Data analytics	11,000	0,461	35,000	0,963	23,500	0,689
	Cloud	0,000	0,004	29,000	0,541	17,000	0,272
	Artificial intelligence	6,000	0,109	25,500	0,321	5,000	0,008
	E-invoices	3,000	0,028	29,000	0,541	11,000	0,066
	AI or Cloud or Data analytics	0,000	0,004	30,000	0,606	17,500	0,272
	Unicorns	10,500	0,368	19,500	0,114	11,000	0,066
	SMEs selling online	16,000	1,000	26,000	0,370	17,500	0,272
DIGITALIZATION OF PUBLIC SERVICES	e-Government users	0,000	0,004	25,000	0,321	13,000	0,113
	Digital public services for citizens	8,000	0,214	34,000	0,888	13,000	0,113
	Digital public services for businesses	11,500	0,461	28,500	0,481	17,000	0,272
	Pre-filled Forms	2,000	0,016	26,000	0,370	20,000	0,456
	Transparency of service delivery, design and personal data	10,000	0,368	33,000	0,815	18,000	0,328
	User support	15,500	0,933	27,500	0,423	15,000	0,181
	Mobile friendliness	1,000	0,008	23,000	0,236	17,500	0,272
	Access to e-health records	16,000	1,000	35,000	0,963	21,500	0,529

Source: Own calculation based on DESI (2024)

It is also worth examining the pairwise differences between the innovation performance groups. For this purpose, the Mann-Whitney U test can be applied, and the results are presented in Table 2. It can be seen that the differences in the indicators of the digital economy and society are likely smaller among the countries in the middle range of innovation performance.

Table 2 reveals that there are only minor differences between moderate and strong innovators, with significant differences observed in just two variables: internet use and mobile broadband uptake. In contrast, there is a significant difference in ten variables between moderate and emerging innovators, six of which are related to the digital transformation of businesses. The largest differences are observed between leaders and strong innovators, with 13 variables showing significant differences. Three of these are associated with the dimensions of digital skills, digital infrastructure, and digitalization of public services, while four are linked to the digital transformation of businesses. The critical factors contributing to differences between innovation performance groups include internet use, advanced digital skills, mobile broadband uptake, electronic information sharing, and e-invoices. The differences in internet use and mobile broadband take up indicate that countries performing well in innovation also excel in these areas. Significant differences are observed among the better-performing groups, whereas there is no notable difference among lower innovation performance countries, which lag behind in the elements of digital skills and digital infrastructure. Interestingly, some low-performing countries show signs of a catching-up process, with faster development in certain areas. For example, Latvia is above the EU average in mobile broadband take-up, having improved significantly over six years, from 67.03% in 2018 to 90.17% in 2024. The correlation is 0.7608 between the SII and internet use, and 0.7639 between the SII and mobile broadband take-up. In other cases, where significant differences are observed between innovation leaders and strong innovators, and moderate and emerging innovators indicated higher gap in EU Member States while in the middle range of innovation ranking is quite homogenous. This tendency also highlights the remaining disparities among countries in several fields.

The causes of differences can be examined with the analysis of trends in critical dimensions of DESI. There is balanced progress among countries in certain areas, such as internet usage and internet coverage. Additionally, in some countries, significant improvements can be observed in specific indicators. A notable example is the impressive progress made by Italy and Estonia in the field of e-invoices. In the case of the e-government users indicator, several strong innovators lag behind, such as Germany, and Cyprus has also fallen behind, performing below the EU average. They are outpaced by emerging innovators like Hungary, Latvia, and Slovakia.

4. FUTURE RESEARCH DIRECTIONS

This research examines the significant differences in the digital economy and society across EU Member States, which were categorized into innovation performance groups. A more detailed analysis could identify the limiting factors in each country and explore how the EU can support efforts to reduce these disparities. Future research could further investigate the relationship between innovation performance and the digital economy and society to demonstrate how investments in digital skills development and the digital transformation of businesses can enhance innovation performance and help reduce disparities within the European Union.

5. CONCLUSION

The Covid-19 pandemic accelerated digitalization progress. In response to the rapid diffusion of new technologies, the European Union developed Europe's Digital Decade Strategy to support the effective exploitation of digitalization's benefits. The Digital Economy and Society Index (DESI), which includes 35 indicators grouped into four categories – digital skills, digital infrastructure, digital transformation of businesses, and digitalization of public services – monitors the digital progress of EU Member States. This research compares the performance of EU Member States across the different dimensions of the digital economy and society using DESI data, applying

multivariate statistical methods and simple time-series analysis. The correlation analysis confirmed a strong positive relationship between the development of the digital economy and society and innovation performance. As a result, DESI indicators were compared by categorizing countries into innovation performance groups based on the Summary Innovation Index.

Based on the analysis, it can be concluded that a more advanced digital economy and society is strongly associated with better innovation performance. As previously hypothesized, significant disparities exist between EU Member States, though not typically in the soft factors of digital transformation. The analysis highlights that innovation leaders clearly dominate in the areas of digital skills and digital infrastructure, although their dominance is less pronounced in digital public services. The digital transformation of businesses emerges as the most critical dimension of DESI, where substantial disparities are observed between countries. While countries demonstrate convergence in digital infrastructure, there are also best practices showcasing notable catching-up in certain areas.

References

Bánhidi, Z., Dobos, I., & Nemeslaki, A. (2020). What the overall Digital Economy and Society Index reveals: A statistical analysis of the DESI EU28 dimensions. *Regional Statistics, 10*(2), 42-62. https://doi.org/10.15196/rs100209

Borowiecki, R., Siuta-Tokarska, B., Maroń, J., Suder, M., Thier, A., & Żmija, K. (2021). Developing Digital Economy and Society in the Light of the Issue of Digital Convergence of the Markets in the European Union Countries. *Energies*, *14*(9), 2717. https://doi.org/10.3390/en14092717

Digital Economy and Society Index (DESI). (2022). https://digital-strategy.ec.europa.eu/en/library/digital-economy-and-society-index-desi-2022

Digital Economy and Society Index (DESI). (2024). https://digital-decade-desi.digital-strategy.ec.europa.eu/datasets/desi/indicators#desi2023-1

European Innovation Scoreboard (EIS). (2023). https://research-and-innovation.ec.europa.eu/knowledge-publications-tools-and-data/publications/all-publications/european-innovation-scoreboard-2023_en

European Innovation Scoreboard (EIS). (2024). https://research-and-innovation.ec.europa.eu/statistics/performance-indicators/european-innovation-scoreboard_en

Fidan, Ü. (2024). Convergence or divergence? Trends in the digitalisation index cluster over the years. *Regional Statistics*, *14*(6), 1050–1068. https://doi.org/10.15196/RS140602

Georgescu, M. R., Stoica, E. A., Bogoslav, I. A., & Lungu, A. E. (2022). Managing Efficiency in Digital Transformation – EU Member States Performance during the COVID-19 Pandemic. *Procedia Computer Science*, *204*(2022), 432–439. https://doi.org/10.1016/j.procs.2022.08.053

Grigorescu, A., Pelinescu, E., Ion, A. E., & Dutcas, M. F. (2021). Human Capital in Digital Economy: An Empirical Analysis of Central and Eastern European Countries from the European Union. *Sustainability*, *13*(4). https://doi.org/10.3390/su13042020

Harangozó, G., & Fakó, P. (2024). Relationship between the DESI and the SDG index in the European Union with a special focus on the Visegrad Group countries. *Regional Statistics*, *14*(6), 1187–1221. https://doi.org/10.15196/RS140607

Hunady, J., Pisár, P., Vugec, D. S., & Bach, M. P. (2022). Digital Transformation in European Union: North is leading, and South is lagging behind. *International Journal of Information Systems and Project Management*, *10*(4), 39-56. https://doi.org/10.12821/ijispm100403

Imran, M., Liu, X., Wang, R., Saud, S., Zhao, Y., & Khan, M. J. (2022). The influence of digital economy and society index on sustainable development indicators: the case of European Union. *Sustainability 14*(18), 11130. https://doi.org/10.3390/su141811130

Ivanová, E., & Grmanová, E. (2023). Digital transformation and ICT sector performance in EU countries. *Problems and Perspectives in Management*, *21*(1), 48–58. http://dx.doi.org/10.21511/ppm.21(1).2023.05

Jarzębowski, S., Bozhenko, V., Didorenko, K., Tkachenko, O., Blyznyukov, A., Melnyk, M., & Cieslik, J. (2024). The Impact of Digitalisation on the Competitiveness of European Countries. *SocioEconomic Challenges*, *8*(3), 238-261. https://doi.org/10.61093/sec.8(3).238-261.2024

Kovács, T. Z., Bittner, B., Huzsvai, L., & Nábrádi, A. (2022). Convergence and the Matthew effect in the European Union based on the DESI index. *Mathematics*, *10*(4), 613. https://doi.org/10.3390/math10040613

Liu, T. C. (2022). Digital policy in European countries from the perspective of the digital Economy and Society Index. *Policy & Internet 14*(1), 202-218. https://doi.org/10.1002/poi3.274

Małkowska, A., Urbaniec, M., & Kosała, M. (2021). The impact of digital transformation on European countries: insights from a comparative analysis. *Equilibrium. Quarterly Journal of Economics and Economic Policy*, *16*(2), 325–355. https://doi.org/10.24136/eq.2021.012

Matthess, M., & Kunkel, S. (2020). Structural change and digitalization in developing countries: conceptually linking the two transformations. *Technology in Society, 63*, 101428. https://doi.org/10.1016/j.techsoc.2020.101428

Nosratabadi, S., Atobishi, T., & Hegedűs, S. (2023). Social Sustainability of Digital Transformation: Empirical Evidence from EU-27 Countries. *Administrative Sciences*, *13*(5), 126. https://doi.org/10.3390/admsci13050126

Olczyk, M., & Kuc-Czarnecka, M. (2022). Digital transformation and economic growth – DESI improvement and implementation. *Technological and Economic Development of Economy*, *28*(3), 775–803. https://doi.org/10.3846/tede.2022.16766

Pinto, H., Nogueira, C., & Vieira, G. (2023). Digitalisation landscape in the European Union: Statistical insights for a Digital Transformation: Panorama de la digitalización en la Unión Europea: Perspectivas estadísticas para una Transformación Digital. *European Public & Social Innovation Review*, *8*(1), 20–38. https://doi.org/10.31637/epsir-2023-233

Pisar, P., Hunady, J., Khawaja, S., & Qureshi, F. H. (2024). The Digital Transformation of European Union Countries before and during COVID-19. *Business Systems Research*, *15*(1), 22-44. https://doi.org/10.2478/bsrj-2024-0002

Tran, T. L., Herdon, M., Phan, T. D., & Nguyen, T. M. (2023). Digital skill types and economic performance in the EU27 region, 2020–2021. *Regional Statistics*, *13*(3), 536–558. https://doi.org/10.15196/RS130307

Wysokińska, Z. (2021). A Review of the Impact of the Digital Transformation on the Global and European Economy. *Comparative Economic Research. Central and Eastern Europe*, 24(3), 75-92. https://doi.org/10.18778/1508-2008.24.22

Zherlitsyn, D., Kolarov, K., & Rekova, N. (2025). Digital Transformation in the EU: Bibliometric Analysis and Digital Economy Trends Highlights. *Digital*, *5*(1), 1. https://doi.org/10.3390/digital5010001

APPENDIX

A1. The structure of Digital Economy and Society Index (DESI)

Digital area	Indicator	Short definition and measurement
Digital skills (5)	Internet use	Individuals who use the internet at least once a week
	At least basic digital skills	individuals with 'basic' or 'above basic' digital skills in all the five competences (information and data literacy, communication and collaboration, digital content creation, safety, problem solving)
	Above basic digital skills	individuals with 'above basic' digital skills all five competences
	ICT specialist	jobs like ICT service managers, ICT professionals, ICT technicians, ICT installers and servicers
	ICT graduates	persons with a degree in ICT
Digital infrastructure (11)	Overall internet take-up	households with access to the Internet at home
	Share of fixed broadband subscriptions >= 100 Mbps	based on advertised download speeds
	Share of fixed broadband subscriptions >= 1 Gbps	
	Fixed Very High Capacity Network (VHCN) coverage	percentage of households covered by any fixed VHCN
	Fibre to the Premises (FTTP) coverage	percentage of households covered by FTTH and FTTB
	Mobile broadband take-up	individuals who used the internet on a mobile device
	5G coverage	percentage of households with coverage by at least one 5G mobile network
	5G coverage in the 3.4–3.8 GHz band	percentage of households with coverage by 5G using the 3.4-3.8GHz spectrum band
	5G spectrum	the amount of spectrum assigned and ready for 5G use within the so-called 5G pioneer bands
	5G SIM cards share of population	5G mobile subscriptions defined as SIM cards that generated any internet traffic on a domestic 5G network in the last 90 days.
	Edge nodes	Number of compute nodes providing latencies below 20 milliseconds.
Digital transformation of businesses (11)	SMEs with at least a basic level of digital intensity (DII v3)	the digital intensity score is based on counting how many out of 12 selected technologies are used by enterprises - a basic level requires usage of at least 4 technologies.
	Electronic information sharing	enterprises who have in use an ERP software package to share information between different functional areas
	Social media	enterprises using two or more of the following social media
	Data analytics	enterprises performing data analytics (internally or externally)
	Cloud	Cloud computing, measured as the percentage of enterprises using at least one intermediate or sophisticated cloud computing services
	Artificial intelligence	enterprises using any AI technology
	e-Invoices	enterprises sending e-invoices, suitable for automated processing
	AI or Cloud or Data analytics	enterprises using AI technologies or buying sophisticated or intermediate cloud computing services or performing data analytics
	Unicorns	the sum of unicorns: startups that pass a $1B valuation
	e-Commerce turnover	SMEs total turnover from e-commerce
	SMEs selling online	SMEs selling online (at least 1% of turnover)
Digitalisation of public services (8)	e-Government users	individuals who used the Internet, in the last 12 months, for interaction with public authorities on websites or on mobile applications.
	Digital public services for citizens	online provision of key public services for citizens, measured as the share of administrative steps that can be completed fully online for major life events
	Digital public services for businesses	online provision of key public services for entrepreneurs, measured as the share of administrative steps that can be completed fully online for major life events
	Pre-Filled Forms	the share of administrative steps that present prefilled data, already known to public administrations, in online forms to the user
	Transparency of service delivery, design and personal data	the extent to which service processes are transparent, services are designed with user involvement and users can manage their personal data
	User support	the extent to which online support, help features, and feedback mechanisms are available to both national as well as cross-border users.
	Mobile friendliness	the share of services which are provided through a mobile-friendly interface, an interface that is responsive to the mobile device
	Access to e-health records	measured as the nationwide availability of online access services

Source: DESI (2024)

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Living in Smaller UNESCO Sites – Paradise or Hell? Factors Influencing the Perception of Residents

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Abstract: *UNESCO sites are objects of extensive research. Generally, research concentrates on the tourists´ perspective. The small UNESCO sites are specific in several ways (smaller towns, seasonal demand, lower capacities, lower staff capacities in municipalities and DMOs, lower budget, etc.). Tourism is often the most visible phenomenon in these towns despite not being a major employer or income generator. Tourism´s impacts are divided into three areas – the economic, socio-cultural, and environmental ones. There are a total of 16 items representing them in the research. The Likert scale was used for impact evaluation. Research collected 258 questionnaires in 5 smaller UNESCO sites in the Czech Republic. Correlation analysis, reliability tests, and structural equation modelling (SEM) are applied to the dataset. The research results can help the municipalities and DMOs argue tourism's positive impacts and focus on and manage the relevant aspects of being a tourism site.*

1. INTRODUCTION

UNESCO sites are objects of extensive research. Generally, research concentrates on tourism development and the tourists´ perspective. Tourism intensity grew in the last few years before the pandemic. This growth returned after the pandemic and shows that residents´ perceptions play a more and more crucial role in the destination image (not only in UNESCO sites).

Many papers and case studies are studying the impact of tourism also on residents (Adie & Falk, 2020; Escudero-Gomez, 2019; Rua, 2020; Ruiz et al., 2019), their attitudes and perception of tourism, especially in sites rich in heritage. There are also studies studying residents´ quality of life linked with tourism development (Amin, 2020; Wu et al., 2020). According to Destefanis et al. (2020), cultural tourism can be used by the local community as a means of improving their quality of life. The local population´s attitudes must be one of the tools to assume resilience towards tourism developments (Linderova et al., 2021). This context is important as many of the UNESCO sites, even small ones, suffered from overtourism before 2019, and even more in 2019 when international tourism reached the highest numbers. After the COVID-19 pandemic, it is time to rethink pre-pandemic tourism, a massive and generally damaging tourism destination, towards more sustainable and inclusive approaches for the local community and their residents (Hall et al., 2020). Empowering the residents is important for the sustainability of tourism destinations (Kamata, 2021). This author emphasises the importance of communication with residents, which might affect their attitude toward tourism after the pandemic. Some authors (e.g., An et al., 2021) are investigating the influence of residents' perceived tourism impacts on their attitudes towards tourism growth, the effects of proximity to tourism centres, and how their effect is moderated by residents' demographic features (age, gender, length of residence). Recent research (Soares et al., 2022) also deals with implementing measures that

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can contribute to improving, among other things, the quality of the tourism destination for both visitors and residents.

The research aims to identify the factors relevant to the perception of the influence tourism has on the quality of life in small UNESCO sites in the Czech Republic.

2. FACTORS INFLUENCING LIFE IN SMALL UNESCO TOWNS

The small UNESCO sites are distinct from larger, more urbanised areas in several ways. They are smaller towns with seasonal tourism demand, they have lower tourism capacities and lower staff capacities in municipalities and Destination Management Organisations (DMOs), and lower budgets, etc. Tourism is often the most visible phenomenon in these towns despite not being a major employer or income generator. Many key factors influence life in these towns. Any negative tourism impact or even an impact not positive enough for anybody is visible. It can cause dissatisfaction in the local community.

Life in small UNESCO towns is influenced by various factors, including socio-economic dynamics, tourism, urbanisation, environmental sustainability, and the preservation of cultural heritage. These factors affect life in small UNESCO towns, focusing on the interplay between preservation and modernisation.

2.1. Cultural and Heritage Preservation

According to Wang and Zhang (2016), these towns serve as living monuments, where the preservation of local traditions, craftsmanship and architectural forms is maintaining their unique character. Duxbury (2014) emphasises the need for local communities to be engaged in heritage management to ensure that cultural integrity is preserved without negative influence on contemporary living standards. Nordin and Svensson (2017) discuss maintaining the historical sites and adapting them to modern use.

2.2. Economic Impact

Tourism is a major economic driver in many small UNESCO towns. It can have both positive and negative effects. Tosun and Timothy (2001) argue and show, based on examples, that tourism can bring economic benefits such as job creation and increased revenue for local businesses and the population. Tourism is a source of income and boosts the economy and infrastructure development. Bramwell and Lane (2000) highlight that the high volume of tourists in UNESCO towns can lead to overcrowding, increased cost of living, and a shift in the local economy towards catering to visitors rather than residents. Perkin (2020) in his study on historic towns in the Mediterranean notes that towns face significant challenges in balancing the needs of residents with the influx of tourists, particularly in terms of maintaining affordable housing and local services.

2.3. Socio-Economic Factors

Small UNESCO towns often face the dual challenge of preserving heritage while fostering economic development. Jenkins (2015) discusses how gentrification can arise in these towns as tourists, wealthy individuals, or developers invest in property, driving up housing prices and displacing long-time residents. This process can cause a shift in the social fabric of these towns, as local communities may struggle to keep up with rising costs, and local traditions can be eroded. On the other hand, Healy and Quigley (2016) emphasise that economic development in UNESCO towns can also result in improved infrastructure, increased services, and enhanced community

welfare. Some towns have implemented models of sustainable tourism that integrate local economic development with the preservation of cultural heritage, ensuring that resident's benefit from the UNESCO designation while maintaining their way of life.

2.4. Environmental Sustainability and Urbanisation

The urbanisation process in small UNESCO towns can lead to increased demand for land, resources, and infrastructure. Swyngedouw and Keil (2014) suggest that while UNESCO towns are often seen as cultural havens, they are not immune to the pressures of modern urbanisation, including pollution, waste management, and the degradation of natural landscapes. Environmental sustainability becomes a critical issue in maintaining the balance between growth and preservation. In some towns, the development of tourism infrastructures such as hotels, restaurants, and transport networks put pressure on local ecosystems. According to Leask and Fyall (2006), sustainable tourism initiatives—such as eco-friendly accommodations, waste-reduction strategies, and the conservation of natural spaces—are essential for the long-term viability of UNESCO towns.

2.5. Community Engagement and Governance

Effective governance and community participation are crucial in managing the development of UNESCO towns. Cicerchia (2019) argues that local communities must be actively involved in decision-making processes to ensure that development projects respect both heritage and the interests of residents. Involving local populations in heritage management and urban planning fosters a sense of ownership and can lead to more sustainable outcomes. Duxbury and Jeannotte (2010) advocate for the establishment of community-driven initiatives to address the challenges posed by tourism, infrastructure changes, and socio-economic pressures. The introduction of visitor management strategies, sustainable tourism initiatives, and active community involvement in tourism planning has been shown to mitigate negative perceptions (Blackstock, 2005). According to UNESCO (2015), community-based tourism, which actively involves local people in planning and management, helps to mitigate negative impacts. By ensuring that tourism development aligns with the needs and desires of residents, small UNESCO towns can achieve sustainable growth that benefits both visitors and the local community/residents.

2.6. Technological Advancements

Technological innovations play an increasingly important role in the management and life of small UNESCO towns. Müller and Schwanen (2019) discuss the concept of "smart heritage management", where digital technologies are used to monitor, manage, and preserve historical assets. Technologies such as augmented reality, virtual tours, and digital mapping tools offer new opportunities to educate visitors and enhance the tourism experience while maintaining the town's integrity. However, the implementation of these technologies must be done thoughtfully to avoid disrupting the character of these towns. As Buhalis and Law (2008) suggest, there is a growing need for digital platforms that allow for the controlled dissemination of information to tourists, providing educational experiences without overwhelming local resources.

2.7. Psychological factors

UNESCO status often elevates a town´s cultural significance, leading to a heightened sense of pride among residents. This can foster a strong collective identity tied to the town´s historical and cultural uniqueness (Iorio et al., 2015). Residents feel proud to be part of a globally recognized community, contributing to improved mental health and a positive sense of belonging.

2.8. Remarks

All these factors influence life in small UNESCO towns. Balancing these elements requires careful planning and active engagement from local communities, authorities, and external stakeholders. Life in these towns depends differently on them.

The impact of tourism on residents' lives is mostly divided into three groups: economic, socio-cultural, and environmental. This also follows the logic of the three-pillar conception of sustainability (Purvis et al., 2019) and most theories of CSR. Therefore, also in this research, the logic of the three essential factors will be respected.

3. RESEARCH METHODS AND DATA

The impacts of tourism are divided into three areas based on previous research: (1) economic, (2) socio-cultural, and (3) environmental. In each of these factors, there are a lot of indicators (WTO, 2004; ETIS, 2016), which can be monitored and measured. In this research, 16 items (indicators) were chosen: (1) economic ones (Employment, Income for inhabitants, Income for community, Investments (into restaurants, hotels), Cost of living), (2) sociocultural (Quality of public services (transportation, libraries, ..), Entertainment and relaxation, Preservation of historical and cultural monuments, Local culture and crafts, Contact with other cultures, Crime, Customs and traditions, Self-confidence), and (3) environmental (Noise, Garbage, Use of the city center for housing).

The Likert scale was used for impact evaluation from 1 (tourism has a very negative impact) to 5 (tourism has a very positive impact). For the analysis, 258 questionnaires in 5 smaller UNESCO sites in the Czech Republic were collected between April and May 2022. Questionnaires were distributed via inhabitants' Facebook groups and on-site research. The 5 small UNESCO towns were Český Krumlov, Kutná Hora, Třebíč, Telč and Litomyšl.

After the data were checked, correlation analysis, reliability tests, and structural equation modelling (SEM) were applied to the dataset, and a model of factors influencing the perceived impact of tourism on life quality was created. SPSS was used for correlations, factors, and Cronbach´s alpha and SPSS Amos was used for regression weights and model creation.

3.1. Short description of small UNESCO towns

In the Czech Republic, there are altogether 16 historic sites listed on the UNESCO World Heritage Site list (České dědictví UNESCO, 2024). The research concentrated only on 6 small UNESCO towns.

- Český Krumlov, with an area of 2,216 hectares and 12,788 inhabitants (CSU, 2024), is a town located in the South Bohemian Region and on the Vltava River. Its historical centre and the State Castle and Chateau have been included on the UNESCO World Heritage Site list since 1992. In addition to the monuments, the town has a Baroque theatre and a castle garden including the Bellaire Summer Palace with a revolving auditorium.
- Kutná Hora, with an area of 3,307 hectares and approximately 21,000 inhabitants (CSU, 2024), is in the Central Bohemian Region. The historic centre of the town´s conservation area with the church of St. Barbara and the Church of the Assumption of the Virgin Mary in Sedlec, has been listed as a UNESCO World Heritage Site since 1995.
- Telč is a town with an area of 2,487 hectares and 5,224 inhabitants (CSU, 2024). It is in the Vysočina Region. In 1992, the historic center of the town was inscribed on the UNESCO World Heritage List.

- Třebíč is a town of 5,760 hectares and 34,797 inhabitants (CSU, 2024). It is in Vysočina Region, located on both banks of the Jihlava River. Jewish Quarter and St. Procopius Basilica were listed as a UNESCO World Heritage Site in 2003.
- Litomyšl is a town of 3,300 hectares and 10,493 inhabitants (CSU, 2024). It is located in Pardubice region. The town is associated with the famous composer, Bedřich Smetana, who was born in the Renaissance chateau to a family of maltsters. The entire castle complex has been listed as a UNESCO World Heritage Site since 1999.

3.2. Data

The respondents' structure is 58.5 % females and 41.5% males (151 and 107 respondents, respectively). Table 1 presents the age structure of the research sample.

Table 1. The age structure of the respondents

Age	Number of respondents
18 - 29	85
30 – 45	110
46 – 55	38
56 – 64+	25

Source: Own research

42.6% of respondents are high school graduates, 48.8% are university or college graduates, 8.1% are apprenticeship field graduates, and 0.4% (1 person) didn´t want to say.

4. RESULTS

First, the correlation matrix between the individual items and life quality is created. The correlation analysis confirms a significant correlation between life quality and the items. Table 2 presents the results.

Table 2. Average values and correlation matrix

	Average	Pearson Correlation	Sig. (2-tailed)
LIFE QUALITY		1	
Employment	3.68	.457**	<.001
Self-confidence	3.61	.450**	<.001
Income for community	3.70	.425**	<.001
Investments	3.75	.418**	<.001
Entertainment	3.67	.413**	<.001
Income	3.44	.412**	<.001
Living in the center	2.96	.383**	<.001
Contact with other cultures	3.85	.315**	<.001
Monument preservation	4.27	.308**	<.001
Public services	3.36	.286**	<.001
Costs of living	3.09	.255**	<.001
Customs and traditions	3.34	.239**	<.001
Crime	2.85	.226**	<.001
Culture and crafts	3.51	.223**	<.001
Noise	2.76	.114	0.067
Garbage	3.06	.074	0.244
**. Correlation is significant at the 0.01 level (2-tailed).			
*. Correlation is significant at the 0.05 level (2-tailed).			

Source: Own research

Except for noise and garbage creation, all the items are correlated to life quality, and we can conclude that there are some relationships. The strongest correlation from all the factors is with employment. Now, we can approach factor creation.

Cronbach´s Alpha for the economic impact reached the value of 0.764 and is on a satisfactory level. A similar value has the reliability for socio-cultural impact (0.738). It is possible to create the factors. From environmental factors, only the usage of the centre (depopulation vs. attractiveness for a living) is correlated with quality of life, and we will take only this factor into account, as the others are not correlated on a significant level.

After the factor creation, the correlation matrix is created, and the relationships between quality of life and individual factors are confirmed.

Table 3. Correlation matrix for the factors

		SOC_CUL1	ECO1	DEPOP
LIFE Q	Pearson Correlation	.518**	.526**	.383**
	Sig. (2-tailed)	<.001	<.001	<.001

Source: Own research

The SPSS Amos was used to create a model and to test the significance of the effect of the factors on life quality. All factors are statistically significant.

Table 4. Regression weights for the factors

	Estimate	PLabel
LIFEQ ← SOC_CUL1	.508	***
LIFEQ ← ECO1	.310	***
LIFEQ ← DEPOP	.174	***

Source: Own research

Considering the regression weights, the socio-cultural impact is the most significant. Whereas the depopulation of the center has the least effect on perceived quality of life.

5. CONCLUSION

The results confirmed the importance of both economic and socio-cultural factors on the perceived quality of life. A much lower impact is assigned to the usage of the centre but is still statistically significant. The average values of the perceived impact of tourism are, in most cases, not significantly different from the neutral position. This can be given by the individual perception, and thanks to the fact of collecting the data in more UNESCO sites. However, individual people live in the towns, and therefore it is important to analyse relationships with a paired-sample analysis and see the effects.

The main contribution of the research is twofold. The academic benefit lies in the fact that we contribute to the body of knowledge in the field of tourism effects, specifically from the perspective of inhabitants' perception of tourism. The second kind of benefit is managerial contribution. The research results can help the municipalities and DMOs argue the positive impacts of tourism and can help with focusing on and managing the relevant aspects of being a tourism site. This research may be an important input in the discussion about bringing tourism and local life into balance.

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References

Adie, B. A., & Falk, M. (2020). Residents´ perception of cultural heritage in terms of job creation and overtourism in Europe. *Tourism Economics*. 1-17. https://doi.org/10.1177/1354816620943688

Amin, S. (2020). Diversity, Tourism, and Economic Development: A Global Perspective. *Tourism Analysis*, *25*(1), 21-41. https://doi.org/10.3727/108354220X15758301241602

An, Y., Moon, J. W., & Norman, V. C. (2021). Investigating Residents´ Attitude towards Tourism Growth in Destination Greenville, SC: The Effect of Demographic Variables. *Sustainability*, *13*(15), 8474. https://doi.org/10.3390/su13158474

Blackstock, K. (2005). A critical look at community based tourism. *Community Development Journal, 40*(1), 39-49. https://doi.org/10.1093/cdj/bsi005

Bramwell, B., & Lane, B. (2000). *Tourism collaboration and partnerships*. Channel View Publications.

Buhalis, D., & Law, R. (2008). Progress in information technology and tourism management: 20 years on and 10 years after the Internet—The state of eTourism research. *Tourism Management, 29*(4), 609-623. https://doi.org/10.1016/j.tourman.2008.01.005

České dědictví UNESCO. (2024). Šestnáct českých divů světa - České dědictví UNESCO. https://www.unesco-czech.cz/

Cicerchia, A. (2019). Heritage, Identity and the Politics of Heritage Management. Routledge.

CSU (Český statistický úřad). (2024). Počet obyvatel v obcích – k 1. 1. 2024. Praha: Český statistický úřad.17.5. 2024. Retrived May 19, 2024, from https://csu.gov.cz/produkty/pocet-obyvatel-v-obcich-9vln2prayv.

Destefanis, A., Angelini, L., Borlizzi, D., Carlucci, A., Ciardella, G., Governale, G., & Morfini, I. (2020). Cultural tourism development and the impact on local communities: a case study from the South of Italy. *CERN IdeaSquare Journal of Experimental Innovation*, *4*(2), 19–24. https://doi.org/10.23726/cij.2020.1054

Duxbury, N. (2014). The role of heritage management in small towns. *International Journal of Heritage Studies,* 20(6), 563-578.

Duxbury, N., & Jeannotte, M. S. (2010). Culture, sustainability and communities: Exploring the myths. Working paper no. 353, Oficina do CES. Originally presented at the 6th International Conference on Cultural Policy Research, Jyväskylä, Finland, 25 August 2010. www.ces.uc.pt/ publicacoes/oficina/index.php?id=2982

Escudero-Gomez, L. A. (2019). Residents´ Opinions and Perceptions of Tourism Development in the Historic City of Toledo, Spain. *Sustainability*. 11 (14), 3854. https://doi.org/10.3390/su11143854

ETIS (European Tourism Indicators System for Sustainable Destination Management). (2016). ETIS toolkit for sustainable destination management. https://ec.europa.eu/docsroom/documents/21749

Hall, C. M., Scott, D., & Gössling, S. (2020). Pandemics, transformations and tourism be careful: what you wish for. *Tourism Geographics*. 22, 577-598. https://doi.org/10.1080/14616688.2020.1759131

Healy, R., & Quigley, A. (2016). Gentrification and cultural preservation in UNESCO towns. *Journal of Urban Affairs,* 38(4), 423-440.

Iorio, M., et al. (2015). Cultural heritage and community development in UNESCO towns. *Journal of Rural Studies, 40*(1), 45-56.

Jenkins, C. (2015). Gentrification and displacement in UNESCO heritage sites. *Urban Studies, 52*(11), 1972-1991.

Kamata, H. (2021). Tourist destination residents' attitudes towards tourism during and after the COVID-19 pandemic. *Current Issues in Tourism*, *25*(1), 134-149. https://doi.org/10.1080/13683500.2021.1881452

Leask, A., & Fyall, A. (2006). Managing World Heritage Sites. https://doi.org/10.4324/9780080461755

Linderova, I., Scholz, P., & Almeida, N. (2021). Attitudes of Local Population Towards the Impacts of Tourism Development: Evidence From Czechia. *Frontiers in Psychology, 12*. https://doi.org/10.3389/fpsyg.2021.684773

Müller, M., & Schwanen, T. (2019). Smart cities, digitalization, and heritage management. *Journal of Urban Technology, 26*(1), 45-60.

Nordin, S., & Svensson, B. (2017). *Tourism, heritage, and cultural landscapes*. Oxford University Press.

Perkin, H. (2020). The impacts of tourism on Mediterranean UNESCO towns. *Mediterranean Studies, 33*(2), 120-137.

Purvis, B., Mao, Y., & Robinson, D. (2019). Three pillars of sustainability: in search of conceptual origins. *Sustainability Science.* 14, 681–695 https://doi.org/10.1007/s11625-018-0627-5

Rua, S. V. (2020). Perception of tourism: a study of residents´ attitudes towards tourism in the city of Girona. *Journal of Tourism Analysis*. *27*(2), 165-184. https://doi.org/10.53596/jta.v27i2.359

Ruiz, E. C., De la Cruz, E. R. R., & Vázquez, F. J. C. (2019). Sustainable Tourism and Residents' Perception towards the Brand: The Case of Malaga (Spain). *Sustainability, 11*(1), 292. https://doi.org/10.3390/su11010292

Soares, J. R. R., Remoaldo, P., Perinotto, A. R. C., Gabriel, L. P. M. C., Lezcano-González, M. E., & Sánchez-Fernández, M.-D. (2022). Residents' Perceptions Regarding the Implementation of a Tourist Tax at a UNESCO World Heritage Site: A Cluster Analysis of Santiago de Compostela (Spain). *Land, 11*(2), 189. https://doi.org/10.3390/land11020189 **[**

Swyngedouw, E., & Keil, R. (2014). Urbanization and sustainability challenges in UNESCO towns. *Urban Studies Journal*, 51(3), 601-617.

Tosun, C., & Timothy, D. (2001). Tourism and local economic development. *Journal of Economic Geography, 11*(2), 102-120.

UNESCO. (2015). UNESCO´s approach to sustainable tourism: A guide development. UNESCO.

Wang, J., & Zhang, D. (2016). Heritage tourism and sustainable development. Springer.

WTO (World Tourism Organization). (2004). *Indicators of Sustainable Development for Tourism Destinations A Guidebook (English version).* UNWTO, Madrid, DOI: https://doi.org/10.18111/9789284407262

Wu, Y.-C., Lin, S.-W., & Wang, Y.-H. (2020). Cultural tourism and temples: Content construction and interactivity design. *Tourism Management, 76*, 103972. https://doi.org/10.1016/j.tourman.2019.103972

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Branding the City Through Events: The Influence of Cultural Events on Reputation from the Residents' Perspective

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Abstract: *This study examines the contribution of cultural events to the development of a city's brand identity. The case study focuses on Šibenik in Croatia. A survey was conducted to ascertain the perceptions of local residents regarding the impact of these events on the city's brand, across four dimensions: functional, social, mental and spiritual. The results of the statistical analyses, which included correlation and regression analyses, indicated that there is a statistically significant relationship between the cultural events and all four dimensions of the city's brand. The findings emphasise the strategic value of events for the development of city branding and provide practical guidance for those responsible for formulating policy and planning, as well as those involved in the promotion of tourism. By aligning the management of events with the objectives of branding, cities can foster a stronger identity, improve their competitiveness and create long-lasting value for communities and tourism. This research provides a practical framework for integrating events into cities' branding strategies.*

1. INTRODUCTION

In the contemporary era of globalized tourism, cities face intense competition to attract visitors, investments, and global recognition. Destination branding, which involves creating a distinctive identity and image for a place, has become a critical strategy for cities aiming to stand out from the competition (Bose et al., 2022; Inkinen et al., 2024). Scholars such as Anholt (2006), Morgan et al. (2004) and Ruiz-Real et al. (2020) have highlighted the multi-faceted nature of city branding, which combines cultural, economic and social elements to create a coherent and appealing image for a tourist destination.

The role of events, particularly cultural ones, in strengthening a destination's identity and appeal has become an increasingly prominent area of research within the academic community (Deng et al., 2023; Iversen et al., 2023; Kastenholz & Gronau, 2022). Events provide a distinctive opportunity to showcase a city's identity and appeal to a heterogeneous audience. Getz (2008) argues that events can transform a city's image, boosting its visibility and fostering emotional connections with visitors. Despite these insights, the local impact of cultural events on residents' perceptions and their contribution to brand dimensions remains largely underexplored.

The city of Šibenik, with its UNESCO-listed sites and rich cultural heritage, serves as an illustrative case study of these dynamics. In recent years, Šibenik has leveraged its rich cultural heritage and diverse events programme, promoted under the slogan "The City is a Stage", to reinforce its position as a prominent cultural and tourist destination. However, how these initiatives impact residents and the extent to which they shape the brand's key dimensions — functional, social, mental, and spiritual, as proposed by Gad (2016) — remains largely unexplored in the academic literature.

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This research aims to address this gap by investigating how Šibenik's events contribute to its brand from the residents' perspective. The study uses a quantitative survey methodology to examine the relationship between events and the four dimensions that constitute a brand, offering insights relevant to the development of city branding strategies. Furthermore, it explores previously under-researched aspects of this relationship, including the integration of residents' perceptions into brand strategies and the balance between cultural authenticity and tourism-driven innovation.

The study is organized as follows: The initial section provides an overview of the theoretical framework of destination branding, the significance of cultural events, and resident engagement. The subsequent section outlines the methodology used in the study and explains the application of a quantitative survey to analyze residents' perceptions of events and their impact on brand dimensions. Next, the results are discussed, highlighting the positive influence of all dimensions and underscoring their importance to Šibenik's identity. The conclusion summarizes the findings, confirms the hypotheses, and emphasizes the strategic value of events for the city's branding.

The study contributes to tourism marketing by analyzing event branding empirically and highlighting the pivotal role of resident engagement in developing a coherent and resilient city brand.

2. THEORETICAL BACKGROUND

2.1. Destination Branding and Its Components

Destination branding takes a strategic approach to create a distinctive and memorable identity for a place to differentiate it from competitors in the marketplace (Bose et al., 2022; Hanna et al., 2021; Inkinen et al., 2024). This process involves highlighting unique cultural, historical, and natural assets to shape positive perceptions and attract target audiences. Anholt (2006) states that effective destination branding occurs when tangible and intangible elements integrate to shape perceptions and foster emotional connections with target audiences. These elements include historical landmarks, local culture, and community values (Campelo et al., 2014; Qiu & Zuo, 2023). When harmoniously combined, these components create a compelling narrative that resonates with visitors and distinguishes the destination in a competitive global market. Kotler and Gertner (2002) argue that a destination brand goes beyond a logo or slogan; rather, it represents a comprehensive identity that communicates the distinctive essence of a place to tourists, investors, and residents. The brand dimensions offer a framework to assess the impact of branding efforts. Gad (2001) proposed a four-dimensional brand model, consisting of the functional, social, mental, and spiritual dimensions. The functional dimensions refer to the practical benefits and usability of the brand. The social dimensions reflect a sense of belonging and community. The mental dimensions pertain to self-expression and individual identity. The spiritual dimensions address ethical and environmental considerations. This comprehensive model proves valuable in evaluating the impact of brand initiatives on diverse stakeholders.

2.2. The Role of Events in Destination Branding

Events serve as an effective means to reinforce a destination's brand identity and provide a platform to showcase its cultural, historical, and innovative attributes. Getz (2008) categorizes events as a significant factor in the tourism industry, with the capacity to elevate a destination's profile and visibility while simultaneously attracting a diverse audience. In particular, cultural events allow cities to convey a distinctive image, highlighting their traditions and creativity. Deng et al. (2023) emphasize the dual role of events in strengthening the identity of the local community and

gaining external recognition. In the context of tourism, events make a significant contribution to brand equity by creating memorable experiences and enhancing the overall perception of a destination. As Bowdin et al. (2011) observe, well-managed events can transform a city's image, fostering emotional connections and loyalty among visitors and residents. However, insufficient consideration of local values or poor management practices may lead to adverse perceptions, highlighting the importance of strategic planning (Maddaloni & Sabini, 2022).

2.3. Resident Engagement in City Branding

Resident perception plays a critical role in the success of destination branding initiatives. As local ambassadors, residents significantly influence the authenticity and sustainability of a city's image (García et al., 2012; Su et al., 2020). To ensure coherence and community acceptance, Braun et al. (2013) argue that branding strategies must reflect residents' values and feedback. Community-oriented events act as a conduit between branding objectives and resident engagement (Hay et al., 2022). By involving residents in the planning and decision-making processes, cities can cultivate a sense of ownership and alignment with branding objectives (Golestaneh et al., 2022; Hanna & Rowley, 2011). When residents feel their voices are heard and valued, they are more likely to support branding initiatives, participate in city events, and promote their city through word of mouth and social media (Amani, 2024; Jain et al., 2022). This inclusive approach not only enhances community pride but also ensures the brand reflects the authentic character and values of the place (Hay et al., 2022; Zhao et al., 2025).

Despite extensive research on destination branding and the role of events, little attention has been given to examining the impact of cultural events on specific brand dimensions from the residents' perspective. Moreover, a significant gap remains regarding the integration of residents' perceptions into event-based branding strategies. This study aims to address these gaps by focusing on the City of Šibenik, Croatia, and exploring the impact of its cultural events on the functional, social, mental, and spiritual dimensions of its brand.

3. METHODOLOGY

This study investigates the influence of cultural events on the city branding of Šibenik, with a particular focus on residents' perceptions of these events' impact on four brand dimensions: functional, social, mental, and spiritual. A combination of theoretical and empirical methods ensures a comprehensive analysis, considering all relevant aspects. The research addresses several key questions: Do events reinforce the Šibenik city brand? Do events positively impact the functional dimension of the brand, focusing on the city's practical features and benefits? Do events enhance the social dimension of the brand, including social interaction and cultural diversity? Do events strengthen the mental dimension of the brand, which relates to the city's reputation and image? Finally, do events contribute to the spiritual dimension of the brand by reflecting the city's spiritual values and goals?

This study tests the primary hypothesis that events positively influence the strengthening of Šibenik's brand. This hypothesis is subdivided into sub-hypotheses aligned with the aforementioned brand dimensions. The sub-hypotheses propose that events favorably influence the functional, social, mental, and spiritual aspects of the brand.

The research employed a survey method, with an online questionnaire serving as the principal instrument. The questionnaire included 34 questions, divided into three sections. The introductory section contained two dichotomous questions, two multiple-choice questions, and one open-ended

question. The objective of this section was to determine respondents' familiarity with events in Šibenik and previous initiatives to promote the city.

The second section featured 24 Likert-scale statements grouped into five constructs: events, functional dimension, social dimension, mental dimension, and spiritual dimension. Respondents indicated their level of agreement with each statement on a scale ranging from 1 (strongly disagree) to 5 (strongly agree). This section aimed to identify the extent to which respondents perceived the influence of events on the various brand dimensions.

In the third section, respondents provided socio-demographic information, including age, gender, level of education, and average income. This was achieved through two dichotomous questions and four multiple-choice questions. Data were collected online via Facebook groups, including "Volim Šibenik" and "Iz Šibenika si ako…", between 15 April and 3 May 2023. A total of 184 properly completed surveys were received, in accordance with the instructions provided.

The data underwent analysis using descriptive statistics to summarize the results for each construct, correlation analysis to examine relationships between events and brand dimensions, and regression analysis to evaluate the strength and significance of the impact of events on the brand dimensions.

4. RESULTS AND DISCUSSION

The findings of this study underwent analysis to determine the impact of cultural events on the branding dimensions of the city of Šibenik. The analyses utilized descriptive statistics, correlation analyses, and regression analyses to evaluate the relationships between events and brand dimensions (functional, social, mental, and spiritual). The study tested the primary hypothesis that "events have a positive impact on strengthening the Šibenik brand" through a survey of 184 participants. The sample consisted predominantly of females (79.9%), with an even age distribution across all groups. Most respondents were residents of Šibenik (77.2%), while 22.8% lived in surrounding areas. The majority of respondents were employed (73.4%), and 43.5% held a university degree. The results indicate that participants are generally familiar with the events in Šibenik and attend them several times a year. Additionally, respondents highlighted the importance of investing more in the organisation and promotion of events to enhance the city's brand. However, 51.6% of respondents were unaware of the branding proposal under the slogan "The City is a Stage."

Table 1 provides the descriptive statistics for the five constructs analyzed in the study: Events, Functional, Social, Mental, and Spiritual. The mean values and standard deviations offer insights into respondents' overall perceptions.

Table 1. Research constructs

Construct	*Mean*	*SD*
Events	3.79	0.80
Functional Dimension	3.98	0.88
Social Dimension	3.83	0.93
Mental Dimension	4.20	0.90
Spiritual Dimension	4.10	0.95

Source: Own calculations

The participants expressed predominantly positive perceptions across all constructs, with the highest mean score recorded for the Mental Dimension (4.20) and the lowest for the Events construct

(3.79). These results suggest a generally favorable perception of the impact of events on Šibenik's brand dimensions.

Table 2 summarizes the correlation coefficients for the relationships between cultural events and each brand dimension (functional, social, mental, and spiritual).

Table 2. Pearson's correlation coefficient

Brand Dimension	Correlation (r)		Relationship Strength
	Events	Functional Dimension	*Strong positive*
Events	1		
Functional Dimension	0,630579788	1	
	Events	Social Dimension	*Strong positive*
Events	1		
Social Dimension	0,576696195	1	
	Events	Mental Dimension	*Strong positive*
Events	1		
Mental Dimension	0,578956458	1	
	Events	Spiritual Dimension	*Moderate positive*
Events	1		
Spiritual Dimension	0,483617789	1	

Source: Own calculations

The correlation analysis evaluated the strength of the relationships between the constructs, with Pearson's correlation coefficients calculated to determine significance. A strong and statistically significant positive correlation was found between the "Events" construct and the "Functional Dimension" ($r = 0.631$, $p < 0.05$). Similarly, strong and statistically significant positive relationships were observed between "Events" and both the "Social Dimension" ($r = 0.577$, $p < 0.05$) and the "Mental Dimension" ($r = 0.579$, $p < 0.05$). Additionally, a moderate but statistically significant positive correlation was identified between the "Events" construct and the "Spiritual Dimension" ($r = 0.484$, $p < 0.05$). Table 3 presents the results of the regression analysis for brand dimensions.

Table 3. Regression Analysis Results for Brand Dimensions

Indicator	Functional Dimension	Social Dimension	Mental Dimension	Spiritual Dimension
Multiple R	0.631	0.577	0.579	0.484
R^2	0.398	0.333	0.335	0.234
Adjusted R^2	0.394	0.329	0.332	0.230
Standard Error	4.82	3.03	3.67	3.32
F-statistic	120.14	90.69	91.76	55.56
Significance (p-value) Events	<0.05	<0.05	<0.05	<0.05
Beta Coefficient (β)	1.223	0.669	0.816	0.573
t-statistic for β	10.96	9.52	9.58	7.45
Significance for β (p)	<0.05	<0.05	<0.05	<0.05

Source: Own calculations

Functional Dimension: The regression reveals a strong, positive, and statistically significant association between events and the functional dimension of the brand ($R^2 = 0.398$, $F = 120.14$, $p < 0.05$).

The beta coefficient ($\beta = 1.223$, $p < 0.05$) shows that a one-unit increase in events correlates with a 1.223-unit increase in the functional dimension. Events notably enhance the practical aspects of the city's brand, such as infrastructure improvements and economic benefits.

Social Dimension: A strong, positive, and statistically significant relationship exists between events and the social dimension ($R^2 = 0.333$, $F = 90.69$, $p < 0.05$). The beta coefficient ($\beta = 0.669$, $p < 0.05$) demonstrates that events moderately contribute to social cohesion and cultural diversity. Events positively influence community interaction and the social attractiveness of the city.

Spiritual Dimension: A moderately positive and statistically significant relationship exists between events and the spiritual dimension ($R^2 = 0.234$, $F = 55.56$, $p < 0.05$). The beta coefficient ($\beta = 0.573$, $p < 0.05$) demonstrates a moderate contribution of events to ethical and environmental values. Events focused on sustainability and spiritual goals appear to reinforce this dimension.

All auxiliary hypotheses and the main hypothesis were confirmed, highlighting the significant role of events in strengthening the Šibenik brand. The findings of this research highlight the necessity for strategic initiatives in event planning and promotion to reinforce the city's brand identity and facilitate greater engagement from residents and visitors.

5. FUTURE RESEARCH DIRECTIONS

Future research should expand the scope of the study by incorporating broader socio-demographic and numerical parameters to ensure greater representativeness of the results. Additionally, involving the public in the research process when developing a brand strategy would prove beneficial. Exploring visitors' and tourists' perceptions of the impact of events on Šibenik's brand image could enable a more nuanced analysis of the city's brand. The involvement of residents in the branding process can strengthen their sense of ownership and connection with the brand, thereby enhancing the city's overall brand image. Examining the impact of co-creation on the mental and social dimensions of city branding would offer further valuable insights.

Future research in city branding and cultural tourism should address emerging trends and challenges to enhance the understanding and application of event-driven branding strategies, including those leveraging virtual and augmented reality as well as artificial intelligence. An additional avenue of inquiry could explore the impact of these tools on city brand perceptions and compare their effectiveness with more traditional marketing methods.

Subsequent studies should examine the influence of eco-friendly events on a city's brand, particularly regarding its functional and spiritual dimensions. Given the growing global awareness of climate change, research could assess the role of eco-friendly practices in enhancing community well-being and environmental awareness. Longitudinal impact analysis is also essential to understand the lasting effects of cultural events on city branding and resident attitudes. Most current studies focus on short-term outcomes. However, longitudinal research could reveal how repeated events shape brand dimensions and engagement over decades.

6. CONCLUSION

This study investigated the impact of cultural events on the branding of the city of Šibenik, with a particular focus on their influence on the functional, social, mental, and spiritual dimensions of the city's brand. The findings show that events significantly influence these four dimensions,

with the most substantial effects observed in the mental and functional dimensions. These results highlight the importance of cultural events in defining Šibenik's identity as an attractive and distinctive tourist destination.

The research concludes that cultural events have a twofold impact on the city. They enhance its practical attractiveness, evidenced by increased economic benefits and infrastructure improvements, and foster community cohesion. The favourable impact on the mental dimension demonstrates that events play a key role in developing the city's reputation and image. While the spiritual dimension exhibits a moderate positive impact, it remains an area for potential growth, particularly through initiatives aligned with sustainability and ethical values.

The confirmation of all auxiliary and main hypotheses highlights the strategic importance of integrating cultural events into city image efforts. The outcomes of this study provide invaluable insights for policymakers, event organizers, and tourism stakeholders, emphasizing the need for greater investment in the organisation and promotion of events to strengthen Šibenik's competitive position. By applying the findings of this research, Šibenik can reinforce its brand identity, deliver long-term benefits to residents and visitors, and establish itself as a leading cultural destination.

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References

Amani, D. (2024). Destination identification and destination community identification as drivers of destination brand value co-creation in emerging tourism destinations: A social identity theory perspective. *International Journal of Hospitality & Tourism Administration*, 1-37. https://doi.org/10.1080/15256480.2024.2332990

Anholt, S. (2006). The Anholt-GMI City Brands Index: How the world sees the world's cities. *Place Branding*, *2*(1), 18–31. https://doi.org/10.1057/palgrave.pb.5990042

Bose, S., Pradhan, S., Bashir, M., & Roy, S. K. (2022). Customer-based place brand equity and tourism: A regional identity perspective. *Journal of Travel Research*, *61*(3), 511-527. https://doi.org/10.1177/0047287521999465

Bowdin, G. A. J., Allen, J., O`Toole, W., Harris, R., & McDonnell, I. (2011). *Events Management* (3rd ed.). Elsevier.

Braun, E., Kavaratzis, M., & Zenker, S. (2013). My city – my brand: The different roles of residents in place branding. *Journal of Place Management and Development*, *6*(1), 18–28. https://doi.org/10.1108/17538331311306087

Campelo, A., Aitken, R., Thyne, M., & Gnoth, J. (2014). Sense of place: The importance for destination branding. *Journal of travel research*, *53*(2), 154-166. https://doi.org/10.1177/0047287513496474

Deng, F., Ruan, W.-Q., & Zhang, S.-N. (2023). National traditional festival tourism and visitors' national identity: A dual collaborative framework of cultural inheritance and inherited innovation. *Tourism Review*, *78*(3), 1019–1035. https://doi.org/10.1108/TR-04-2022-0197

Gad, T. (2001). *4-D Branding: Cracking the corporate code of the network economy*. Pearson.

Gad, T. (2016). *Customer Experience Branding: Driving engagement through surprise and innovation*. Kogan Page.

García, J. A., Gómez, M., & Molina, A. (2012). A destination-branding model: An empirical analysis based on stakeholders. *Tourism Management*, *33*(3), 646–661. https://doi.org/10.1016/j.tourman.2011.07.006

Getz, D. (2008). Event tourism: Definition, evolution, and research. *Tourism Management*, *29*(3), 403–428. https://doi.org/10.1016/j.tourman.2007.07.017

Golestaneh, H., Guerreiro, M., Pinto, P., & Mosaddad, S. H. (2022). On the role of internal stakeholders in place branding. *Journal of Place Management and Development*, *15*(2), 202–228. https://doi.org/10.1108/JPMD-05-2020-0041

Hanna, S., & Rowley, J. (2011). Towards a strategic place brand-management model. *Journal of Marketing Management*, *27*(5–6), 458–476. https://doi.org/10.1080/02672571003683797

Hanna, S., Rowley, J., & Keegan, B. (2021). Place and destination branding: A review and conceptual mapping of the domain. *European Management Review*, *18*(2), 105-117. https://doi.org/10.1111/emre.12433

Hay, N. A., Chien, P. M., & Ruhanen, L. (2022). Tell me your story: Branding destinations through residents' (place) stories. *Journal of Vacation Marketing*, *28*(3), 319–334. https://doi.org/10.1177/13567667211060567

Inkinen, T., Heikkonen, M., Makkonen, T., & Rautiainen, S. (2024). Multilayered spatial categories in tourism marketing and branding. *Journal of Destination Marketing & Management*, *31*, 100867. https://doi.org/10.1016/j.jdmm.2024.100867

Iversen, N. M., Foley, C., & Hem, L. E. (2023). The role of immersive festival experiences, identity, and memory in cultural heritage tourism. *Event Management, 27*(1), 33-50. https://doi.org/10.3727/152599522X16419948694847

Jain, V., Shroff, P., Merchant, A., & Bezbaruah, S. (2022). Introducing bi-directional participatory place branding: a theoretical model with multi-stakeholder perspectives. *Journal of Product & Brand Management*, *31*(1), 73-95. https://doi.org/10.1108/JPBM-05-2020-2921

Kastenholz, E., & Gronau, W. (2022). Enhancing competences for co-creating appealing and meaningful cultural heritage experiences in tourism. *Journal of Hospitality & Tourism Research, 46*(8), 1519-1544. https://doi.org/10.1177/1096348020951637

Kotler, P., & Gertner, D. (2002). *Theoretical papers Country as brand, product, and beyond: A place marketing and brand management perspective. 9*(4).

Maddaloni, F. D., & Sabini, L. (2022). Very important, yet very neglected: Where do local communities stand when examining social sustainability in major construction projects? *International Journal of Project Management*, *40*(7), 778–797. https://doi.org/10.1016/j.ijproman.2022.08.007

Morgan, N., Pritchard, A., & Pride, R. (Eds.). (2004). *Destination branding: Creating the unique destination proposition* (2nd ed.). Elsevier.

Qiu, Q., & Zuo, Y. (2023). "Intangible cultural heritage" label in destination marketing toolkits: Does it work and how?. *Journal of Hospitality and Tourism Management*, *56*, 272-283. https://doi.org/10.1016/j.jhtm.2023.06.025

Ruiz-Real, J. L., Uribe-Toril, J., & Gázquez-Abad, J. C. (2020). Destination branding: Opportunities and new challenges. *Journal of Destination Marketing & Management*, *17*, 100453. https://doi.org/10.1016/j.jdmm.2020.100453

Su, L., Swanson, S. R., & He, X. (2020). A scale to measure residents perceptions of destination social responsibility. *Journal of Sustainable Tourism*, *28*(6), 873–897. https://doi.org/10.1080/09669582.2019.1708372

Zhao, R., Edelenbos, J., & de Jong, M. (2025). Between branding and being: how are inclusive city branding and inclusive city practices related? *Journal of Place Management and Development, 18*(1), 20-39. https://doi.org/10.1108/JPMD-11-2023-0113

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Analyzing the Influence of Commercial Partnerships on the Authenticity of Tourism Content Created by Influencers

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Abstract: *With digital platforms like YouTube increasingly shaping travel choices, influencers play a valuable role in promoting destinations. However, as influencers engage in sponsorships and paid collaborations, questions arise about the impact of commercial interests on the authenticity of their content. The study employs a qualitative content analysis of 30 videos created by five prominent tourism influencers on YouTube. The analysis focuses on key elements such as personal storytelling, sponsorship disclosure, brand alignment, and audience engagement. The findings reveal that influencers adopt subtle strategies to blend personal experiences with brand promotions, often using storytelling techniques and transparent sponsorship disclosures to maintain credibility. The study identifies key factors that influence audience perceptions of authenticity, such as alignment between the influencer's personal brand and the sponsored content. These insights offer valuable implications for tourism marketing, highlighting how influencer-driven content affects consumer behavior and destination branding. The research provides actionable guidance for influencers, tourism boards, and marketers aiming to balance authenticity with commercial demands in an increasingly commercialized digital environment.*

1. INTRODUCTION

The published content on social media platforms like YouTube (and other primarily video-based social networks) has been transforming the way people make decisions, including the ones in the context of traveling. Travel influencers – social media users who gained a large number of followers by sharing their personal tourist experiences and recommendations, play a significant role in shaping travel behavior and promoting destinations (Stubb et al., 2019). For these reasons, the industry uses influencer marketing which "leverages well-followed online users to sway consumer attitudes and decision-making processes in favor of brands or ideas" (Evans et al., 2017, p. 138). Influencers serve as trusted figures for their audience and their perceived authenticity and relatability contribute to the formation of a virtual community, fostering a desire among audiences to replicate shared experiences (Schouten et al., 2020). They usually offer insights into travel locations, accommodations and activities. However, as the influencer industry grows, so does the pressure to monetize the content. Sponsorships, brand partnerships, and paid collaborations have become the main financial support and the way how influencers sustain their work. These commercial arrangements raise important questions about how they impact the authenticity of the content created by influencers (Abidin, 2016). One of the biggest differences that separate influencers from traditional media (especially when it comes to their relationship with the audience), lies in authenticity because this is often the most important element that drives the audience's trust and engagement.

The audience expects influencers to present honest and personal reflections and experiences, rather than promotional content that can feel overly commercialized (Ercegovac & Tankosić, 2023), which

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creates tension and a unique challenge for influencers. As financial demands increase, they face the difficult task of balancing credibility and audience trust with the demands of brand partnerships and this paper explores that very challenge. Through a qualitative content analysis of travel influencers on YouTube, the study investigates how they navigate between maintaining authenticity and fulfilling commercial obligations. The study seeks to uncover the subtle strategies that influencers use to blend personal storytelling with brand promotion, shedding light on how these efforts affect both consumer behavior and destination branding (Hudders et al., 2021). Given the growing importance of influencer-driven tourism marketing, this research offers valuable insights into how the industry can evolve in a way that benefits both influencers and tourism brands. By focusing on the balance between authenticity and commercialization, this paper also contributes to broader discussions on digital capitalism and the cultural implications of monetized content in the online space (Fuchs, 2020).

2. LITERATURE REVIEW

Influencers play a very important role in tourism marketing, fostering trust and influencing consumer decisions through relatable and credible content. Unlike traditional advertising, their ability to connect with audiences on a personal level builds stronger bonds and encourages deeper engagement (Schouten et al., 2020). Research highlights that daily vlogs and user-generated content allow influencers to share genuine personal experiences, creating emotional connections that significantly influence travel motivations (Wu et al., 2024; Zaim et al., 2024). Story-driven narratives, where influencers reflect on their real-life journeys, encourage audiences to consider destinations they might not have previously considered (Evans et al., 2017).

YouTube influencers have transformed into business innovators, leveraging storytelling techniques to create content that resonates with their audiences while simultaneously capitalizing on commercial opportunities. Books like The YouTube Formula by Derral Eves (2021) and YouTubers by Chris Stokel-Walker (2019) emphasize YouTube's profound impact on media and marketing. Eves explores how algorithms and engagement metrics determine content success, while Stokel-Walker illustrates how influencers revolutionize niche industries, including tourism, by maintaining relatable connections with viewers. While partnerships and sponsorships offer financial sustainability, they also introduce challenges. Influencers often face pressure to prioritize promotional content, which risks shifting the focus from meaningful storytelling to corporate-driven messaging (Abidin, 2016). When brand deals feel excessive or irrelevant, audiences may question the influencer's credibility and lose trust (Dedić, 2022; Ercegovac & Tankosić, 2023). especially when there is a misalignment between perceived and projected authenticity (Balaban & Szambolics, 2022).

Studies show that younger demographics like millennials are especially critical of content that appears overly commercialized or disconnected from the influencer's usual style (Anubha et al., 2024; Kim & Kim, 2022). Transparent communication about sponsorships, such as clear disclosures early in videos, is essential for maintaining viewer confidence and retention (Roy et al., 2020). To navigate these challenges, successful influencers rely on storytelling techniques that seamlessly integrate personal experiences with promotional messaging. By aligning partnerships with their values and lifestyles, influencers ensure that brand collaborations feel organic rather than forced (Kapita et al., 2022). For instance, travel influencers focused on adventure tourism often work with companies promoting outdoor gear, eco-tourism, or sustainability. This alignment not only enhances credibility but also reinforces the influencer's connection with their audience. Maintaining creative control further strengthens this connection, enabling influencers to produce content that reflects their real interests while addressing commercial obligations (Chen et al., 2023;

Ercegovac et al., 2023). Platform algorithms, particularly YouTube's recommendation system, introduce additional complexities for influencers. Content visibility is largely determined by engagement metrics—likes, shares, and comments—which incentivize influencers to prioritize commercially appealing or "viral" topics (Chen, 2024). While this may increase visibility, it can sometimes conflict with the influencer's established storytelling style or content preferences. As a result, influencers must strike a careful balance between producing relatable, value-driven content and meeting algorithmic demands (Acikgoz & Burnaz, 2021), especially as audience perception is often shaped by subconscious cues, as shown in studies combining media theory with neuromarketing approaches (Ercegovac et al., 2022). Those who retain control over their creative process—while aligning brand partnerships with their unique voice—are better equipped to sustain audience engagement without compromising their identity.

Although existing research points out the significance of personal storytelling, brand alignment, and transparency in tourism marketing, little attention has been given to how influencers manage the tension between creative narratives and commercial imperatives. The correlation between personal reflections, sponsorship disclosures, and algorithmic influences remains under-explored. This study addresses that gap, offering insights into the strategies influencers use to balance meaningful content creation with promotional responsibilities.

3. METHODOLOGY

This study employs qualitative content analysis to examine how YouTube influencers balance personal storytelling and commercialization in tourism promotion. The analysis identifies recurring visual and narrative elements, with particular attention to storytelling techniques, sponsorship disclosures, and brand integration. A qualitative approach allows for a deeper understanding of the strategies influencers use to blend personal experiences with promotional content. Data collection involved purposive sampling of five YouTube travel influencers who met specific criteria: a subscriber base of over 500,000, a mix of personal and sponsored content, and regular engagement in brand partnerships with clear sponsorship disclosure. These criteria ensured diversity and relevance in the selected content. A total of 30 videos (six per influencer) were analyzed, capturing a broad spectrum of content across different cultural and geographic contexts. The videos were collected from the influencers' official YouTube channels and transcribed verbatim to facilitate systematic narrative analysis, following best practices from prior qualitative studies on vlog narratives (Vlahović et al., 2023). The analysis focused on several elements, including sponsorship disclosure practices, personal storytelling, and visual techniques such as location shots, cultural depictions, and aesthetic presentation. Engagement metrics (likes, comments, shares) were also recorded to evaluate audience responses. Thematic analysis was conducted in multiple stages: familiarization with the transcripts, coding of authenticity (e.g., storytelling, transparency, creative control) and commercialization indicators (e.g., product placements, brand mentions, calls to action), and grouping codes into broader themes. To enhance reliability, an intercoder agreement process was implemented, where two researchers independently coded a subset of videos. Discrepancies were discussed and resolved, ensuring consistency in the themes identified.

The study focuses exclusively on YouTube to maintain consistency in content format and audience behavior, as platforms like Instagram and TikTok differ significantly in structure and engagement strategies. YouTube's long-form video format allows for a more detailed exploration of storytelling and brand integration. However, several limitations should be noted. The purposive selection of five influencers limits the generalizability of findings to the broader tourism influencer population. The analysis relies on self-reported sponsorship disclosures, which may underrepresent

undisclosed partnerships. The exclusive focus on YouTube means the findings may not apply to other platforms with shorter-form content. Despite these limitations, the study provides valuable insights into how influencers manage the balance between commercial and personal content, offering practical implications for marketers, tourism boards, and brands seeking to leverage influencer-driven promotion.

4. FINDINGS

The analysis of the five selected YouTube influencers — Louis Cole (FunForLouis), Nadine Sykora (Hey Nadine), Christian LeBlanc (Lost LeBlanc), Eva zu Beck, and Kara and Nate — reveals a nuanced approach to managing authenticity and commercialization. Across the 30 videos analyzed, several recurring themes emerged that shed light on how these influencers balance personal storytelling with sponsored content, maintain credibility, and engage their audiences.

A consistent approach across all five influencers is the use of **personal narratives** to connect with their audiences. By sharing candid moments, challenges, and reflections, they offer content that feels relatable and grounded in personal experience. Eva zu Beck, for instance, frequently emphasizes her solo travels to remote and culturally significant locations, combining adventure with meaningful insights. Her storytelling appeals to viewers who value raw and immersive travel experiences. Similarly, Louis Cole integrates moments of spontaneity and self-reflection into his videos, with a particular focus on themes of freedom and sustainability. These narratives resonate with audiences seeking content that feels personal rather than overly curated. **Transparency about sponsorships** is essential for maintaining audience trust. All five influencers disclose their partnerships through verbal mentions, on-screen text, or video descriptions. For example, Christian LeBlanc and Kara and Nate acknowledge sponsorships early in their videos, while Nadine Sykora includes promotional codes in descriptions to keep the content unobtrusive. This openness helps audiences engage without feeling misled, as videos with clear disclosures typically receive more positive responses and steady engagement.

An effective strategy observed among the influencers is the **seamless integration of brand partnerships** into their content. Rather than presenting sponsorships as separate segments, influencers integrate promotional content naturally into their narratives. Nadine Sykora shows how travel services enhance her experiences, while Kara and Nate incorporate hotels or travel insurance into their trip stories. This approach reduces the commercial tone, making promotions feel more relevant and relatable. In contrast, when sponsorships dominate the content, viewer responses tend to be less positive. For example, Christian LeBlanc's video on a luxury cruise emphasized amenities and services so heavily that many viewers felt the personal connection was lost, leading to critical feedback and lower engagement.

The **alignment between influencer values and sponsored content** also plays an important role in shaping audience perceptions. Collaborations that align with an influencer's established style and interests are generally well-received. For example, Louis Cole's partnerships with eco-friendly and adventure-oriented brands are consistent with his sustainability-driven persona, reinforcing the connection with his audience. By contrast, his occasional promotion of luxury products has led to mixed reactions, as some viewers found the content inconsistent with his usual free-spirited and down-to-earth image. Similarly, Eva zu Beck's collaborations with local tourism initiatives complement her off-the-beaten-path travel content, enhancing her credibility among viewers. Audience responses to these partnerships reflect a preference for sponsorships that feel genuine and closely tied to the influencer's identity. The extent and presentation of **commercial content**

significantly influence audience engagement. Videos with subtle, well-integrated promotions tend to attract higher interaction rates, including positive comments, likes, and shares. Kara and Nate's content, for instance, often receives praise for seamlessly incorporating sponsorships into their travel experiences without distracting from the overall narrative. On the other hand, overt commercialization can lead to viewer dissatisfaction. Christian LeBlanc's luxury travel videos, which feature frequent product placements and direct calls to action, are sometimes criticized for prioritizing brand promotion over personal storytelling. Comments on these videos often reflect frustration that the commercial focus overshadows the authenticity viewers seek.

Commercial markers such as product placements, endorsements, and calls to action were evident in all 30 videos. Christian LeBlanc's content relied on product placements, particularly in videos featuring luxurious travels and upscale accommodations. Nadine Sykora, meanwhile, frequently included promotional details and affiliate offers in her video descriptions. While these markers effectively communicate sponsorship intent, audience responses varied based on execution. Subtle brand mentions integrated into the narrative tended to be received more positively, while overt sponsorships, particularly those that dominated the content, led to mixed reactions. The findings show that influencers manage audience trust and engagement by combining personal storytelling with sponsorship transparency and carefully chosen brand collaborations. These results emphasize the importance of subtle execution, transparency, and aligning commercial content with an influencer's established image to sustain trust and maintain strong audience relationships.

5. DISCUSSION

The findings from this study provide critical insights into how YouTube influencers navigate the tension between authenticity and commercialization in their tourism-related content. By analyzing the five selected influencers, it becomes evident that maintaining credibility while engaging in commercial partnerships requires a delicate balance, and this balance is reflected in the main themes of authenticity, commercialization, transparency, audience engagement, and brand alignment.

Table 1. Coding Scheme with examples

Code	Description	Example
Authenticity	Personal storytelling, personal anecdotes, or reflections to build trust.	Louis Cole sharing personal adventures in travel vlogs.
Commercialization	Inclusion of sponsored content or product placements.	Nadine Sykora promoting travel services during vlogs.
Transparency	Clear disclosure of sponsorships either verbally or visually.	Christian LeBlanc mentioning sponsorships at the start of videos.
Audience Engagement	Audience reactions including metrics like comments, likes, and shares.	Kara and Nate receiving positive feedback on sponsored content.
Brand Alignment	Aligning sponsorships with the influencer's personal brand and values.	Eva zu Beck collaborating with local tourism initiatives.

Source: Own research

The analysis shows that influencers manage authenticity by incorporating personal storytelling and experiences into their content. Table 1 outlines the coding scheme used to identify markers of authenticity, commercialization, transparency, audience engagement, and brand alignment across the videos analyzed. The influencers, such as Eva zu Beck and Louis Cole, consistently presented their content in ways that highlighted personal reflection and unfiltered experiences, which scored high in authenticity (Table 2).

Table 2. Influencer Metrics

Influencer	Authenticity Score	Commercialization Score	Transparency Score	Audience Engagement Score	Brand Alignment Score
Louis Cole	8	5	9	8	8
Nadine Sykora	7	6	8	7	8
Christian LeBlanc	6	8	7	7	6
Eva zu Beck	9	4	9	9	9
Kara and Nate	8	6	9	8	8

Source: Own research

According to the data presented in **Figure 1**, authenticity was highest among influencers who prioritized storytelling and cultural immersion over overtly commercial content. Eva zu Beck's emphasis on personal journeys to remote and culturally rich areas, where sponsorships were minimal or aligned with her brand, set her apart as one of the most authentic influencers in the study. This focus on local culture and immersive experiences aligns with research on how influencers visually frame destinations to influence audience perceptions (Motahar et al., 2024). Louis Cole similarly demonstrated authenticity by focusing on adventure travel and sustainability, although his occasional partnerships with luxury brands slightly lowered his score.

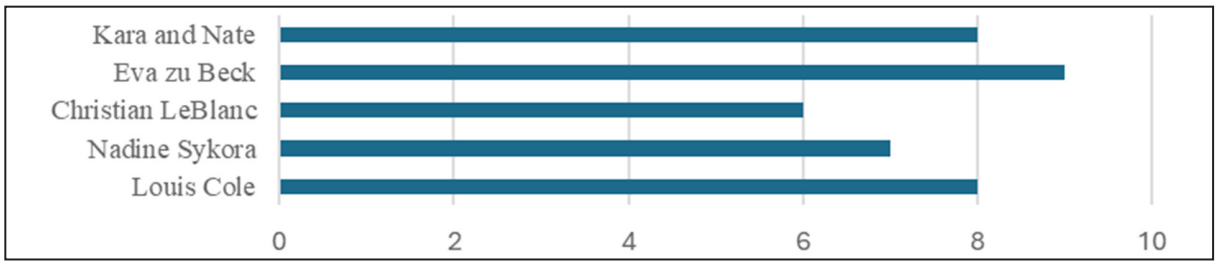

Figure 1. Authenticity score

Source: Own research

In contrast, **Figure 2** highlights the commercialization aspect, where Christian LeBlanc had the highest score. His content leaned heavily into brand partnerships, with frequent product placements and endorsements. While his videos still attracted an audience, the high degree of commercialization reduced the authenticity of his content in the eyes of some viewers, which led to mixed audience engagement (Table 2). The high commercialization score reflects the difficulty influencers face when monetizing content, as they must strike a balance between earning revenue and retaining audience trust.

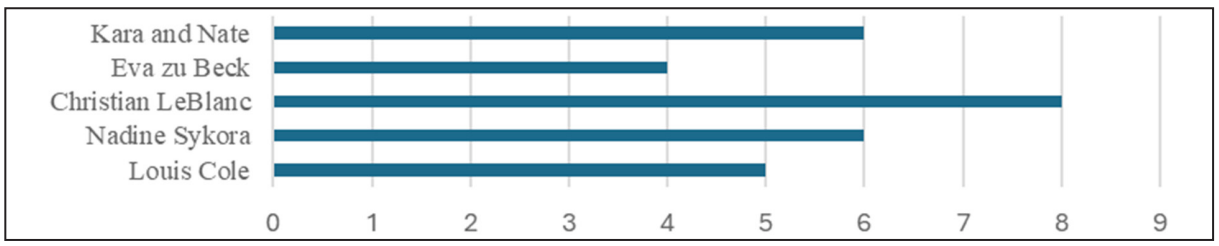

Figure 2. Commercialization Score

Source: Own research

Transparency emerged as a critical factor for maintaining credibility and trust with viewers. As demonstrated in **Figure 3**, transparency scores were consistently high across all influencers, with

many explicitly disclosing sponsorships verbally or through on-screen text. This practice aligns with previous research that suggests clear sponsorship disclosures are essential to maintaining trust, even in the context of commercialized content (Acikgoz & Burnaz, 2021; Kapita et al., 2022). Kara and Nate, along with Louis Cole, scored particularly high in transparency, which reflects their upfront approach to sponsorship disclosures. Their willingness to clearly communicate the commercial nature of their partnerships likely contributed to the positive audience responses observed in their engagement metrics (Figure 4). Transparency plays a crucial role in managing the commercialization dilemma, allowing influencers to engage in partnerships without alienating their audience.

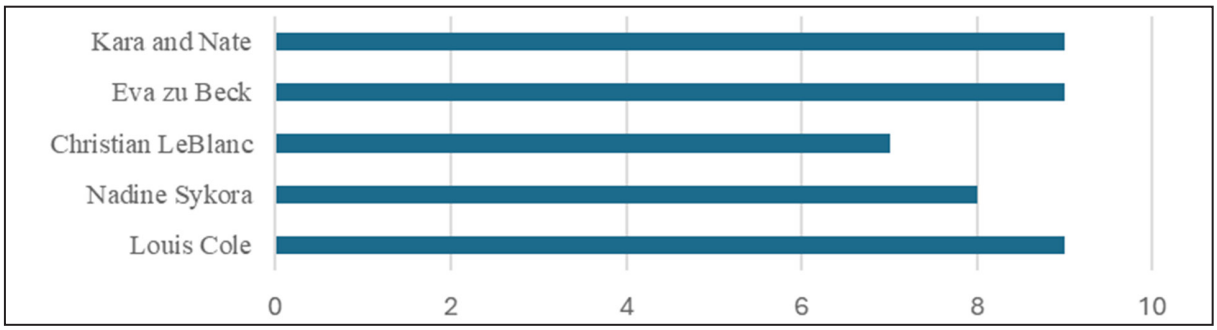

Figure 3. Transparency Score
Source: Own research

Audience engagement was closely tied to the perceived authenticity of the content. Influencers who successfully blended personal experiences with commercial content saw higher engagement levels, as depicted in **Figure 4**. Kara and Nate, who integrated sponsorships subtly into their travel vlogs, maintained strong audience interaction through comments, likes, and shares. Their ability to balance brand partnerships with personal storytelling made their content feel relatable and genuine to their audience. In contrast, Christian LeBlanc, whose content was more overtly commercialized in specific videos, experienced lower engagement on videos where the sponsored elements dominated the narrative. This supports the idea that while commercialization is an essential aspect of influencer marketing, it must be managed carefully to avoid diminishing audience engagement.

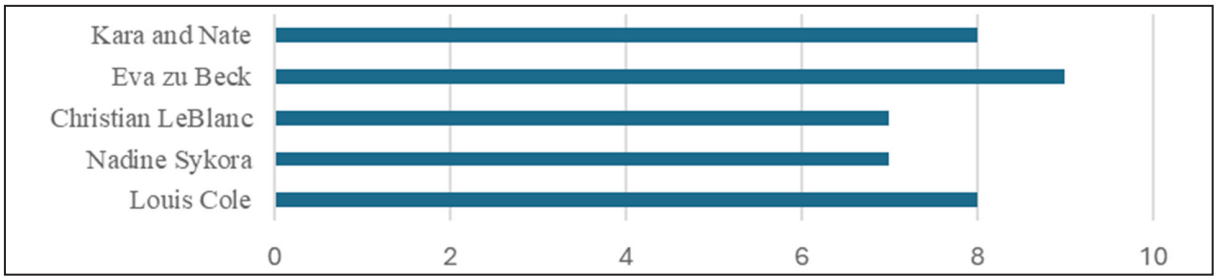

Figure 4. Audience Engagement Score
Source: Own research

Another finding worth mentioning, from the study is the importance of brand alignment, shown in **Figure 5**. Influencers who partnered with brands that aligned with their personal values and content style were more likely to maintain credibility and trust with their audience. For example, Eva zu Beck's collaborations with local tourism initiatives and sustainable travel companies resonated well with her audience, as the partnerships matched her established travel ethos. This alignment not only contributed to her high brand alignment score (Table 2) but also supported her strong audience engagement and authenticity.

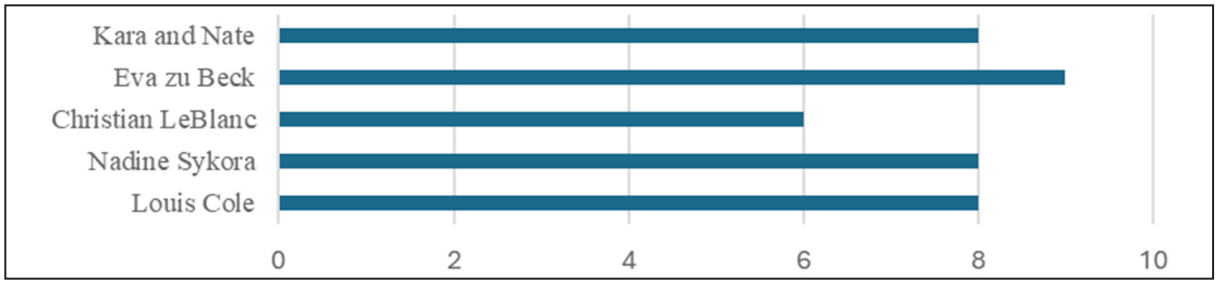

Figure 5. Brand Alignment Score
Source: Own research

On the other hand, Christian LeBlanc's partnerships with luxury brands, while consistent with his luxury travel content, sometimes felt disconnected from his earlier adventure-focused persona, resulting in a lower brand alignment score. This mismatch highlights the importance of influencers carefully selecting partnerships that align with their core brand to preserve authenticity.

The findings from this study have important implications for tourism marketers and influencers. First, the balance between authenticity and commercialization must be carefully managed to maintain audience trust. Influencers who prioritize personal storytelling, disclose sponsorships transparently, and align with brands that reflect their values are more likely to engage their audience positively. Tourism marketers should seek to collaborate with influencers who have established a strong personal brand that resonates with their target audience. By aligning with influencers who maintain high levels of authenticity and transparency, brands can effectively reach potential travelers without compromising the influencer's credibility.

6. CONCLUSION

This study examines how YouTube travel influencers balance authenticity and commercialization in tourism promotion, focusing on strategies for maintaining audience trust and credibility. The findings demonstrate that transparency in sponsorships, alignment with personal values, and integration of promotional content into narratives are essential for achieving positive audience engagement. For example, influencers such as Kara and Nate and Eva zu Beck successfully incorporate sponsorships into their storytelling, enhancing their connection with viewers. By contrast, evident promotional content, as observed in Christian LeBlanc's luxury travel videos, often receives critical feedback as it shifts the focus away from personal connection. Brand partnerships that align with an influencer's established identity resonate more positively with audiences. Louis Cole's collaborations with eco-friendly brands reflect his sustainability-driven persona, reinforcing audience trust, while transparent sponsorship disclosures, as seen in the practices of Nadine Sykora and Kara and Nate, prevent feelings of deception among viewers. These approaches illustrate how influencers maintain the delicate balance between commercial goals and personal storytelling.

The study builds on existing research into authenticity and influencer credibility, emphasizing the importance of strategies that merge storytelling with brand integration (Abidin, 2016; Djafarova & Rushworth, 2017). By focusing on YouTube's long-form content, the analysis highlights how influencers leverage detailed narratives to combine personal experiences with promotional elements to sustain audience engagement.

Future research should explore how these strategies adapt across other platforms such as TikTok or Instagram, where content formats and audience behaviors differ. Also, studies with larger sample sizes or longitudinal approaches could provide further insights into how these practices evolve. While the study's focus on YouTube and reliance on self-disclosed sponsorships present limitations, it offers valuable insights for marketers and tourism boards seeking to optimize influencer-driven campaigns by blending commercial content with authentic storytelling.

References

Abidin, C. (2016). *Visibility labour: Engaging with influencers' fashion brands and #OOTD advertorial campaigns on Instagram*. *Media International Australia, 161*(1), 86-100. https://doi.org/10.1177/1329878X16665177

Acikgoz, F., & Burnaz, S. (2021). The influence of 'influencer marketing' on YouTube influencers. *International Journal of Internet Marketing and Advertising, 15*(2), 201. https://doi.org/10.1504/ijima.2021.114331

Anubha, A., Narang, D., & Sharma, H. (2024). Unveiling the impact of YouTube advertising on the cognitive attitude of Indian millennials. *Global Knowledge, Memory and Communication, 73*(6/7), 890–912. https://doi.org/10.1108/GKMC-08-2022-0196

Balaban, D. C., & Szambolics, J. (2022). A proposed model of self-perceived authenticity of social media influencers. *Media and Communication, 10*(1), 235–246. https://doi.org/10.17645/mac.v10i1.4765

Chen, C.-P. (2024). YouTube influencer marketing through parasocial interaction: A dyadic perspective. *Journal of Research in Interactive Marketing*. https://doi.org/10.1108/JRIM-02-2024-0112

Chen, G., Li, Y., & Sun, Y. (2023). How YouTubers make popular marketing videos: Speech acts, move structure, and audience response in YouTube influencer marketing videos. *SAGE Open, 13*(1), 1–14. https://doi.org/10.1177/21582440231152227

Chen, L., Yan, Y., & Smith, A. N. (2023). What drives digital engagement with sponsored videos? An investigation of video influencers' authenticity management strategies. *Journal of the Academy of Marketing Science, 51*(1), 198-221. https://doi.org/10.1007/s11747-022-00887-2

Dedić, G. (2022). Influencer marketing in tourism: An overview and research agenda. In *90th International Scientific Conference on Economic and Social Development – Building Resilient Society: National and Corporate Security*, 285-290. Varazdin Development and Entrepreneurship Agency.

Djafarova, E., & Rushworth, C. (2017). Exploring the credibility of online celebrities' Instagram profiles in influencing the purchase decisions of young female users. *Computers in human behavior, 68*, 1-7. https://doi.org/10.1016/j.chb.2016.11.009

Ercegovac, I., & Tankosić, M. (2023). Exploring the Ethical Dimensions of Influencer Communication in the Fashion Industry. *EMAN 2023–Economics & Management: How to Cope with Disrupted Times*, 179-191. https://doi.org/10.31410/EMAN.S.P.2023.179

Ercegovac, I., Tankosić, M., & Grilec, A. (2022). Influence of two-step flow theory supported by neuromarketing methods on consumers' perception – The theoretical overview. In *90th International Scientific Conference on Economic and Social Development – Building Resilient Society*, 91–102. Varazdin Development and Entrepreneurship Agency.

Ercegovac, I., Tankosić, M., & Vlahović, A. (2023). From content creators to business innovators: The entrepreneurial impact of YouTube influencer channels. *9th International Scientific Conference ERAZ 2023 – Selected Papers*, 187–194. https://doi.org/10.31410/ERAZ.S.P.2023.187

Evans, N. J., Phua, J., Lim, J., & Jun, H. (2017). Disclosing Instagram influencer advertising: The effects of disclosure language on advertising recognition, attitudes, and behavioral intent. *Journal of Interactive Advertising*, *17*(2), 138-149. https://doi.org/10.1080/15252019.2017.1366885

Eves, D. (2021). *The YouTube formula: How anyone can unlock the algorithm to drive views, build an audience, and grow revenue*. Wiley.

Fuchs, C. (2020). The ethics of the digital commons. *Journal of Media Ethics*, *35*(2), 112-126. https://doi.org/10.1080/23736992.2020.1736077

Hudders, L., De Jans, S., & De Veirman, M. (2021). *The commercialization of social media stars: A literature review and conceptual framework on the strategic use of social media influencers*. *International Journal of Advertising, 40*(3), 327-375. https://doi.org/10.1080/02650487.2020.1836925

Kapita, S., van Esch, P., & Kietzmann, J. (2022). Influencer marketing and authenticity in content creation. *Australasian Marketing Journal, 30*(4), 280-290. https://doi.org/10.1177/18393349211011171

Kim, E., & Kim, Y. (2022). Factors affecting the attitudes and behavioral intentions of followers toward advertising content embedded within YouTube influencers' videos. *Journal of Promotion Management, 28*(8), 1235-1256. https://doi.org/10.1080/10496491.2022.2060414

Motahar, P. S., Tavakoli, R., & Mura, P. (2024). Social media influencers' visual framing of Iran on YouTube. *Tourism Recreation Research, 49*(2), 270–282. https://doi.org/10.1080/02508281.2021.2014252

Roy, S. K., Fatema, M. R., Islam, M. J., & Huda, M. N. (2020). Reviewing YouTube as a compelling tool for the promotion of tourism. *International Journal of Management and Accounting, 2*(5), 96-104. https://doi.org/10.34104/ijma.020.0960104

Schouten, A. P., Janssen, L., & Verspaget, M. (2020). Celebrity vs. influencer endorsements in advertising: The role of identification, credibility, and Product-Endorser fit. *International Journal of Advertising*, *39*(2), 258-281. https://doi.org/10.1080/02650487.2019.1634898

Stokel-Walker, C. (2019). *YouTubers: How YouTube shook up TV and created a new generation of stars*. Canbury Press.

Stubb, C., Nyström, A. G., & Colliander, J. (2019). Influencer marketing: The impact of disclosing sponsorship compensation justification on sponsored content effectiveness. *Journal of Communication Management*, *23*(2), 109-122. https://doi.org/10.1108/JCOM-11-2018-0119

Vlahović, A., Ercegovac, I., & Tankosić, M. (2023). Unraveling the narrative structures in YouTube vlogs: A Qualitative Content Analysis. *Media Studies and Applied Ethics, 4*(2), 25-42. https://doi.org/10.46630/msae.2.2023.03

Wu, P., Zou, Y., Jin, D., Li, Y., & Zhang, J. (2024). Daily vlog-induced tourism: Impact of enduring involvement on travel intention. *Tourism Review, 79*(5), 1166–1181. https://doi.org/10.1108/TR-04-2023-0223

Zaim, I. A., Stylidis, D., Andriotis, K., & Thickett, A. (2024). Does user-generated video content motivate individuals to visit a destination? A non-visitor typology. *Journal of Vacation Marketing*. https://doi.org/10.1177/13567667241268369

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Leisure Constraints and Negotiating in Tourism: Case Study of Croatian Students as Solo Travelers

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Tourism;
Consumer behavior;
Statistic methods

Abstract: *When deciding to consume a tourist service or product, tourists sometimes go through a process of negotiating with their perceived constraints. The sources of those constraints may be interpersonal, intrapersonal, structural or other, and they present a deterrent to making a decision. A tourist's ability to successfully negotiate those constraints may be the deciding factor that determines whether one chooses to travel or not. This paper aims to add to the scientific literature on the constraint-negotiation process of tourists by investigating the constraint-negotiation strategies and processes of Croatian students when deciding about solo travel. The research was conducted using a structured questionnaire developed based on relevant literature and with a sample of Croatian students. Collected data was analyzed with different quantitative methods, using descriptive and inferential statistical analyses. The results point to the constraints Croatian students face when deciding to travel solo as well as negotiation strategies they use when trying to overcome those constraints. Recommendations for tourist business subjects as well as limitations and future directions for research are also presented in the conclusion of the paper.*

1. INTRODUCTION

Tourists face many and diverse constraints to their engagement in tourism activities, the number and variety of which is even more considerable concerning solo travel. Traveling and other tourist activities impose various and significant challenges on tourists who partake in solo travel that may not only affect their experience but even hinder their participation. Since solo traveling is one of the fastest-growing segments due to lifestyle changes in different cultures around the world (Mill & Morrison, 2009), understanding leisure constraints and negotiation strategies of tourists who travel solo might result in important findings both for academia and tourist operators. This paper attempted to add to the literature dealing with leisure constraints and negotiation strategies of a specific group of tourists, namely, Croatian students as solo travelers.

2. LITERATURE REVIEW

2.1. Leisure Constraints

Constraints were usually considered as obstacles to participating in leisure and leisurely activities (Crawford et al., 1991). Aforementioned construct was also defined as „people's reasons for refraining from participating in leisure activities and refer to the probability that people will alter their activities and preferences" (Lenggogeni & Syafrizal, 2023) or „factors and barriers that affect individuals or tourists to participate in leisure activities, either locally or internationally" (Andreani & Njo, 2021).

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Crawford and Godbey (1987) were often considered and referenced as authors of seminal research on leisure constraints. The aforementioned authors classified leisure constraints based on their research into intrapersonal (stress, depression and anxiety), interpersonal (concerned with relationship between individuals), and structural barriers (opportunity, time or money). Intrapersonal constraints refer to psychological states or cognitive obstacles derived from individual beliefs and experiences such as family issues (Karl et al., 2021), safety and security issues (Shin et al., 2022; Wang et al., 2018), lack of interest, anxiety, stress, religiosity and depression (Andreani & Njo, 2021; Aziz et al., 2022; Chen et al., 2021). Interpersonal constraints refer to social interactions and can include a lack of a person with whom one may participate in tourist activities (Andreani & Njo, 2021; Fredman & Heberlein, 2005). Structural constraints can be considered as external obstacles that can encompass a lack of time, limited financial resources, climatic factors, information and access (Andreani & Njo, 2021; Nyaupane & Andereck, 2008).

Leisure constraints have also been investigated in the touristic context and found to influence travel behavior (Ahmad et al., 2022), travel intention (Andreani & Njo, 2021; Aziz et al., 2022), travel decision making (Chen et al., 2021; Karl et al., 2020), destination choice (Sun et al., 2022) as well as travel plans (Karl et al., 2021) of various tourists segments such as people with mobility disability (Tao et al., 2019), individuals with mental health conditions (Park et al., 2025), senior citizens (Hou & Li, 2024), tourists that travel with their pets (Ying et al., 2021) etc.

As aforementioned, there were several relevant papers dealing with leisure constraints employed by different groups of tourists, and some also dealt with the leisure constraints of students. Although leisure constraints among North American students have been extensively researched, different authors showed that leisure constraints among students from different cultural contexts differ (Chung et al., 2013; Li & Stodolska, 2007; Mei & Lantai, 2018; Sivan, 2003; Walker et al., 2008). Additionally, authors investigating student leisure constraints regarding travel found specific constraint factors, such as constraints concerned with the opinions of close others (Mei & Lantai, 2018), lazy solo, lack of leisure activity companion, university student's life without time to rest and enjoy (Lee et al., 2020), lack of time, language barrier and cultural differences, lack of friends and feeling of lack of entitlement to pursue leisure (Li & Stodolska, 2007).

Studies that investigated solo tourists' constraints or factors that affect their non-participation in travel activities were few. For instance, Chung et al. (2017), as well as Yang et al. (2025), confirmed that structural, intrapersonal and interpersonal constraints factors can be extracted with tourists who travel solo. However, Wilson and Little (2008) found four specific constraints while investigating women as solo travelers: others' perceptions and opinions, proneness to vulnerability, restrictions to access, and temporal immobility and conspicuousness. In addition, according to Yang and Tung (2018), single students as tourists are more prone and more exposed to constraints that originate from their family's concerns and pressure than those that travel in company.

Based on the review of the relevant studies concerning leisure constraints, that mainly found the existence of different groups or factors of leisure constraints, the following hypothesis was set:

Hypothesis One: Different factors of leisure constraints to solo travel of Croatian students can be extracted.

2.2. Negotiation Strategies

Some researchers on leisure constraints reported that people might participate in leisure activities despite perceiving certain leisure constraints (Kay & Jackson, 1991; Shaw et al., 1991), which led

to the conclusion of the existence of certain means some employ in order to overcome or negotiate constraints. Based on the aforementioned, negotiation strategies and leisure negotiation were introduced to the literature (Jackson & Rucks, 1995). Leisure constraint negotiation can be defined as "a series of measures individuals apply to avoid and reduce the impacts of constraints on leisure participation" (Lyu & Oh, 2015).

There are different strategies one might resort to during the decision-making process. Jackson and Rucks (1995) classify aforementioned negotiation strategies into cognitive strategies, which refer to changes in cognition that one should make in order to choose with regards to travel; and behavioral strategies, which refer to changes in behavior that one has to introduce in order to make the travel happen. Some behavioral constraint negotiation factors are related to travel styles, travel planning, life changes, on-site travel decisions (Karl et al., 2021), time management, skill acquisition, changing interpersonal relations, and improving finances (Jackson & Rucks, 1995); while cognitive negotiation factors may refer to the change of perception, cognitive restructuring, and attitude change (Karl et al., 2021). Constraint negotiation was researched in order to provide a better understanding of their impact on the travel decisions of different tourist segments such as senior citizens (Wen et al., 2020), mountaineering tourists (Doran & Pomfret, 2019), international students (Mei & Lantai, 2018), etc.

According to Li and Stodolska (2007), there is only a limited number of studies dealing with leisure constraints and negotiation strategies applied by students, namely international students. The aforementioned authors attempted to fill this gap by finding that Chinese students negotiated leisure constraints on behavioral and cognitive levels, but were more likely to modify leisure rather than adjust their lives to find leisure time. Additionally, Lee et al. (2020) found several types of negotiation strategies applied by South Korean students ("replacer", "continuer", "quitter"). Furthermore, the authors claimed that different negotiation strategies can be induced, such as having willpower, being sociable and preference of single person (solo) leisure activities. Based on conducted relevant studies, the following hypothesis was set:

Hypothesis Two: Different factors of negotiation strategies to solo travel constraints of Croatian students can be extracted.

Based on negotiation strategies they applied; different segments of respondents could be extracted as could be confirmed in the relevant literature. For instance, Boo et al. (2014) successfully segmented the nonparticipants from participants in a large festival event. Even though this study is among the rare studies that attempted to segment the respondents based on the negotiation strategies they use, it showed that consumers could be segmented based on the negotiation strategies they apply, so the following hypothesis could be set:

Hypothesis Three: Based on negotiation strategies they use when deciding on solo travel, different segments of students can be discerned.

3. METHODOLOGY

The empirical part of the research was conducted with a survey method in September 2024. In order to collect the data, a questionnaire was developed based on quantitative studies of leisure constraints and negotiation strategies (Jun & Kyle, 2011; Karl et al., 2021; Lyu et al., 2013; Nyaupane et al., 2008). The measurement instrument consisted of three parts: 18 items were used to measure leisure constraints perceived by the respondents in the first part and eight items were used to measure negotiation strategies in the second part of the questionnaire. The third part of the questionnaire consisted of demographic questions.

The authors used a sample of students exclusively from the University of Applied Sciences "Nikola Tesla" in Gospić, and a total of 48 students were included in the survey. The collected data was analyzed with SPSS. Descriptive and inferential statistical methods were employed in the analysis in order to test the set hypotheses: Cronbach's Alpha, factor analysis, cluster analysis (TwoStep and K-means) and independent samples T-test.

4. RESEARCH RESULTS

After the descriptive statistical analysis was conducted, it was concluded that the respondents were predominantly female (64.4%), obtained a bachelor's degree and studying to obtain their master's degree (44,4%), had a family income between 1001 and 2000 euros (51.1%) and lived in households that consisted of 3 members (33,3%) or four members (31.1%).

Further statistical analysis encompassed the inferential statistical analysis methods. Firstly, the reliability analysis of the questionnaire was conducted by applying the Cronbach's Alpha test. Cronbach's Alpha results (0.892) indicated the items of the leisure constraints questionnaire were internally consistent. After the preconditions for conducting factor analysis were assessed (KMO = 0.782, Bartlett's test of Sphericity = 0.000), the principal component analysis was conducted. Based on the conducted analysis, four leisure constraint factors of students as solo tourists were extracted: *family related*, *intrapersonal*, *finances and time related*, and *interpersonal*. As can be seen in Table 1, the extracted factors explained 74.4% of the total variance.

Table 1. Total Variance Explained of Leisure Constraints Factors

Factors	Eigenvalues	Variance Explained
Family related	4.624	42.036
Intrapersonal	1.405	12.774
Financial and time related	1.081	9.831
Interpersonal	1.068	9.712
		74.352

Source: Own calculations

The factor loadings of the extracted factors are presented in Table 2.

Table 2. Leisure Constraints' Rotated Component Matrix

Items	Family related	Intrapersonal	Financial and time related	Interpersonal
LC 1	**0.782**		0.254	0.210
LC 2	**0.749**	0.192	-0.103	0.154
LC 3	-0.109	**0.885**	-0.116	0.141
LC 4	0.437	**0.732**	0.380	0.204
LC 5	0.448	**0.662**	0.263	
LC 6	-0.160	0.699	**0.860**	0.236
LC 7	0.406	0.328	**0.691**	
LC 8	0.455		**0.599**	0.233
LC 9	0.286		0.133	**0.847**
LC 10		0.300	0.164	**0.831**
LC 11	0.445	0.172	0.300	**0.484**

Source: Own calculations

The family related factor has the highest factor loading to the first two items of the questionnaire, and thus refers to the effect of opinion and needs of family members on the decision-making process when deciding on solo travel. This finding was consistent with Yang and Tung (2018) who concluded that single students perceive constraints originating from their family's influence as very important. The second factor was named *intrapersonal*, because it is most connected to emotional states and feelings of respondents when considering solo travel, such as feeling comfort or emotional burden when deciding about solo travel. *Financial and time related* factor refers to considering financial means and time limits as hindrances for solo travel. The final extracted factor, *interpersonal*, deals with privacy issues, risks and relationships with other potential tourists and travelers students consider when deciding on consuming tourist services and products solo.

Further analysis is demanded to verify the second and third hypotheses. The first part of the analysis consisted of the reliability analysis of the questionnaire investigating negotiation strategies; the results of which indicated the questionnaire was internally consistent (Cronbach's Alpha = 0.861). After confirming the reliability of the measurement instrument, the preconditions for factor analysis were tested proving that the collected data was adequate for factor analysis (KMO = 0.817, Bartlett's test of Sphericity = 0.000). Factor analysis was conducted based on principal components analysis that extracted two factors which explained 67.5% of total variance; the results of this part of the analysis are depicted in table 3.

Table 3. Negotiation Strategies' Total Variance Explained

Leisure Constraints Factors	Eigenvalues	Variance Explained
Behavioral, travel planning and life changes factor	4.357	54.468%
Cognitive negotiation strategies factor	1.043	13.036%
		67.504%

Source: Own calculations

Extracted factors of negotiation strategies were named *behavioral, travel planning and life changes factor* and *cognitive negotiation strategies factor*. Factor loadings of the extracted factors are shown in Table 4.

Table 4. Rotated Component Matrix of Negotiation Strategies Factors

Items	Behavioral, travel planning and life changes factor	Cognitive negotiation strategies factor
NS 1	**0.869**	0.263
NS 2	**0.844**	0.142
NS 3	**0.785**	
NS 4	**0.676**	0.519
NS 5		**0.730**
NS 6	0.453	**0.699**
NS 7	0.276	**0.693**
NS 8	0.587	**0.603**

Source: Own calculations

The *behavioral, travel planning and life changes* factors described the behaviors a person was willing to undertake, such as adjusting the schedule, organizing their obligations, learning new skills, and working overtime to be able to travel. The second factor, *cognitive negotiation strategies*, refers to perceptions of the effort a person might put forth to travel, or attitudes about the obstacles in planning.

Based on extracted factors, cluster analyses were conducted. TwoStep cluster analysis indicated the existence of two diverse clusters of respondents. K-means cluster analysis resulted in extracting two statistically significantly different clusters of respondents. Those segments were named the *cognitive adaptative segment* and *cognitive maladaptive segment*. The difference between the extracted factors was tested with ANOVA and the results indicated there were statistically significant differences between the clusters considering the second factor. The first segment, the *cognitive maladaptive segment*, is more likely to be between the ages of 26 and 35 (35%), have a bachelor's degree (50%), have lower levels of family income (45%) and live in three-member households (45%). Furthermore, they are less likely to find solo travel appealing (50%). They are statistically significantly more likely to fear embarrassment if traveling solo, be less prone to solo travel due to negative attitudes of others and feel the lack of support of their surroundings to solo travel. The second segment of students, the *cognitive adaptive segment*, is a predominantly female segment (69,6%), and also a younger segment since most of the respondents were in the youngest age group (52,2%). Furthermore, they are equally as likely to have a high school degree as a bachelor's degree (39,1%), none of the respondents have the lowest levels of family income and mostly live in households consisting of four members. They mostly express a preference towards solo travel in order to gain new experiences (47,8%). Unlike the *cognitive maladaptive segment*, this segment is less likely to be influenced by their surroundings' attitudes and lack of support for solo travel.

5. FUTURE RESEARCH

The limitations of this study should be emphasized in order to point to future research directions. Namely, the research was conducted on a student sample, so it could be recommended that other tourist groups be included in future research. Additionally, a more comprehensive questionnaire might provide a deeper insight into the constructs investigated in this research. Furthermore, only Croatian students were investigated in this paper. It could be recommended to compare the results to student populations from different countries of Europe and also the world.

6. CONCLUSION

This paper aims to contribute to the literature on leisure constraints and solo travel by investigating and describing perceived leisure constraints of solo travel and negotiation strategies aimed at dealing with those constraints used by Croatian students. Based on the relevant literature, hypotheses about the aforementioned variables were set. The empirical part of the research enabled the collection of data and implementation of statistical methods that confirmed or partially confirmed the set hypotheses.

The first hypothesis was confirmed by factor analysis that enabled extracting four diverse leisure constraints for solo travel: *family related*, *intrapersonal*, *financial and time related* and *interpersonal*. The extracted factors further our understanding and knowledge about students as solo tourists. Firstly, some of the factors mostly collide with those extracted in the relevant literature (*intrapersonal* and *interpersonal*), but Croatian students also emphasize the importance of family needs and opinions as possible constraints when deciding on solo travel, as well as time and financial constraints. This can be expected, because students are still reliant on their families to a higher degree, but also lack the time to travel due to college obligations and also feel financial limits due to not having their own source of income. It could be advised that marketing experts include information about various aspects and advantages of solo travel to introduce this mode of travel to students' families. Furthermore, organizing more affordable tourist products and services for student solo tourists and when students have no classes or exams could also be advised.

In order to test the second hypothesis, factor analysis of negotiation strategies applied by students was conducted. The hypothesis was confirmed when two statistically significantly different factors were extracted: *behavioral, travel planning and life changes factor* and *cognitive negotiation strategies factor*. Based on the extracted factors, cluster analysis was conducted for confirmation of the third hypothesis that resulted in the extraction of two segments of Croatian students (*cognitive adaptive segment* and *cognitive maladaptive segment*). However, since the two segments statistically significantly differ based on the *cognitive negotiation strategies factor*, but not on the *behavioral, travel planning and life changes factor*, this hypothesis can only partially be confirmed. The segments were further described with descriptive statistical methods and the independent samples T-test that showed the existence of certain differences. It was shown that the younger, predominantly female segment was more likely to have a positive attitude towards solo travel, and included the influence of their surroundings into their solo travel decision-making to a lesser degree. It could be advised to marketing and tourist practitioners to develop solo tourist products and services aimed at younger female Croatian students. Furthermore, addressing the negative attitudes about solo travel in Croatia, in general, might prove to be beneficial since the second segment was more influenced by them when deciding on solo travel. Appealing to the freedom, and security but also new experiences and educational benefits provided to young students when traveling solo might positively influence the aforementioned attitudes and thus attract more solo student travelers to a tourist destination.

References

Ahmad, N., Harun, A., Khizar, H. M. U., Khalid, J., & Khan, S. (2022). Drivers and barriers of travel behaviors during and post COVID-19 pandemic: a systematic literature review and future agenda. *Journal of Tourism Futures*. https://doi.org/10.1108/jtf-01-2022-0023

Andreani, F., & Njo, A. (2021). The impact of travel constraints on travel intention. *Promoting Creative Tourism: Current Issues in Tourism Research*, 652-658. https://doi.org/10.1201/9781003095484-94

Aziz, N. A., Long, F., Bhuiyan, M. A., & Rahman, M. K. (2022). Travel decision making during and after the COVID-2019 pandemic: Revisiting travel constraints, gender role, and behavioral intentions. *Frontiers in Psychology, 13*. https://doi.org/10.3389/fpsyg.2022.961464

Boo, S., Carruthers, C. P., & Busser, J. A. (2014). The Constraints Experienced and Negotiation Strategies Attempted by Nonparticipants of a Festival Event. *Journal of Travel & Tourism Marketing, 31*(2), 269-285. https://doi.org/10.1080/10548408.2014.873317

Chen, F., Dai, S., Xu, H., & Abliz, A. (2021). Senior's travel constraint, negotiation strategy and travel intention: Examining the role of social support. *International Journal of Tourism Research, 23*(3), 363-377. https://doi.org/10.1002/jtr.2412

Chung, J. Y., Baik, H.-J., & Lee, C.-K. (2017). The role of perceived behavioural control in the constraint-negotiation process: the case of solo travel. *Leisure Studies, 36*(4), 481-492. https://doi.org/10.1080/02614367.2016.1190780

Chung, P. K., Liu, J. D., & Chen, W. P. (2013). Perceived constraints on recreational sport participation: evidence from Chinese university students in Hong Kong. *World Leisure Journal, 55*(4), 347-359. https://doi.org/10.1080/04419057.2013.836559

Crawford, D. W., & Godbey, G. (1987). Reconceptualizing barriers to family leisure. *Leisure Sciences, 9*(2), 119-127. https://doi.org/10.1080/01490408709512151

Crawford, D. W., Jackson, E. L., & Godbey, G. (1991). A hierarchical model of leisure constraints. *Leisure Sciences, 13*(4), 309-320. https://doi.org/10.1080/01490409109513147

Doran, A., & Pomfret, G. (2019). Exploring efficacy in personal constraint negotiation: An ethnography of mountaineering tourists. *Tourist Studies, 19*(4), 475-495. https://doi.org/10.1177/1468797619837965

Fredman, P., & Heberlein, T. A. (2005). Visits to the Swedish Mountains: Constraints and Motivations. *Scandinavian Journal of Hospitality and Tourism, 5*(3), 177-192. https://doi.org/10.1080/15022250500266583

Hou, P., & Li, Y. (2024). Tourism Constraints and Subjective Well-Being for Senior: A Serial Multiple Mediation Model. *Journal of Quality Assurance in Hospitality & Tourism*, 1–20. https://doi.org/10.1080/1528008X.2024.2373461

Jackson, E. L., & Rucks, V. C. (1995). Negotiation of Leisure Constraints by Junior-High and High-School Students: An Exploratory Study. *Journal of Leisure Research, 27*(1), 85-105. https://doi.org/10.1080/00222216.1995.11969978

Jun, J., & Kyle, G. T. (2011). Understanding the Role of Identity in the Constraint Negotiation Process. *Leisure Sciences, 33*(4), 309-331. https://doi.org/10.1080/01490400.2011.583157

Karl, M., Bauer, A., Ritchie, W. B., & Passauer, M. (2020). The impact of travel constraints on travel decision-making: A comparative approach of travel frequencies and intended travel participation. *Journal of Destination Marketing & Management, 18*, 100471. https://doi.org/10.1016/j.jdmm.2020.100471

Karl, M., Sie, L., & Ritchie, B. W. (2021). Expanding Travel Constraint Negotiation Theory: An Exploration of Cognitive and Behavioral Constraint Negotiation Relationships, *Journal of Travel Research*, *61*(4), 762-785. https://doi.org/10.1177/00472875211011547

Kay, T., & Jackson, G. (1991). Leisure Despite Constraint: The Impact of Leisure Constraints on Leisure Participation. *Journal of Leisure Research, 23*(4), 301-313. https://doi.org/10.1080/00222216.1991.11969862

Lee, W., Shin, L., & Jeong, C. (2020). Leisure constraints and negotiation strategies of South Korean university students living in single-person households: a grounded theory exploration. *World Leisure Journal, 62*(4), 357-377. https://doi.org/10.1080/16078055.2020.1739120

Lenggogeni, S., & Syafrizal. (2023). The post-COVID-19 road-based tourism market: Negotiation of travel constraints. *Transportation Research Interdisciplinary Perspectives, 22*, 100908. https://doi.org/10.1016/j.trip.2023.100908

Li, M. Z., & Stodolska, M. (2007). Working for a dream and living for the future: Leisure constraints and negotiation strategies among Chinese international graduate students. *Leisure/Loisir, 31*(1), 105-132. https://doi.org/10.1080/14927713.2007.9651375

Lyu, S. O., & Oh, C.-O. (2015). Bridging the Conceptual Frameworks of Constraints Negotiation and Serious Leisure to Understand Leisure Benefit Realization. *Leisure Sciences, 37*(2), 176-193. https://doi.org/10.1080/01490400.2014.952461

Lyu, S. O., Oh, C.-O., & Lee, H. (2013). The Influence of Extraversion on Leisure Constraints Negotiation Process: A Case of Korean People with Disabilities. *Journal of Leisure Research, 45*(2), 233-252. https://doi.org/10.18666/jlr-2013-v45-i2-3013

Mei, X. Y., & Lantai, T. (2018). Understanding travel constraints: An exploratory study of Mainland Chinese International Students (MCIS) in Norway. *Tourism Management Perspectives, 28*, 1-9. https://doi.org/10.1016/j.tmp.2018.07.003

Mill, R. C., & Morrison, A. M. (2009). *The tourism system*. Dubuque, IA: Kendall/Hunt.

Nyaupane, G. P., & Andereck, K. L. (2008). Understanding Travel Constraints: Application and Extension of a Leisure Constraints Model. *Journal of Travel Research, 46*(4), 433-439. https://doi.org/10.1177/0047287507308325

Nyaupane, G. P., McCabe, J. T., & Andereck, K. L. (2008). Seniors' travel constraints: Stepwise logistic regression analysis. *Tourism Analysis*, *13*(4), 341-354.

Park, E., Lee, K., & Kim, S.-B. (2025). Navigating travel constraints for individuals with mental health conditions. *Current Issues in Tourism, 28*(6), 963-981. https://doi.org/10.1080/13683500.2024.2318453

Shaw, S. M., Bonen, A., & McCabe, J. F. (1991). Do More Constraints Mean Less Leisure? Examining the Relationship between Constraints and Participation. *Journal of Leisure Research, 23*(4), 286-300. https://doi.org/10.1080/00222216.1991.11969861

Shin, H., Nicolau, J. L., Kang, J., Sharma, A., & Lee, H. (2022). Travel decision determinants during and after COVID-19: The role of tourist trust, travel constraints, and attitudinal factors. *Tourism Management, 88*, 104428. https://doi.org/10.1016/j.tourman.2021.104428

Sivan, A. (2003). Has leisure got anything to do with learning? An exploratory study of the lifestyles of young people in Hong Kong universities. *Leisure Studies, 22*(2), 129-146. https://doi.org/10.1080/713777174

Sun, T., Zhang, J., Zhang, B., Ong, Y., & Ito, N. (2022). How trust in a destination's risk regulation navigates outbound travel constraints on revisit intention post-COVID-19: Segmenting insights from experienced Chinese tourists to Japan. *Journal of Destination Marketing Management*, *25*, 100711. https://doi.org/10.1016/j.jdmm.2022.100711

Tao, B. C., Goh, E., Huang, S. S., & Moyle, B. (2019). Travel constraint perceptions of people with mobility disability: a study of Sichuan earthquake survivors. *Tourism Recreation Research, 44*(2), 203-216. https://doi.org/10.1080/02508281.2019.1589085

Walker, G. J., Jackson, E. L., & Deng, J. (2008). The Role of Self-Construal as an Intervening Variable between Culture and Leisure Constraints: A Comparison of Canadian and Mainland Chinese University Students. *Journal of Leisure Research, 40*(1), 90-109. https://doi.org/10.1080/00222216.2008.11950134

Wang, F., Deng, Z., & Petrick, J. F. (2018). Exploring the formation mechanisms of urban residents' travel behaviour in China: perceptions of travel benefits and travel constraints. *Journal of Travel & Tourism Marketing, 35*(7), 909-921. https://doi.org/10.1080/10548408.2018.1445575

Wen, J., Huang, S. S., & Goh, E. (2020). Effects of perceived constraints and negotiation on learned helplessness: A study of Chinese senior outbound tourists. *Tourism Management, 78*, 104059. https://doi.org/10.1016/j.tourman.2019.104059

Wilson, E., & Little, D. E. (2008). The Solo Female Travel Experience: Exploring the 'Geography of Women's Fear'. *Current Issues in Tourism, 11*(2), 167-186. https://doi.org/10.2167/cit342.0

Yang, E. C. L., Liang, A. R. D., & Lin, J. H. (2025). A Market Segmentation Study of Solo Travel Intentions and Constraints. *Journal of Hospitality & Tourism Research, 49*(1), 132-145. https://doi.org/10.1177/10963480231163517

Yang, R., & Tung, V. W. S. (2018). How does family influence the travel constraints of solo travelers? Construct specification and scale development. *Journal of Travel & Tourism Marketing, 35*(4), 507-516. https://doi.org/10.1080/10548408.2017.1363685

Ying, T., Tang, J., Wen, J., Ye, S., Zhou, Y., & Li, F. S. (2021). Traveling with pets: Constraints, negotiation, and learned helplessness. *Tourism Management, 82*, 104183. https://doi.org/10.1016/j.tourman.2020.104183

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Evaluating the Impact of Material Efficiency in the Circular Economy on Economic Growth in European Countries

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Abstract: *This research evaluates the impact of material efficiency within the circular economy (CE) framework on economic growth in European countries from 2012 to 2021. Focusing on key indicators - Recycling Rate of Municipal Waste, Resource Productivity, and Domestic Material Consumption per Capita - the research employs panel data analysis and Principal Component Analysis (PCA). The findings reveal that Resource Productivity significantly contributes to GDP per capita growth, particularly in EU27 countries, underscoring the importance of efficient resource use in driving sustainable economic development. Conversely, Resource Productivity and Domestic Material Consumption per capita exhibit a more complex relationship with economic growth, lacking statistical significance in the main models. The research highlights the necessity for policymakers to prioritize resource efficiency strategies to foster economic prosperity while advancing CE practices. These insights are crucial for designing targeted policies that balance material efficiency with broader economic objectives across diverse European contexts.*

1. INTRODUCTION

The transition towards a circular economy (CE) is fundamental to sustainable development strategies in Europe, shifting from a traditional "take-make-dispose" model to the new model that emphasizes resource efficiency, waste reduction, and the continual use of materials (European Commission, 2020). Material efficiency optimizes the use of resources in order to drive economic growth while minimizing environmental impact, making it crucial to understand its relationship with economic growth amid concerns over resource depletion and environmental degradation.

Current research suggests that the CE can stimulate economic growth. Busu and Trica (2019) found a positive relationship between CE indicators - such as recycling rates and resource productivity - and economic growth in the EU. Similarly, Androniceanu et al. (2021) highlighted the CE as a strategic option for promoting sustainable economic growth and human development within the European Union. However, there are still gaps present regarding non-EU Balkan countries, comprehensive analyses of multiple CE indicators, and country-specific variations in the impacts of material efficiency.

The authors address these gaps by evaluating the impact of material efficiency within the CE framework on economic growth in EU27 and non-EU Balkan countries. Through the focus on three critical indicators, the recycling rate of municipal waste (RECR), resource productivity (RESP), and domestic material consumption per capita (DMCpc), the study examines their relationships with gross domestic product per capita growth (GDPpcgr) to provide empirical insights into how material efficiency drives economic prosperity.

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The following hypotheses guide this study:

H1: There is a positive relationship between the recycling rate of municipal waste (RECR) and GDP per capita growth (GDPpcgr).

H2: Higher resource productivity (RESP) leads to increased GDP per capita growth.

H3: Lower domestic material consumption per capita (DMCpc) is associated with higher GDP per capita growth.

The primary research question utilized in this paper is: How does efficient material use within the CE framework influence economic growth in EU27 and Balkan countries? Through the exploration of the specific impacts of RECR, RESP, and DMCpc on GDPpcgr, the paper aims to provide valuable insights for policymakers, economists, and environmental scientists seeking to enhance material efficiency and promote sustainable economic development.

2. LITERATURE REVIEW

The CE concept is supposed to reconcile economic growth with environmental sustainability. Lehmann et al. (2022) emphasized that investment and innovation are critical drivers in leveraging the CE for economic performance, with innovation reducing environmental degradation and investment promoting resource efficiency. Similarly, Hysa et al. (2020) developed an integrated model demonstrating that CE innovation and environmental sustainability positively impact economic growth in EU countries.

Recycling, as a key identified element of the CE, enables the reintegration of waste materials into production. Busu (2019) found that higher municipal waste recycling rates significantly contribute to economic growth in the EU by reducing environmental burdens and enhancing resource availability. Smol et al. (2017) proposed indicators to measure the integration of eco-innovation and CE practices, highlighting the importance of recycling rates in assessing regional progress.

The second indicator in the focus of this research, resource productivity, defined as economic output per unit of material consumed, is crucial for material efficiency. Androniceanu et al. (2021) used principal component analysis to show that resource productivity significantly contributes to sustainable economic growth and human development in EU countries. This aligns with Busu and Trica (2019), who demonstrated that increased resource productivity leads to higher GDP growth rates.

Furthermore, domestic material consumption per capita measures the total material used directly by an economy. Ferrante and Germani (2020) explored the relationship between CE practices and economic growth, noting that reducing material consumption per capita is associated with positive socio-economic outcomes, as lower DMCpc indicates more efficient resource use leading to enhanced economic performance.

Despite growing research, several gaps persist. Most studies focus on EU countries, with limited attention to non-EU Balkan countries. Bucea-Manea-Țoniș et al. (2021) highlighted the need for more research on the Balkan region, noting that Romania and Serbia require increased R&D investments to align with EU standards in CE practices. Additionally, comprehensive analyses incorporating multiple CE indicators are scarce. Karman and Pawłowski (2021) emphasized evaluating various factors collectively to understand their combined impact on economic growth.

Many studies utilize cross-sectional data or short time periods, limiting the understanding of long-term effects. Popović et al. (2022) pointed out the insufficient exploration of country-specific

heterogeneity in CE implementation and its economic impacts across Europe. Moreover, research focusing specifically on GDP per capita growth in relation to CE measures is limited, as most studies use broader economic indicators.

EU policies have been instrumental in promoting CE practices. The EU Circular Economy Action Plan sets ambitious targets for waste reduction, recycling, and resource efficiency (European Commission, 2020), aiming to decouple economic growth from resource use. Building on policy frameworks, Todorović et al. (2023) discussed how ecological innovations, supported by EU policies, contribute to sustainable development. However, the effectiveness of these policies varies among member states and neighboring countries, highlighting the need for tailored approaches.

Methodologies used to examine the impact of CE practices on economic growth include panel data regression models (Busu & Trica, 2019; Hysa et al., 2020), principal component analysis to create CE indices (Androniceanu et al., 2021), and comparative analyses across countries (Popović et al., 2022). Despite these advances, further research is needed to comprehensively control for economic factors and explore potential non-linear relationships.

3. RESEARCH METHODOLOGY

This study employs a quantitative approach to evaluate the impact of material efficiency within the circular economy framework on economic growth in EU27 and selected Balkan countries from 2012 to 2021. The methodology includes data collection and preparation, data preprocessing, descriptive statistical and panel data analysis, Principal Component Analysis (PCA) for composite indices, and robustness checks.

3.1. Data Collection, Preparation, and Variables

The data used in this research were sourced from reliable, open-source international databases, such as Eurostat and the World Bank, to ensure reliability and consistency across countries and over time. The dataset includes 27 EU member states and select Balkan countries, covering 2012–2021. The inclusion of non-EU Balkan countries addresses gaps in the literature, where limited attention has been given to these regions (Bucea-Manea-Țoniș et al., 2021; Popović et al., 2022).

Table 1. Variables used in the analysis

Name	Variable	Type
GDPpcgr	GDP per capita growth (annual %)	Dependent
RECR	Recycling rate of municipal waste	Independent
RESP	Resource productivity	Independent
DMCpc	Domestic material consumption per capita	Independent
GFCF	Gross capital formation (current US$)	Control
INF	Inflation, GDP deflator (annual %)	Control
UNEMP	Unemployment, total (% of total labor force)	Control
ENU	Energy use (kg of oil equivalent per capita)	Control
RNWC	Renewable energy consumption (% of total)	Control
GGFC	General government final consumption expenditure (% of GDP)	Control

Source: World Bank (2024) and Eurostat (2024)

Data were sourced from reliable international databases such as Eurostat and the World Bank, ensuring consistency across countries and over time. The dataset covers 27 EU member states and selected Balkan countries, addressing gaps in the literature concerning non-EU Balkan regions

(Bucea-Manea-Țoniș et al., 2021; Popović et al., 2022). The key variables are summarized in Table 1. These variables align with previous studies examining the economic impacts of circular economy initiatives (Busu, 2019; Lehmann et al., 2022).

3.2. Data Preprocessing and Logarithmic Transformation

To ensure comparability across variables with diverse units and scales, data preprocessing involved normalization and standardization techniques, following methodologies used in prior research (Hysa et al., 2020). Variables exhibiting positive skewness, such as GFCF, ENU, and DMCpc, were log-transformed to address heteroscedasticity and approximate normality (Lehmann et al., 2022), improving the accuracy and interpretability of regression models.

3.3. Descriptive Statistical Analysis, Panel Data Analysis with Individual Variables

Descriptive statistics were calculated to understand the central tendencies and dispersion of each variable. After preprocessing, variables were standardized, resulting in means approximately equal to zero and unit variances, confirming the effectiveness of the preprocessing steps (Karman & Pawłowski, 2021).

Panel data analysis leveraged both cross-sectional and time-series dimensions, enhancing the efficiency of econometric estimates and controlling for unobserved heterogeneity (Hsiao, 2014). The initial model included GDPpcgr as the dependent variable and the independent and control variables.

In the research, both Fixed Effects (FE) and Random Effects (RE) models were estimated. The Hausman test determined the most appropriate model specification, favoring the FE model due to correlated individual effects (Baltagi, 2008). Diagnostic tests included:

- **Breusch-Pagan Test** for heteroscedasticity (Breusch & Pagan, 1979).
- **Wooldridge Test** for autocorrelation (Wooldridge, 2010).
- **Variance Inflation Factor (VIF)** for multicollinearity (O'Brien, 2007).

These tests indicated issues with multicollinearity, heteroscedasticity, and autocorrelation, necessitating model refinement.

3.4. Principal Component Analysis (PCA) and Macro and Investment Index Creation

To mitigate multicollinearity and reduce dimensionality, PCA was applied, consistent with methodologies from Androniceanu et al. (2021) and Karman and Pawłowski (2021). PCA transformed correlated variables into composite indices:

- **Macro_Index:** Derived from INF, UNEMP, and GGFC.
- **Invest_Index:** Derived from log_GFCF, log_ENU, and RNWC.

Following the example from previous research, these indices reduced multicollinearity and improved model interpretability (Jolliffe & Cadima, 2016).

3.5. Revised Panel Data Analysis with Composite Indices

The panel data analysis was re-estimated with the composite indices. The FE model remained appropriate, and diagnostic tests showed improvements, with lower VIF values indicating reduced multicollinearity and mitigated heteroscedasticity and autocorrelation.

Robustness checks included:

- **Alternative Model Specifications:** Testing interaction terms (e.g., INF × UNEMP) to explore potential moderating effects, inspired by Hysa et al. (2020).
- **Subsample Analyses:** Splitting the sample into EU27 and Balkan countries to investigate regional variations, addressing gaps noted by Bucea-Manea-Țoniș et al. (2021).

This comprehensive methodology allowed for a robust evaluation of the impact of material efficiency on economic growth, contributing valuable insights to the circular economy literature.

4. RESEARCH RESULTS

This study examines the impact of material efficiency within the circular economy on economic growth in EU27 and selected Balkan countries from 2012 to 2021 using a quantitative research design. The analysis incorporates data collection, preprocessing, descriptive statistics, panel data analysis, the creation of composite indices via Principal Component Analysis (PCA), and robustness checks.

An initial examination of the dataset, comprising 320 observations, reveals substantial variability across key variables. For instance, GDP per capita growth (GDPpcgr) shows a mean of 2.11% with a standard deviation of 4.00%, indicating substantial fluctuations in economic performance. Variables such as Domestic Material Consumption per capita (DMCpc) and Energy Use (ENU) demonstrate high positive skewness (1.40 and 2.47, respectively), highlighting disparities across countries (Table 2). The Shapiro-Wilk test confirms that none of the variables follow a normal distribution ($p < 0.05$), necessitating transformations for parametric analysis.

Table 2. Descriptive Statistics of Original Dataset

Variable	N	Mean	SD	Median	Min	Max	Skew	Kurt	W	p-value
GDPpcgr	320	2.11	4.00	2.19	-15.21	23.30	0.04	4.40	0.94	1.6E-10
RECR	320	31.40	18.35	32.35	0	70.3	-0.09	-0.92	0.97	1.5E-06
RESP	320	1.59	1.14	1.22	0	5.50	0.86	-0.01	0.92	5.5E-12
DMCpc	320	15.90	7.82	14.37	0	48.61	1.40	3.68	0.89	1.3E-14
INF	320	1.92	1.60	1.71	-2.05	8.30	0.80	1.25	0.96	7.6E-08
UNEMP	320	10.08	6.04	7.97	2.02	31.10	1.32	1.22	0.87	4.6E-16
GFCF	320	1.0E+11	1.8E+11	2.9E+10	8.1E+08	9.9E+11	2.74	7.31	0.59	6.9E-27
GGFC	320	19.47	3.45	19.34	10.84	26.47	-0.08	-0.13	0.98	3.0E-05
ENU	320	30.80	46.96	12.75	0.5	221	2.47	5.82	0.63	1.3E-25
RNWC	320	23.02	12.09	19.50	2.7	57.9	0.67	-0.44	0.94	4.7E-10

Source: Own calculations

To address non-normality and heteroscedasticity, several variables, including GFCF, UNEMP, ENU, and DMCpc, were log-transformed to stabilize variance. Variables like INF, RNWC, and RESP were transformed by square root due to moderate skewness. Post-transformation, variables were standardized to have a mean of zero and a standard deviation of one, enhancing comparability across different scales.

4.1. Panel Data Analysis with Individual Variables

Initial panel data analysis employed Fixed Effects (FE) and Random Effects (RE) models to explore the relationships between GDPpcgr and the independent variables. The FE model controls for country-specific, time-invariant heterogeneity, while the RE model assumes uncorrelated individual-specific effects (Baltagi, 2008). The results of the initial Panel Data Analysis are in Table 3.

Table 3. Fixed and Random Effects Model Estimates

Variable	Fixed Effects Model (FE)					Random Effects Model (RE)				
	Est.	SE	t-value	Pr(>|t|)		Est.	SE	t-value	Pr(>|t|)	
Intercept	-	-	-	-		~0	0.0609	~0	1	
RECR	0.4324	0.2074	2.085	0.038	*	-0.0202	0.1201	-0.168	0.8663	
RESP	0.8975	0.3729	2.407	0.0167	*	-0.0361	0.1192	-0.303	0.7621	
log_DMCpc	0.5122	0.4953	1.034	0.3019		0.0109	0.0696	0.157	0.8751	
INF	0.365	0.0649	5.623	4.56E-08	**	0.3189	0.0578	5.516	3.46E-08	**
log_UNEMP	0.3859	0.1483	2.602	0.0097	**	0.0219	0.0873	0.251	0.8016	
log_GFCF	0.2343	0.6646	0.353	0.7247		0.5143	0.3161	1.627	0.1038	
GGFC	-1.2228	0.1728	-7.078	1.19E-11	**	-0.33	0.0702	-4.703	2.57E-06	**
log_ENU	1.928	1.6892	0.2547	0.0167	*	-0.4546	0.2863	-1.588	0.1123	
RNWC	-0.2779	0.2192	-1.268	0.2059		0.0181	0.0742	0.244	0.8074	

Note: Significance levels are indicated as follows: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Source: Own calculations

The Hausman test results ($\chi^2 = 81.60$, $p < 0.001$) favored the FE model over the RE model.

Key findings from the FE model include:

- **RECR (Recycling Rate of Municipal Waste):** A positive and significant impact on GDP growth ($\beta = 0.432$, $p = 0.038$), aligning with the hypothesis that higher recycling rates contribute to economic growth through resource savings.
- **RESP (Resource Productivity):** A positive and significant coefficient ($\beta = 0.898$, $p = 0.017$), reinforcing the importance of efficient material use in driving growth.
- **INF (Inflation):** A positive and significant effect on growth ($\beta = 0.365$, $p < 0.001$), possibly reflecting demand-pull inflation in growing economies.
- **GGFC (Government Expenditure):** A negative and highly significant impact on growth ($\beta = -1.223$, $p < 0.001$), suggesting that higher government spending has the potential to crowd out private investment.

4.2. Principal Component Analysis (PCA) and Composite Index Creation

PCA was conducted to address multicollinearity and streamline the analysis, resulting in two indices: Macro_Index (comprising INF, UNEMP, and GGFC) and Invest_Index (comprising log_GFCF, log_ENU, and RNWC) and the loadings of the analysis are presented in Table 4.

Table 4. Macro and Invest PCA Loadings

Variable	Index	PC1	PC2	PC3
INF	Macro_Index	-0.7097	-0.2711	0.6503
log_UNEMP		0.7044	-0.2916	0.6472
GGFC		0.0142	0.9173	0.3978
log_GFCF	Invest_Index	0.6813	0.1847	0.7083
log_ENU		0.6793	0.2010	-0.7058
RNWC		-0.2728	0.9620	0.0115

Source: Own calculations

4.3. Panel Data Analysis with Index Control Variables

The revised Fixed Effects (FE) model, incorporating the composite indices Macro_Index and Invest_Index, yielded insights into the relationships between material efficiency, macroeconomic stability, and investment activities on economic growth (Table 5).

Table 5. Fixed Effects Model with Composite Indices

Variable	Fixed Effects Model				
	Estimate	Std. Error	t-value	Pr(>|t|)	
RECR	-0.0865	0.2142	-0.404	0.6868	
RESP	0.6542	0.3338	1.960	0.0510	*
log_DMCpc	0.0323	0.4828	0.067	0.9466	
Macro_Index	-0.2911	0.0853	-3.412	7.38E-04	***
Invest_Index	1.6257	0.6576	2.472	0.0140	*

Significance levels: *** p < 0.01; ** p < 0.05; * p < 0.1

Source: Own calculations

The inclusion of Macro_Index and Invest_Index improved the model's explanatory power. A significant negative effect of Macro_Index ($p < 0.001$) indicates that adverse macroeconomic conditions negatively impact GDP growth. In contrast, Invest_Index shows a positive and significant effect ($p < 0.05$), underscoring the importance of investment activities in driving economic growth within the circular economy framework. RESP (Resource Productivity) approaches significance ($p = 0.0510$), reinforcing its role in fostering resource efficiency and economic performance. However, RECR and log_DMCpc did not exhibit significant impacts on growth in this model.

4.4. Subgroup Analysis: EU27 vs. Balkan Countries

Separate FE models were estimated for the EU27 and Balkan countries to explore regional heterogeneity in the impact of material efficiency on economic growth. The results reveal divergent patterns, with macroeconomic stability and investment activities playing key roles in both groups (Table 6).

Table 6. Panel Data Analysis of Subgroups

Variable	FE EU27 SUBGROUP					FE BALKAN SUBGROUP				
	Est.	SE	t-value	Pr(>|t|)		Est.	SE	t-value	Pr(>|t|)	
RECR	0.0353	0.2261	0.156	0.876		-0.3898	1.0146	-0.384	0.703	
RESP	0.6533	0.3424	1.908	0.058	*	-3.8596	3.5883	-1.076	0.289	
Log_DMCpc	-0.1518	0.5543	-0.274	0.784		0.4085	1.5606	0.262	0.795	
Macro_Index	-0.2125	0.0984	-2.160	0.032	*	-0.7496	0.2280	-3.288	0.002	**
Invest_Index	2.1541	0.8527	2.526	0.012	**	0.7094	1.1724	0.605	0.549	**

Note: Significance levels are indicated as follows: *** p < 0.01; ** p < 0.05; * p < 0.1.

Source: Own calculations

In the EU27, RESP (Resource Productivity) approaches significance ($p = 0.058$), suggesting its importance in resource-efficient economies, while Macro_Index and Invest_Index both exhibit significant impacts, highlighting the role of macroeconomic stability and investments. In Balkan countries, Macro_Index has a significant negative effect ($p < 0.01$), indicating that unfavorable macroeconomic conditions hinder growth, while Invest_Index shows no significant impact.

The findings underscore the importance of macroeconomic stability and investment in driving GDP growth within the circular economy framework. While RESP shows potential in resource-efficient economies like the EU27, it has a more uncertain role in the Balkans. RECR and log_DMCpc fail to reach significance, suggesting broader economic factors likely moderate their impacts. These results set the stage for a deeper discussion of the theoretical implications, regional differences, and practical applications in the next section.

5. DISCUSSION

This research assessed how material efficiency within the circular economy influences economic growth in EU27 and Balkan countries, focusing on recycling rates (RECR), resource productivity (RESP), and domestic material consumption per capita (DMCpc).

The findings significantly support Hypothesis 2 (H2): higher resource productivity (RESP) leads to increased GDP per capita growth. RESP positively affects GDP growth in both the overall model and the EU27 subgroup, aligning with Androniceanu et al. (2021), who emphasized efficient material use in promoting sustainable economic performance.

Hypothesis 1 (H1), regarding the positive relationship between recycling rates (RECR) and GDP growth, received partial support. RECR was significant in the initial analysis but lost significance in the revised model with composite indices. This suggests that recycling's direct impact on growth may be less robust than anticipated, possibly due to regional disparities in circular economy development. Busu (2019) also found that recycling's influence on economic growth is context-dependent and influenced by broader macroeconomic factors.

Hypothesis 3 (H3), proposing that lower DMCpc is associated with higher GDP growth, was not supported. DMCpc remained non-significant across models, indicating a complex relationship between material consumption and economic growth. Factors like technological advancements and policy frameworks may mediate this relationship, as noted by Lehmann et al. (2022).

The subgroup analysis revealed regional differences. In EU27 countries, macroeconomic stability and investment activities (Macro_Index and Invest_Index) are key growth drivers, highlighting the role of resource efficiency in developed economies. Conversely, Balkan countries are more sensitive to macroeconomic conditions, with Macro_Index showing a significant negative impact on growth. This underscores structural differences and opportunities to improve material efficiency in less-developed economies (Popović et al., 2022).

These results suggest avenues for future research, such as exploring how macroeconomic stability moderates the effectiveness of circular economy initiatives and conducting sector-specific analyses of material consumption. Longitudinal studies on the long-term impacts of circular economy practices across diverse economic contexts would provide valuable insights for enhancing sustainable growth.

6. CONCLUSION

This research demonstrates that resource productivity (RESP) plays a significant role in driving economic growth in EU27 and Balkan countries, confirming Hypothesis 2. Higher resource efficiency positively impacts economic performance, reinforcing RESP importance in sustainable development. In contrast, recycling rates (RECR) and domestic material consumption per capita (DMCpc) have a more complex and less direct influence on growth, as their impacts were not statistically significant in the main model.

For policymakers, these findings highlight the need to prioritize resource productivity in transitioning to a circular economy. While recycling and reducing material consumption are vital for sustainability, their direct economic benefits may require supportive macroeconomic and investment frameworks. Policymakers can leverage these insights to design strategies that balance material efficiency with broader economic goals.

Investing in technologies and processes that enhance resource productivity is crucial for businesses and environmental organizations. Such investments contribute to environmental sustainability and align with the economic imperative for efficient resource use. Further exploration of the interaction between macroeconomic factors, material efficiency, and economic growth is essential for guiding future circular economy policies.

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References

Androniceanu, A., Kinnunen, J., & Georgescu, I. (2021). Circular economy as a strategic option to promote sustainable economic growth and effective human development. *Journal of International Studies, 14*(1), 60–73. https://doi.org/10.14254/2071-8330.2021/14-1/4

Baltagi, B. H. (2008). Econometric Analysis of Panel Data (4th ed.). John Wiley & Sons.

Breusch, T. S., & Pagan, A. R. (1979). A simple test for heteroscedasticity and random coefficient variation. *Econometrica, 47*(5), 1287–1294. https://doi.org/10.2307/1911963

Bucea-Manea-Țoniș, R., Šević, A., Ilić, M. P., Popović Šević, N., & Mihoreanu, L. (2021). Untapped aspects of innovation and competition within a European resilient circular economy. *Sustainability, 13*(15), 8290. https://doi.org/10.3390/su13158290

Busu, M. (2019). Adopting circular economy at the European Union level and its impact on economic growth. *Social Sciences, 8*(5), 159. https://doi.org/10.3390/socsci8050159

Busu, M., & Trica, C. L. (2019). Sustainability of circular economy indicators and their impact on economic growth of the European Union. *Sustainability, 11*(19), 5481. https://doi.org/10.3390/su11195481

European Commission. (2020). A new Circular Economy Action Plan for a cleaner and more competitive Europe. Retrieved from https://ec.europa.eu/environment/strategy/circular-economy-action-plan_en

Eurostat. (2024). Eurostat Database. Retrieved from https://ec.europa.eu/eurostat/data/database

Ferrante, L., & Germani, A. R. (2020). Does circular economy play a key role in economic growth? *Economics Bulletin, 40*(3), 1855–1862. https://doi.org/10.22004/ag.econ.305403

Hsiao, C. (2014). Analysis of Panel Data (3rd ed.). Cambridge University Press.

Hysa, E., Kruja, A., Rehman, N. U., & Laurenti, R. (2020). Circular economy innovation and environmental sustainability impact on economic growth: An integrated model for sustainable development. *Sustainability, 12*(12), 4831. https://doi.org/10.3390/su12124831

Jolliffe, I. T., & Cadima, J. (2016). Principal component analysis: A review and recent developments. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences, 374*(2065), 20150202. https://doi.org/10.1098/rsta.2015.0202

Karman, A., & Pawłowski, M. (2021). Circular economy competitiveness evaluation model based on the catastrophe progression method. *Journal of Environmental Management, 293*, 112983. https://doi.org/10.1016/j.jenvman.2021.112983

Lehmann, C., Cruz-Jesus, F., Oliveira, T., & Damásio, B. (2022). Leveraging the circular economy: Investment and innovation as drivers. *Journal of Cleaner Production, 360*, 132146. https://doi.org/10.1016/j.jclepro.2022.132146

O'Brien, R. M. (2007). A caution regarding rules of thumb for variance inflation factors. *Quality & Quantity, 41*(5), 673–690. https://doi.org/10.1007/s11135-006-9018-6

Popović, A., Ivanović Đukić, M., & Milijić, A. (2022). Assessment of the impact of circular economy competitiveness and innovation on European economic growth. *Eurasian Journal of Applied Economics, 19*(2), 1–14. https://doi.org/10.5937/EJAE19-39057

Smol, M., Kulczycka, J., & Avdiushchenko, A. (2017). Circular economy indicators in relation to eco-innovation in European regions. *Clean Technologies and Environmental Policy, 19*(4), 669–678. https://doi.org/10.1007/s10098-016-1323-8

Todorović, A., Colić, S., & Popović, A. (2023). Ecological innovations in the service of sustainable development in the European Union. In ISNRM 2021 Proceedings (pp. 121–128).

Wooldridge, J. M. (2010). Econometric Analysis of Cross Section and Panel Data (2nd ed.). MIT Press.

World Bank. (2024). World Development Indicators. Retrieved from https://data.worldbank.org/

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Eco-Innovation R&D-Oriented Initiatives: EU27 Two-Step Clustering

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Abstract: *In today's business environment, research and development (R&D) and eco-innovation are crucial in determining success on micro and macro levels. This study aims to analyze the significance of R&D for achieving some eco-innovation performance (eco-innovation inputs, eco-innovation activities, eco-innovation outputs) of the EU countries evaluated by the Eco-Innovation Index. Data from the Eco-Innovation Scoreboard is utilized to investigate the average value of eco-innovation performance among EU member states throughout two periods of time 2013-2017 and 2018-2022. Authors have used two-step cluster analysis for grouping similar EU27 countries and gathering outcomes that precisely depict the EU members' migration among R&D-oriented clusters. The highest indicators' values in the first period (2013-2017), whereas the lowest share, has the cluster consisting of Denmark, Finland and Sweden. In the second period, the most R&D dominant cluster comprises the same countries as in the first one, including Germany. Other countries such as Bulgaria, have lost their position in the second analyzed period and should put more stress on the R&D policy improvement.*

1. INTRODUCTION

To overcome environmental concerns and to enhance technological capabilities that lead to new and innovative solutions is necessary to implement R&D activities. In the knowledge-based economy, R&D efforts are key to improving the eco-innovation capability. Rationally coordinating and allocating R&D activities has become crucial for boosting eco-innovation performance. R&D is a critical input in environmental innovation and enables better implementation of green knowledge, leading to increased efficiency and effectiveness of production and acceptance of technology. Sustainable development issues can be solved by introducing and developing eco-innovation, as well as achieving targeted environmental goals. On the other hand, eco-innovation incorporates and transforms ecologically sustainable practices into activities that focus on developing society and the economy. R&D initiatives could increase absorptive capacity, widen and exploit accumulated firm knowledge, and enhance the efficiency of natural resources. The number of green patents can measure the creation of new knowledge. The preconditions for developing eco-innovation activities are R&D intensity, number of R&D projects, and investment in R&D personnel. Promotion of R&D through adequate governmental incentives is one of the factors that can have a high impact on creating eco-innovations. In the last few decades, eco-innovation has been fostered throughout the European Union (EU) policy plan. EU promotes and assesses the eco-innovation performance between EU member states through the Eco-Innovation Scoreboard. Eco-Innovation Scoreboard presents a set of indicators and sub-indicators that evaluate and monitor the overall eco-innovation performance of EU member states over time.

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The object of this article is to explore the role of R&D in driving eco-innovation performance (eco-innovation inputs, eco-innovation activities and eco-innovation outputs) across EU countries, that have been evaluated by the Eco-Innovation index. Therefore, the study is organized into several major parts. Following the introduction, Section 2 presents a literature review. After that, there is a description of the used methodology and the presentation of the results. The last part drew a conclusion and suggestions for future research.

2. LITERATURE REVIEW

In a modern and globalized environment, eco-innovation is one of the strategies segment that can enhance competitiveness and sustainable development on the local, national and regional levels. The prime goals of eco-innovation are minimising harm to the natural environment, optimising renewable resource usage, and developing a green economy (Terzić, 2023, p. 16). Implementing R&D and technology strategies is the precondition for creating eco-innovations. Developing a sustainable innovation system largely depends on absorptive capacity, which is driven by extensive R&D efforts (Miao et al., 2024). Differences in eco-innovation activities across countries often result from varying levels of R&D input. R&D is essential for driving sustainable innovations and achieving climate change goals (Sarpong et al., 2023).

R&D enables gathering the knowledge required to develop the capacity to absorb new ideas, which in turn supports the creation of innovative technological solutions and eco-innovations. R&D activities build a knowledge foundation that enhances the ability to take advantage of future technological opportunities (Miroshnychenko & De Massis, 2020). Additionally, implementing R&D activities provides the tools needed to absorb and apply knowledge, enhance existing scientific systems, and create new sustainable products and processes (Sarpong et al., 2023). In a longitudinal study, Horbach (2008) emphasizes that improving technological capabilities (knowledge capital) through R&D drives environmental innovations, while Cainelli et al. (2011) argue that general R&D is not strongly connected to the adoption of eco-innovations.

The academic community has a significant role in generating knowledge and advancing eco-innovative technologies (Shkarupeta & Babkin, 2024). The ability to transform new ideas into economically viable eco-innovations depends on the availability of skilled R&D researchers and talent. R&D personnel plays a critical role in the process of facilitating and coordinating the innovation capability (Pan et al., 2021). Training and developing talented professionals in the R&D sector is essential for achieving high-value technological knowledge. Strengthening and building powerful scientific cadres is crucial in the process of generating scientific knowledge and creating eco-innovation (Sarpong et al., 2023).

Over the past few years, governments have emphasized the importance of environmental protection and increased the allocation of resources to R&D of renewable energies. The level of pollution that affects the environment has prompted governments to incorporate sustainability into their strategies. At the national level, the government plays a central role in policy-making and management of eco-innovation (Jang et al., 2015). During the early stage of eco-innovation, it is essential to introduce governmental policies and apply policy instruments. Thus, different instruments and programs such as environmental regulations and financial incentives that support R&D can be suggested to stimulate businesses to develop eco-innovation as the strategic objective (Jang et al., 2015).

Monitoring indicators related to R&D in the field of eco-innovation can provide useful information on the current situation and serve as a basis for identifying areas for improvement where

needed. Investment in R&D, primarily through public and private spending, is essential for achieving competitiveness (Mas-Verdú et al., 2020), and corporate and private investment support is important as well (Garcia-Alvarez-Coque et al., 2021). These are factors that are also relevant for the development of eco-innovation, so encouraging these elements can have a dual impact on competitiveness, directly and indirectly through the effects achieved by eco-innovation (Chaparro-Banegas et al., 2023).

At the European Union level, a definition of eco-innovation according to which it is "any innovation that makes progress towards a more green and sustainable economy by reducing environmental pressures, increasing resilience or using natural resources more efficiently" has been widely accepted (EC, 2022a). The importance of using certain indicators that measure the development of eco-innovations has also been recognized. To monitor eco-innovation performance in European countries, the Eco-Innovation Performance Index (Eco-IS) has been developed. Eco-IS is a composite index that relies on 12 indicators grouped into five categories: eco-innovation inputs (EI), eco-innovation activities (EA), eco-innovation outcomes (EO), resource efficiency outcomes (REO) and socio-economic outcomes (SCO) (EEA, 2023). The number of indicators within this index has changed over time. The index is used to measure the progress of countries covered by this methodology, for comparison between them, as well as to measure the overall eco-innovation performance of EU countries.

The index is based on a methodology that, among others, includes indicators related to R&D within three indicator categories - eco-innovation inputs, eco-innovation activities, eco-innovation outcomes. Indicators in the eco-innovation inputs group: governments' environmental and energy R&D appropriations and outlays and total R&D personnel and researchers, show the extent to which the government prioritizes investments to support R&D in the field of environment and energy, but also provide information on human resources for R&D in this area. The first indicator is measured as a share of GDP, while information on human resources for R&D is presented as a share of total employment (EC, 2024).

Eco-innovation activities consider indicators to monitor the scope and scale of eco-innovation activities of a business, focusing on the efforts and activities undertaken rather than on the results. This indicator is measured by the number of ISO 14001 certificates, indicating the importance of compliance with environmental management requirements for the business (Al-Ajlani et al., 2022).

Eco-innovation outputs describe the direct results of eco-innovation activities. Indicators in this group monitor the extent to which the knowledge outputs generated by businesses and researchers relate to eco-innovation. This is achieved by collecting data on patents indicating new inventions in the field of eco-innovation, as well as on academic publications in the field of eco-innovation (Al-Ajlani et al., 2022).

Patents can be a measure of a country's technological capabilities and can be used to determine the technological position of nations in a certain technology area. On the other hand, internal R&D activities play a crucial role in ensuring a firm's participation in eco-innovative processes, which are related to investments in patents (Lee & Min, 2015; Triguero et al., 2016). The number of patents is often considered a reliable indicator for assessing the results of R&D efforts and the output of innovation processes (Marín-Vinuesa et al., 2018). Some authors have criticized the use of green patents as reliable measures of eco-innovation, emphasizing that they do not fully represent the outcomes of innovation activities and do not necessarily indicate investment in eco-innovation (Rennings et al., 2006).

The importance of the above indicators is also recognized in the European Innovation Scoreboard (EIS), where similar indicators related to R&D can be found: R&D expenditure in the public sector (percentage of GDP), Direct government funding and government tax support for business R&D (percentage of GDP), R&D expenditure in the business sector (percentage of GDP), intellectual assets (EC, 2022b). According to this methodology, R&D spending is considered as one of the main drivers of economic growth and an essential element for the transition to a knowledge-based economy. This also implies the importance of R&D expenditure indicators, which provide important assumptions about the future competitiveness and progress of the EU countries in which these indicators are monitored (EC, 2022b).

3. METHODOLOGY

This study utilizes a methodology based on a two-step cluster analysis, which was performed in commercial statistical software packages, focused on grouping similar EU27 countries and investigating their migration across R&D-oriented clusters over two periods of time: 2013-2017 and 2018-2022. „The Two-Step cluster analysis is a hybrid approach which first uses a distance measure to separate groups and then a probabilistic approach (similar to latent class analysis) to choose the optimal subgroup model (Benassi et al., 2020)". Specific eco-innovation sub-indicators (from eco-innovation inputs, eco-innovation activities, eco-innovation outputs as indicators' groups) defined by the Eco-Innovation Index, were used to examine the significance of R&D for achieving eco-innovation performance (EEA, 2023):

- *Governments environmental and energy R&D appropriations and outlays (RD),*
- *Eco-innovation activities (EA),*
- *Eco-innovation related patents (PAT).*

Afterward, the output of the auto-clustering table in two-step cluster analysis sublimates the potential number of clusters after cluster criteria computing authors (Radjenovic & Boskov, 2022). Using a bottom-up approach, smaller values of Schwarz's Bayesian Criterion (BIC) indicate a better solution, which implies an automatically assigned number of clusters by authors (Table 1).

Table 1. Auto-clustering process for choosing the appropriate number of clusters

Auto-Clustering				
Number of Clusters	**Schwarz's Bayesian Criterion (BIC)**	**BIC Change[a]**	**Ratio of BIC Changes[b]**	**Ratio of Distance Measures[c]**
1	338,07			
2	384,78	46,70	1,00	1,81
3	457,85	73,07	1,56	1,80
4	545,33	87,48	1,87	1,05
5	633,68	88,35	1,89	1,33
6	726,30	92,61	1,98	1,47
7	823,03	96,73	2,07	1,01
8	919,92	96,89	2,07	1,14
9	1017,87	97,95	2,09	1,20
10	1117,10	99,22	2,12	1,04

a. The changes are from the previous number of clusters in the table.
b. The ratios of changes are relative to the change for the two cluster solutions.
c. The ratios of distance measures are based on the current number of clusters against the previous number of clusters.

Source: Authors' calculations

The aforementioned clustering technique has a very high level of interpretability and scalability. Furthermore, its flexibility handles large datasets and mixed data types, while minimizing the

within-cluster variance and maximizing between-cluster variance. Shaping data with two-step cluster analysis determines the optimal number of clusters through a model selection criterion, with the Bayesian Information Criterion (BIC), reducing the need for the user to predefine this number.

4. RESULTS AND DISCUSSION

The output results of the applied cluster for the first analyzed period depict the existence of five clusters, of which the largest cluster size is occupied by the second cluster (29.6%). On the other hand, the aforementioned cluster consisting of Malta, Latvia, Greece, Cyprus, Croatia, Bulgaria, Poland, and Portugal is not the most dominant in terms of the values of the analyzed indicators of the eco-innovations (Figure 1). The fourth cluster composed of Denmark, Finland and Sweden shows the best movement of the analyzed indicators in the first period, although its size is 11.1% (the smallest country size contribution).

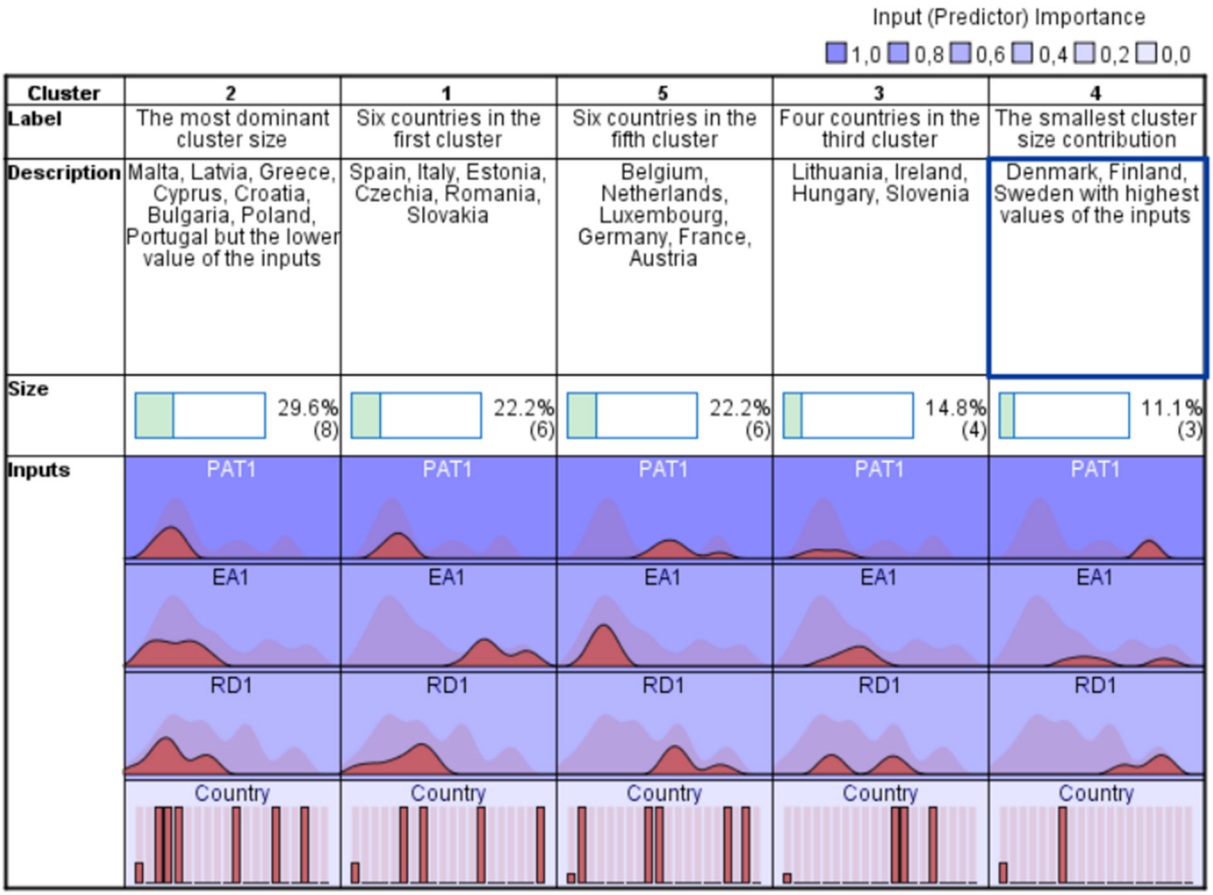

Figure 1. The cluster architecture for the first analyzed period

Source: Authors' calculations

The mean value of the analyzed sub-indicators in the formed clusters shows the conditions prevailing in the analyzed period when it comes to R&D eco-innovations. Accordingly, it can be observed that the fourth cluster has very high values for all three sub-indicators and represents the leader in the formed constellation of clusters (Table 2).

Additionally, in the second analyzed period, there are changes in the perception of the R&D sector of the eco-innovations, and accordingly, the appearance of migratory movements. Germany migrated to another cluster consisting of Denmark, Finland and Sweden, which represents the

cluster with the smallest share but with the highest subindicator values. Bulgaria lost its original position and migrated to a cluster that has a weaker performance than the cluster in which it was in the first analyzed period. The first and fourth clusters in which Spain, Italy, Hungary, Ireland and Slovenia are located, also represent clusters with a promising state in terms of R&D performance in the field of eco-innovations (Figure 2).

Table 2. Mean values of the formed constellation of cluster for the first period

Centroids							
		RD1*		EA1		PAT1	
		Mean	STDEV**	Mean	STDEV	Mean***	STDEV
Cluster	1	68,33	34,92	228,33	36,68	46,00	10,46
	2	47,00	30,34	59,37	35,72	33,50	11,46
	3	101,50	47,02	107,50	27,44	48,00	17,75
	4	195,00	27,78	173,00	75,44	155,66	1,52
	5	148,50	25,04	54,16	11,92	113,83	24,90
	Combined	98,81	59,97	115,51	79,50	69,85	46,04

* RD1, EA1, PAT1- subindicators values for the first analyzed period
** STDEV- Standard deviation
*** Mean- mean value of the analyzed indicators across the given clusters

Source: Authors' calculations

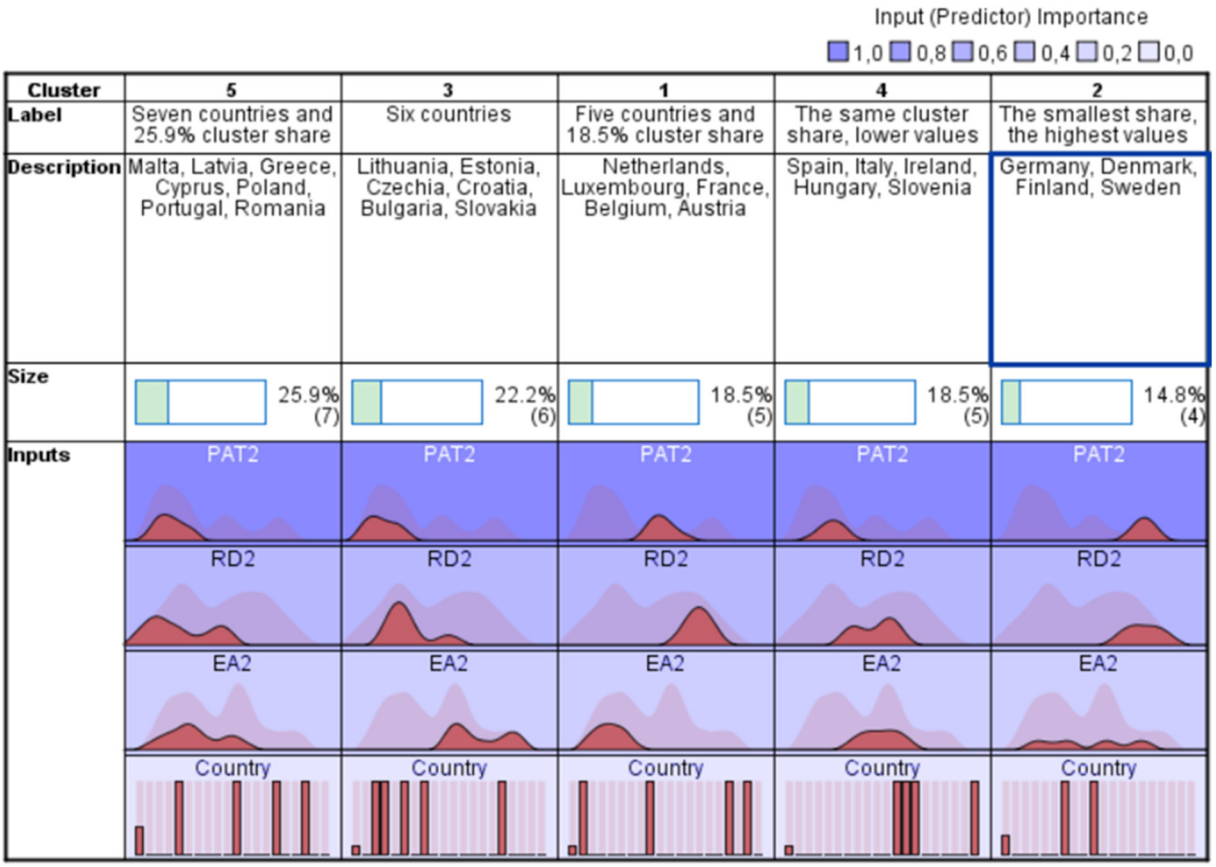

Figure 2. The cluster architecture for the second analyzed period

Source: Authors' calculations

The cluster constellation that was formed in the second analyzed period shows that the second cluster has dominance in the *Governments environmental and energy R&D appropriations and outlays sub-indicator* as well as the *Eco-innovation related patents* sub-indicator, while the third cluster has good performance in the *Eco-innovation activities* sub-indicator.

Table 3. Mean values of the formed constellation of cluster for the second period

Centroids							
		RD2		EA2		PAT2	
		Mean	STDEV	Mean	STDEV	Mean	STDEV
Cluster	1	168,40	13,81	61,80	21,74	96,40	11,86
	2	184,50	23,51	133,75	71,00	147,75	8,69
	3	70,50	27,66	198,50	43,82	29,33	14,65
	4	116,60	26,53	147,80	30,21	47,80	9,93
	5	55,57	41,74	91,57	44,85	34,28	12,59
	Combined	110,18	58,53	126,48	63,66	64,00	44,38

*RD2, EA2, PAT2- subindicators values for the second analyzed period

** STDEV- Standard deviation

*** Mean- mean value of the analyzed indicators across the given clusters

Source: Authors' calculations

5. CONCLUSION

In order to create a favorable environment for the development of an eco-innovative sustainable concept, the members of the European Union must establish efficient, unified and harmonized regulatory and political frameworks. Such frameworks can improve the daily functioning of industrial parks and promote the R&D concept of eco-innovations. In this way, the industrial sector will be able to fully utilize its potential in supporting economic development and generating positive effects beyond the borders of the European Union. Establishing R&D departments in green locations or upgrading existing ones in the region can be a catalyst for sustainable growth, creating an enabling environment where businesses benefit from adopting the EU's green agenda. The potential economic, environmental and social benefits are enormous. Eco-industrial parks can boost job creation and improve competitiveness by creating a more dynamic business environment, improving efficiency and productivity, providing high-quality infrastructure and attracting investment.

Denmark, Finland, and Sweden are recognized for their leadership in sustainable development and eco-innovation, particularly in R&D policies. The most dominant cluster in both analyzed periods with Germany, has developed strong R&D policies with integrated sustainability into their economic and innovation strategies, fostering eco-innovation through various government policies, investments, and collaborations between industry, academia, and government agencies. These policies not only encourage research into green technologies but also create innovation ecosystems where businesses, governments, and academic institutions collaborate to drive sustainable development. The integration of circular economy principles, focused on renewable energy, and commitment to achieving climate goals are central to the eco-innovation R&D strategies in these countries. Through public funding, incentives, and international collaboration, Denmark, Finland, and Sweden are setting the stage for a green and sustainable future. Government-industry collaboration based on public-private partnerships is central to the eco-innovation strategies in all three countries.

Bulgaria's innovation performance has varied over time. Although there has been a decrease in the number of SMEs introducing business process innovations, the number of SMEs implementing product innovations has risen by 13.6 percentage points since 2017. Regarding linkages, the country has seen a growth of 13.7 percentage points compared to 2017, driven by an increase in innovative SMEs collaborating with others and public-private co-publications. However, Bulgaria's performance in intellectual assets has experienced a significant decline, with design applications dropping by 61.5 percentage points, and a nearly negligible decrease in PCT patent applications.

In contrast to the overall trend, trademark applications have increased by 17.9 percentage points. Trademark and design applications are among Bulgaria's strengths, ranking 8th and 5th among EU Member States, with 118.9% and 147.6% of the EU average, respectively, in 2024.

The potential for future research in this field is enormous considering the importance of the subject and the extent it covers. Eco-innovations are the prerequisite for achieving sustainable development while R&D capacity and activities determine their progress. The results have shown that across the EU there have been significant disparities between member countries in their eco-innovation performance, R&D capability and innovation ecosystems. Future work in this area could be more focused on examining the country-specific problems and obstacles in attaining higher innovation performance. Furthermore, appropriate strategies and measures that would eliminate or minimize those causes of low innovation capability and weak R&D sector should be proposed. Not only would such actions help reduce the discrepancy between EU countries, but also in reaching common goals of sustainable development on the European level.

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References

Al-Ajlani, H., Cvijanović, V., Es-Sadki, N., & Müller, V. (2022). EU Eco-Innovation Index 2022: *Policy brief*. https://doi.org/10.13140/RG.2.2.11440.43522

Benassi, M., Garofalo, S., Ambrosini, F., Patrizia, R., Raggini, R., De Paoli, G., Ravani, C., Giovagnoli, S., Orsoni, M., & Piraccini, G. (2020). Using Two-Step Cluster Analysis and Latent Class Cluster Analysis to Classify the Cognitive Heterogeneity of Cross-Diagnostic Psychiatric Inpatients. *Frontiers in Psychology*, *11,* 1085. https://doi.org/10.3389/fpsyg.2020.01085

Cainelli, G., Mazzanti, M., & Zoboli, R. (2011). Environmental innovations, complementarity and local/global cooperation: Evidence from North-East Italian industry. *International Journal of Technology, Policy and Management, 11*, 328–368. https://doi.org/10.1504/IJTPM.2011.042090

Chaparro-Banegas, N., Mas-Tur, A., Park, H. W., & Roig-Tierno, N. (2023). Factors driving national eco-innovation: New routes to sustainable development. *Sustainable Development, 31*(4), 2711-2725. https://doi.org/10.1002/sd.2541

EC. (2022a). *Eco-index 2022 — indicators and methodology*, European Commission.

EC. (2022b). *European Innovation Scoreboard 2022 – Methodology Report*. European Union.

EC. (2024). *EU Eco-Innovation Index 2024*, European Commission, Luxembourg: Publications Office of the European Union.

EEA. (2023). *Eco-innovation index*. Retrieved from https://www.eea.europa.eu/en/analysis/indicators/eco-innovation-index-8th-eap

Garcia-Álvarez-Coque, J. M., Mas-Verdú, F., & Roig-Tierno, N. (2021). Life below excellence: Exploring the links between top-ranked universities and regional competitiveness. *Studies in Higher Education*, *46*(2), 369–384. https://doi.org/10.1080/03075079.2019.1637843

Horbach, J. (2008). Determinants of environmental innovation—New evidence from German panel data sources. *Research Policy, 37*(1), 163-173. https://doi.org/10.1016/j.respol.2007.08.006

Jang, E., Park, M., Roh, T., & Han, K. (2015). Policy Instruments for Eco-Innovation in Asian Countries. *Sustainability, 7*(9), 12586-12614. https://doi.org/10.3390/su70912586

Lee, K.-H., & Min, B. (2015). Green R&D for eco-innovation and its impact on carbon emissions and firm performance. *Journal of Cleaner Production*, *108*(1), 534-542. https://doi.org/10.1016/j.jclepro.2015.05.114

Marín-Vinuesa, L. M., Scarpellini, S., Portillo-Tarragona, P., & Moneva, J. M. (2018). The Impact of Eco-Innovation on Performance Through the Measurement of Financial Resources and Green Patents. *Organization & Environment, 33*(2), 1-26. https://doi.org/10.1177/1086026618819103

Mas-Verdú, F., Roig-Tierno, N., Nieto-Aleman, P. A., & Garcia-Alvarez Coque, J.-M. (2020). Competitiveness in European regions and top-ranked universities: Do local universities matter? *Journal of Competitiveness, 12*(4), 91–108. https://doi.org/10.7441/joc.2020.04.06

Miao, M., Saide, S., Ratna, S., & Muflih, M. (2024). Business Continuity Innovation in Disruption Time: Sociotechnical Systems, Business Analytics, Virtual Business, and Mediating Role of Knowledge Absorptive Capacity. *IEEE Transactions on Engineering Management, 71*, 13201-13212. https://doi.org/10.1109/tem.2021.3086306

Miroshnychenko, I., & De Massis, A. (2020). Three decades of research on corporate governance and R&D investments: a systematic review and research agenda. *R&D management, 50*(5), 648-666. https://doi.org/10.1111/radm.12432

Pan, X., Guo, S., Li, M., & Song, J. (2021). The effect of technology infrastructure investment on technological innovation ——A study based on spatial durbin model. *Technovation, 107*, 102315. https://doi.org/10.1016/j.technovation.2021.102315

Radjenovic, Z., & Boskov, T. (2022). Economic Effects of Congress Tourism: Two- Step Cluster Approach. *In: Fifth International Scientific Conference: Challenges of Tourism And Business Logistics in the 21st Century*, https://www.doi.org/10.46763/YFNTS2251185r

Rennings, K., Ziegler, A., Ankele, K., & Hoffmann, E. (2006). The influence of different characteristics of the EU environmental management and auditing scheme on technical environmental innovations and economic performance. *Ecological Economics*, *57*, 45-59. https://doi.org/10.1016/j.ecolecon.2005.03.013

Sarpong, D., Boakye, D., Ofosu, G., & Botchie, D. (2023). The three pointers of research and development (R&D) for growth-boosting sustainable innovation. *Technovation, 122*, 102681. https://doi.org/10.1016/j.technovation.2022.102581

Shkarupeta, E., & Babkin, A. (2024). Eco-innovative development of industrial ecosystems based on the quintuple helix. *International Journal of Innovation Studies, 8*(3), 273-286. https://doi.org/10.1016/j.ijis.2024.04.002

Terzić, L. (2023). Why is the transition to a green economy important for achieving sustainability? A review of some theoretical approaches and empirical research presented in the literature, *Economic Thought Journal, 68*(3), 307-332. https://doi.org/10.56497/etj2368303

Triguero, A., Moreno-Mondéjar, L., & Davia, M. A. (2016). Leaders and Laggards in Environmental Innovation: An Empirical Analysis of SMEs in Europe. *Business Strategy and the Environment, 25*(1), 28-39. https://doi.org/10.1002/bse.1854

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Digitalization and Its Influence on SMEs Performance in International Expansion: A Bibliometric Analysis

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SMEs;
Global scaling;
Bibliometric analysis

Abstract: *Given the rapid and complex shifts in the international business sphere, companies leverage advanced technologies, such as Artificial Intelligence (AI), cloud computing, or Big Data analytics, to optimize their operations, conduct businesses at the international scale, and, ultimately, to thrive in an increasingly complex and competitive business environment. Digitalization stands at the forefront of the process of integrating new technologies into business operations, being instrumental in how companies grow and expand internationally. Within this framework, the purpose of this paper is to explore the complex role digitalization plays in the international expansion of SMEs (with a focus on the strategic selection of the most appropriate entry modes), and their performance in scaling up, by capitalizing on new opportunities through cross-border market entry. The methodological approach consists of a bibliometric analysis - to assess the impact and productivity of research outputs, in order to identify trends and measure the influence of scholarly works related to digitalization and its effects on the internationalization of SMEs.*

1. INTRODUCTION: OBJECTIVE, RESEARCH QUESTIONS AND MOTIVATION

As a consequence of globalization, technological advancements and intensification of cross-border activity, small and medium-sized enterprises (SMEs) became „a more common kind of actor in the global market" (Sandberg, 2012). In the past, internationalization was much less accessible to SMEs compared to larger companies due to several key factors: limited resources and management system, lack of experience and access to information, environmental constraints (Rialp & Rialp, 2001), or reduced integration in international networks. A Eurobarometer study carried out in 2015 revealed that, although global markets represent an important source of growth for SMEs, only about half of the firms located in the EU area were involved in international business at the time. The survey indicated complex administrative procedures, increased delivery costs, and the difficulty in finding business partners as the main barriers to internationalization (European Commission, 2024). Consequently, although SMEs are the predominant type of firm in most national economies, they tend to prioritize their home markets (Andersson & Wictor, 2003), and only a limited number of them actually internationalize and expand their operations abroad. However, the recent reality forged by digitalization has shown numerous examples of born-global SMEs with rapid international expansion, regardless of the firm size, managed resources, or type of activity (Sekliuckiene & Maculskaite, 2013). Digitalization, the „leitmotiv" of (post) modern times, has revolutionized the business landscape, reshaping the way companies operate (locally and internationally), how they interact with their customers, and how they compete in an increasingly interconnected global market. Digitalization refers to „the use of digital technologies to change a business model and provide new revenue and value-producing opportunities; it is the process of moving to a digital business" (Gartner' glossary, 2024). Numerous studies show that digitalization plays a pivotal role in shaping how firms operate and expand internationally

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(Bargoni et al., 2024; Kamal-Chaoui, 2018; Sanguineti & Zucchella, 2022), providing a competitive edge and fostering sustainability and open innovation (Robertsone & Lapina, 2023) in an increasingly interconnected world.

The increased accessibility of digital technologies to companies of all sizes along with improved digital infrastructure in developing countries have strengthened the management of international operations and strategic assets. As a result, companies can exert now more effective control when utilizing alternative entry modes and leverage innovative strategies in achieving global scaling.

Against this background, the purpose of this paper is to analyze the complex role of digitalization in the international expansion of SMEs (with a focus on the transformations of their traditional entry modes), as well as their performance in global scaling. Therefore, the paper tries to answer the following two specific **research questions**:

1. Does digitalization influence the entry modes of SMEs in foreign markets?
2. Is digitalization an enabler for global scaling of SMEs? Drawing on the definitions of scaling and global scaling, the analysis seeks to establish the degree to which global scaling relies on digitalization.

The motivation behind this research theme resides in the increased interest in the current trends and developments that shape the international business environment, given the opportunities stemming from the rapidly developing digital technologies. The literature review unveils a differentiated role of digitalization in the case of SMEs global expansion and global scaling possibilities in comparison to larger companies. The entry modes of SMEs of SMEs on international markets have been little explored in conjuction with scaling possibilities associated with digitalization. Therefore, a bibliometric analysis might provide new insights on the subject proposed in this research paper, and generate novel ideas for further investigation.

2. LITERATURE REVIEW

2.1. Transforming Pathways: The Impact of Digitalization on SMEs Entry Modes on Foreign Markets

The method of entering a foreign market, known as entry mode, is a crucial aspect of international business research, as it represents a significant strategic decision for firms looking to internationalize (Pedersen et al., 2002). Companies, based on their size and capabilities, may opt for direct exports, foreign direct investments (FDI), or partnerships with other firms when entering international markets (Bruneel & De Cock, 2016). In this context, internationalization theories are revisited. For example, the OLI paradigm of Dunning can be understood from a different perspective since digital technologies offer extended possibilities of remote access and operational control, thus modes of entry without ownership can be preferred to FDI. Control no longer requires ownership, and the activities of multinational enterprises do not necessarily require FDI (Cuervo-Cazurra & Narula, 2015).

Digitalization plays a key role in enhancing the processes of knowledge acquisition, therefore facilitating the internationalization of SMEs (Bargoni et al., 2024), with born-global companies mainly benefitting from this trend (Shneor, 2012). The advantages of digitalization in the global expansion of SMEs are widely acknowledged: it has the potential to build competitive advantage by fostering innovative business strategies that prioritize customer needs, reduce costs, enhance efficiency, and drive innovation (Olara, 2024). Previous research papers predominantly

assessed the extent to which SMEs embraced information and communications technology (ICT) infrastructures and how digital technologies transformed the interactions within their value chain activities, leading to the adoption of innovative business models (Bargoni et al., 2024). According to Pezderka and Sinkovics (2011), in the context of online businesses, the „active online internationalization" is considered the most suitable entry mode in contrast with the traditional ones, such as partnerships and subsidiaries. Interestingly, there are relatively few studies that have examined online market entry in the context of SME entry mode strategies, despite the fact that SMEs are generally more inclined to utilize online market entry compared to larger companies. It can be suggested that digitalization significantly transforms the approaches SMEs take when deciding to enter foreign markets. Digital platforms allow SMEs to expand internationally with minimal resources, providing opportunities to overcome challenges and access various networks (Jin & Hurd, 2018). According to Ciasullo et al. (2022), by incorporating omnichannel strategies through digital technology, SMEs can enhance coordination between distribution channels and the market, thereby fostering the creation of digital value in global markets.

Access to digital marketplaces has empowered numerous SMEs by lowering the trade costs associated with intermediaries (Lendle et al., 2013). Moreover, the rise of e-commerce platforms has allowed SMEs to sell their products globally, leading to an increase in small parcel shipments. By participating in direct-to-consumer sales through e-commerce, SMEs are now delivering individual items more often than bulk shipments to retailers. Some SMEs use the dropshipping model, in which they order items from a third party only after receiving an order rather than keeping things in stock. Also, the just-in-time production approach, which is producing goods based on demand, contributes to more frequent and smaller shipments. This growth in small parcel shipments indicates to some extent the increasing participation of SMEs in e-commerce (OECD et al., 2023). Even more, SMEs that adopted e-commerce platforms recorded a rise in revenues, highlighting the concrete economic benefits of utilizing digital technologies (Bradač Hojnik & Huđek, 2023).

Analyzing if digitalization influences the entry modes of SMEs, it is evident that integration of new technologies and online platforms facilitates access to global markets, allowing these enterprises to select more flexible and cost-effective entry modes based on digital platforms, rather than traditional methods such as subsidiaries or joint ventures.

2.2. The Role of Digitalization as a Catalyst for Global Scaling of SMEs

In addition to the analysis of its significant impact on the entry modes of SMEs, the second research question was how digitalization serves as an enabler for global scaling. The global scaling phenomenon of SMEs is still in its early stages of documentation. While scaling is a prevalent subject that has garnered significant interest in practitioner literature, it has received relatively little focus in academic research (Shepherd & Patzelt, 2020). We are encountering new concepts that require clearer definitions, such as scaling and global scaling. Not all scholars assign the same meanings to these terms, making it crucial to establish a common understanding when using them. For example, Palmié et al. (2023) identified four types of scaling (financial, organizational, market and volume), and more often the concept has been considered a synonym for "growth" (Hart et al., 2021). In essence, scaling is characterized by rapid growth through replication, which involves offering a similar product in various markets with minor modifications (Reuber et al., 2021) or as "spreading excellence within an organization as it expands" (Shepherd & Patzelt, 2020). Even more, Bohan et al. (2024) provide an in-depth analysis of the topic, offering a technical definition of scaling as a "time-limited process in which the size of a business grows exponentially, i.e., increases in proportion over time" which requires "proactive, well-paced internal transformation

and ongoing innovation". According to Reuber et al. (2021), global scaling represents "a logic of multinationalization aimed at achieving rapid growth by replicating a global business model in foreign markets". However, it's essential to closely examine the literature to determine if the term scaling retains the same meaning in the context of digitalization.

In addition to the key factors enhancing SMEs' access to global markets - such as improved policies, sound regulatory systems, trade and investment opportunities, as well as adequate physical and IT infrastructure, and access to appropriate financing - digitalization offers new opportunities for engaging in the global economy. It allows businesses to scale up, reach distant markets and acquire knowledge at a relatively low cost (Kamal-Chaoui, 2018). According to Gartner et al. (2022), in the digital era, the ability of SMEs to succeed globally significantly depends on "learning, understanding, adapting, implementing, accepting and creatively using new technologies". Therefore, competitive strategies are required to capitalize on the competitive advantage conveyed by digital technologies and to scale up at a global level (Iscaro et al., 2020). Banalieva and Dhanaraj (2019) observed that the potential to access foreign markets remotely via digital channels significantly diminishes the necessity for market-seeking foreign direct investment, facilitating internationalization and growth, in one of the few papers that discussed market entry and scalability in the context. In conclusion, the literature review suggests that digitalization serves as a transformative catalyst for SMEs, empowering them to transcend geographical barriers, and enhance operational efficiency, innovation and performance, ultimately enabling them to scale globally and compete in an increasingly interconnected marketplace.

3. METHODOLOGY

The research methodology consists of a systematic literature review that was developed to analyse the current level of knowledge in the academic literature regarding the international expansion of SMEs using digitalization and to identify the main research strands and possible future directions. The methodology is based on a bibliometric analysis which allows for an encapsulation of a large volume of data from a large number of papers. The search and the data download from WoS was done on October 3rd, 2024. In this process, the following steps were taken:

I. Planning the research:
   - Choosing the research theme based on a preliminary reading of several papers on international business,
   - Sketching the objectives and the research questions based on the identification of an emerging trend in the literature,
   - Selecting the methodology supported by its specific benefits from a technical perspective and by its capacity to adequately answer the research questions.

II. Data collecting:
   - Selecting the database for academic papers resources. Web of Science (Clarivate Analytics) was chosen due to the recognition it enjoys in the scholarly community (Pranckutė, 2021).
   - Establishing the keywords to use in the automatic search process. The following prompt was entered on the platform, initially returning 9387 results: <"internationalisation" or "internationalization" and "digitalisation" or "digitalization" and "SME">. To avoid limiting the results, we excluded keywords pertinent to our research question, such as "entry mode" and "scaling," from the search. Instead, we allowed for the possibility of determining whether the bibliometric analysis would indicate a frequent occurrence of these keywords and their co-occurrence with other relevant terms.
   - Selecting the time range of the publications. Only documents published starting with the year 2000 were kept because digitalization is a recent phenomenon (9238 results),

- Selecting the document types. We included only articles (7125), proceeding papers (1362), review articles (513), early access (179) and book chapters (374): 8929 in total,
- Selecting the language. Only English language papers were retained to be able to subsequently read and review them. The filtering retained 8607 results.
- Selecting the Web of Science categories: Business (1752), Management (961) and Economics (587). After this filtering process, only 2081 documents remained in total,
- Exporting the data from the Web of Science database in a tab-delimited file format.

III. Performing the bibliometric analysis and the systematic literature review:
- Analysing the data with VosViewer software which provided a visual representation of the networks and clusters that were formed from the most frequent keywords,
- Manually filtering the papers based on the abstract and keywords relevant to the paper objectives: 208 documents were kept to be analysed in the systematic literature review,
- Mannually categorising the abstracts by subtopics and significance, and organising them into serialised groups according to the research questions and the cluster formation which resulted from the bibliometric analysis,
- A comprehensive analysis of the most relevant papers was finally conducted, explaining the clusters and answering the research questions.

IV. Elaborating the conclusions and future research directions.

4. ANALYSIS AND RESULTS

The time frame of the articles included in the initial selection, based on which the bibliometric analysis was performed, was 2000 - 2024. However, the final manual selection, which was done for discussion purposes, retains only 208 articles. The yearly distribution of the 208 articles where we can observe a very recent development of the interest for this research topic: 31 (2008-2019), 18 (2020), 17 (2021), 37 (2022), 35 (2023) and 69 (2024). This is explained by the emerging technologies that supported the SME international expansion and generated a new interest in the literature.

Figure 1 illustrates the keywords' co-occurrence network. The size of the nodes is directly proportional to the frequency of the keywords appearances and edges show the co-occurrence in the same document. The database contained 311 keywords, but the threshold was set for minimum 3 co-occurrences and only 29 keywords qualify and are included on the map. The keywords are also grouped into five clusters based on how often they co-occur in the same document. Each cluster is differentiated through a different color and its components are listed in Table 1.

Table 1. The cluster components from the keywords' co-occurrence analysis

Cluster 1 (8 items)	**Cluster 2 (8 items)**	**Cluster 3 (5 items)**	**Cluster 4 (5 items)**	**Cluster 5 (3 items)**
Behavior	Entrepreneurship	Barriers	Entry mode	Business
Capabilities	International	Impact	Globalisation	Culture
Firm resources	entrepreneurship	Innovation	Internationalisation	Strategy
Firms	Firm	Networks	Psychic distance	
Knowledge	Market	SME	Technology	
Management	Ownership			
Model	Performance			
Resource-based view	Perspective			
	R&D			

Source: Own processing

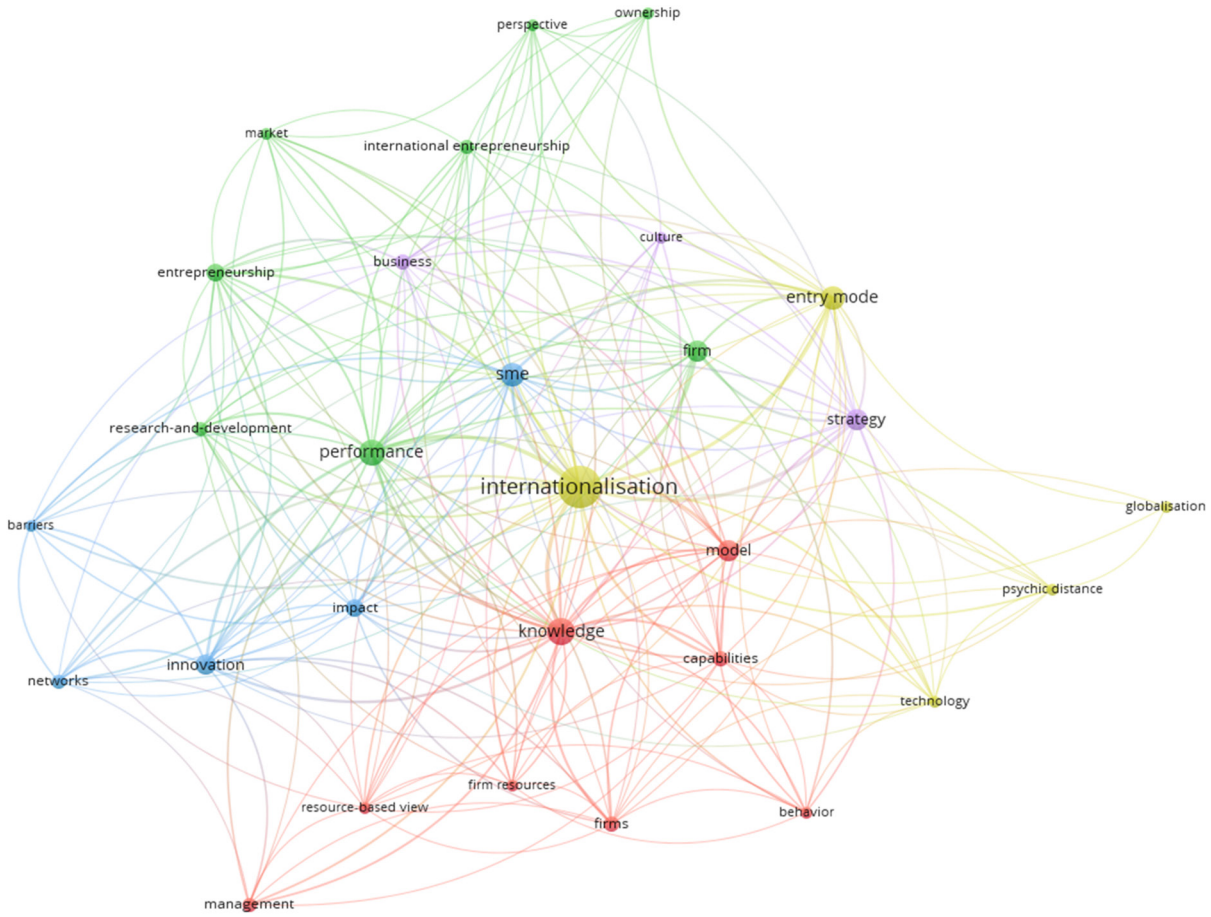

Figure 1. Keywords co-occurrence network
Source: Own processing

Clusters 2 and 4 contribute to addressing the first research question, regarding the entry modes of SMEs. Cluster 2 emphasizes the theoretical literature that was developed at the intersection of international business and entrepreneurship theories, namely international entrepreneurship. The research included in our database mostly starts from empirical analysis based on which it further approaches theoretical implications on international entrepreneurship (Falco et al., 2020; Teltz, 2019). It is recognized that SMEs are impacted by globalization in distinct ways relative to large corporations and use different strategies and processes for internationalization (Teltz, 2019). Classical internationalization theories, such as Vernon's, life cycle theory do not consistently pertain to SMEs, as these entities do not invariably adhere to the conventional progression of acquiring incremental expertise in international markets and correspondingly modifying assumed risks. The word "ownership" from cluster 2 appears in both theoretical and empirical analysis in our selected literature. The OLI advantages are redefined or updated according to the new trends. Zheng and Sun (2022) stress the importance of digital ownership advantage (composed of three elements: digital infrastructure, technology, and investment) and its capacity to increase firms' internationalization. Bhandari et al. (2023) acknowledge new OLI advantages that arise in the context of digitalization: open resources, linkages and integration. Online internationalization has become a new entry mode on foreign markets and is more approachable to SMEs due to the lower costs compared to traditional alternatives (Westerlund, 2020). Thus, Oviatt and McDougall (1994), among the first authors to examine born global SMEs, challenge the applicability of classical internationalization theories, as these enterprises, due to their business model, do not necessitate substantial time to gather resources and knowledge for entering foreign markets. The Uppsala model is also challenged in the same context (Neubert,

2018). Under this topic, we find connections with keywords in **cluster 1**: "knowledge", "model" and "firm resources". Based on the selected research, we can conclude that digitalization does influence the entry modes of SMEs on foreign markets, and it happens differently compared to MNEs.

In an era characterized by rapid technological advancements and global economic integration, digitalization has become a crucial driver for transforming businesses and the entire economy. (Bradač Hojnik & Huđek, 2023). Given today's evolving business environment, SMEs must utilize digital technologies to break down their traditional barriers to scalability, innovation, and internationalization (Olara, 2024), as suggested in **cluster 3**. Moreover, the development of networks with new business partners is facilitated by specialized digital platforms (Martins & Ling, 2017). **Cluster 5** reveals a different literature strand that does not fall under the scope of this analysis.

The answer to the second research question is not suggested through the keywords obtained in the bibliometric analysis, but was developed from the review of the selected articles. Tippmann et al. (2023), when studying software firms, support the idea that global scalability does not depend on firm size and age, but rather on a "strategy that sustains three interrelated mechanisms: top-down replication, bottom-up entrepreneurial orientation, and replicable innovation generation to engender and screen replicable ideas." This implies that digitalization is useful, but not enough for scaling. On the other hand, scaling also depends on how the digital technologies are used in the international expansion. Online internationalization allows for the rapid scaling of SMEs (Westerlund, 2020), while digital platforms can be used for collaboration or to manage several processes and improve efficiency (Osano, 2023). In regard to the second research question, we can conclude that digitalization is an enabler for the global scaling of SMEs, but only under certain specific conditions.

5. FUTURE RESEARCH DIRECTIONS

Throughout the most recent work, the emphasis is put on the following trends that can be developed in future research:

- Given the profound changes brought by digitalization in the companies' internationalization strategies and entry modes, internationalization theories have to be revisited to see how they apply in the case of SMEs, born-global and born-digital companies as well as for any contemporary company using digital technologies to expand abroad.
- How SME internationalization depends on the innovation type employed in the company's digitalization and what would be the managerial and policy implications.
- What type of entry mode supports a higher global scalability of SMEs.

6. CONCLUSION

Digitalization leads the integration of new technology into company operations, helping organisations develop and expand abroad. This paper examined the complex role digitalization plays in SMEs' international expansion (with a focus on strategic entry mode selection) and global scaling. Bibliometric analysis was used to examine to help answer the two research questions. First, we may conclude that digitalization affects SMEs' overseas market entry modes differently than MNEs. Moreover, digitalization enables the worldwide growth of SMEs under particular conditions, answering the second research question. Finally, we were able to discover current trends and future research directions on the impact of digitalization on SMEs' internationalization.

References

Andersson, S., & Wictor, I. (2003). Innovative international strategies in new firms: Born Globals – the Swedish Case. *Journal of International Entrepreneurship*, *1*, 249-276. https://doi.org/10.1023/A:1024110806241

Banalieva, E. R., & Dhanaraj, C. (2019). Internalization theory for the digital economy. *Journal of International Business Studies, 50*, 1372-1387. https://doi.org/10.1057/s41267-019-00243-7

Bargoni, A., Ferraris, A., Vilanova, S., & Hussain, W. (2024). Digitalisation and Internationalisation in SMEs: a Systematic Review and Research Agenda. *Journal of Enterprise Information Management, 37*(5), 1418-1457.
https://doi.org/10.1108/JEIM-12-2022-0473

Bhandari, K. R., Zámborský, P., Ranta, M., & Salo, J. (2023). Digitalization, internationalization, and firm performance: A resource-orchestration perspective on new OLI advantages. *International Business Review*, *32*(4), 102135. https://doi.org/10.1016/j.ibusrev.2023.102135

Bohan, S., Tippmann, E., Levie, J., Igoe, J., & Bowers, B. (2024). What is Scaling?. *Journal of Business Venturing*, *39*(1). https://doi.org/10.1016/j.jbusvent.2023.106355

Bradač Hojnik, B., & Huđek, I. (2023). Small and Medium-Sized Enterprises in the Digital Age: Understanding Characteristics and Essential Demands. *Information*, *14*(11), 606. https://doi.org/10.3390/info14110606

Bruneel, J., & De Cock, R. (2016). Entry Mode Research and SMEs: A Review and Future Research Agenda. *Journal of Small Business Management, 54*(S1), 135-167. https://doi.org/10.1111/jsbm.12291

Ciasullo, M. V., Montera, R., Mercuri, F., & Mugova, S. (2022). When digitalization meets omnichannel in international markets: A case study from the agri-food industry. *Administrative Sciences*, *12*(2), 68. https://doi.org/10.3390/admsci12020068

Cuervo-Cazurra, A., & Narula, R. (2015). A set of motives to unite them all? Revisiting the principles and typology of internationalization motives. *The Multinational Business Review*, *23*(1), 2-14. https://doi.org/10.1108/MBR-03

European Commission. (2024). SME Internationalisation Beyond the EU.
https://single-market-economy.ec.europa.eu/smes/growing-and-scaling-sme/improving-smes-access-marktets/sme-internationalisation-beyond-eu_en

Falco, B. D., Neubert, M., & van der Krogt, A. (2020). Usage of machine learning in international entrepreneurship. In *8th International Conference Innovation Management, Entrepreneurship and Sustainability (IMES 2020)* (pp. 140-151). https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3698818

Gartner. (2024). Glossary: digitalization. https://www.gartner.com/en/information-technology/glossary/digitalization

Gartner, J., Maresch, D., & Tierney, R. (2022). The key to Scaling in the Digital Era: Simultaneous Automation, Individualization and Interdisciplinarity. *Journal of Small Business Management, 64*(2), 628-655. https://doi.org/10.1080/00472778.2022.2073361

Hart, M., Prashar, N., & Ri, A. (2021). From the Cabinet of Curiosities: The Misdirection of Research and Policy Debates on Small Firm Growth. *International Small Business Journal, 39*(1), 3–17. https://doi.org/10.1177/0266242620951718

Iscaro, V., Castaldi, L., Maresca, P., & Mazzoni, C. (2020). Digital transformation and internationalization: a complexity approach. In Proceedings of 15th International Forum of Knowledge Asset Dynamic (IFKAD 2020): Knowledge in Digital Age (pp. 1166-1180). Giovanni Schiuma.

Jin, H., & Hurd, F. (2018). Exploring the Impact of Digital Platforms on SME Internationalization: New Zealand SMEs Use of the Alibaba Platform for Chinese Market Entry. *Journal of Asia-Pacific Business*, *19*(2), 72-95. http://dx.doi.org/10.1080/10599231.2018.1453743

Kamal-Chaoui, L. (2018). Better policies for SMEs to scale up and go global. *OECD Observer*. https://doi.org/10.1787/46baadee-en

Lendle, A., Schropp, S., Vézina, P.-L., & Olarreaga, M. (2013). 'eBay's Anatomy', *Economics Letters 121*(1):115-120.

Martins, J. T., & Ling, S. (2017). Local enterprise partnerships: Socialisation practices enabling business collective action in regional knowledge networks. *Knowledge and Process Management*, *24*(4), 269-276. https://doi.org/10.1002/kpm.1546

Neubert, M. (2018). The Impact of Digitalization on the Speed of Internationalization of Lean Global Startups. *Technology Innovation Management Review, 8*(5), 44-54. https://doi.org/10.22215/timreview/1158

OECD, United Nations, Word Bank, & World Trade Organization. (2023). Digital Trade for Development. https://www.wto.org/english/res_e/booksp_e/dtd2023_e.pdf

Olara, O. J. (2024). Digital Transformation in Small and Medium Enterprises: Challenges and Opportunities. *Research Output Journal of Education*, *3*(2), 26-29. https://www.researchgate.net/publication/383083748

Osano, H. M. (2023). Global scaling by SMEs: Role of innovation and technology. *Journal of the International Council for Small Business*, *4*(3), 258-281. https://doi.org/10.1080/26437015.2023.2201896

Oviatt, B. M., & McDougall, P. P. (1994). Toward a Theory of International New ventures. *Journal of International Business Studies, 25*(1), 45-64. https://doi.org/10.1057/palgrave.jibs.8490193

Palmié, M., Parida, V., Mader, A., & Wincent, J. (2023). Clarifying the Scaling Concept: A Review, Definition, and Measure of Scaling Performance and An Elaborate Agenda for Future Research. *Journal of Business Research 158* (1).
http://dx.doi.org/10.1016/j.jbusres.2022.113630

Pedersen, T., Petersen, B., & Benito, G. R. (2002). Change of Foreign Operation Method: Impetus and Switching Costs. *International Business Review 11*(3), 325–345. https://doi.org/10.1016/S0969-5931(01)00063-4

Pezderka, N., & Sinkovics, R. R. (2011). A conceptualization of e-risk perceptions and implications for small firm active online internationalization. *International Business Review, 20*(4), 409-422. https://doi.org/10.1016/j.ibusrev.2010.06.004

Pranckutė, R. (2021). Web of Science (WoS) and Scopus: The titans of bibliographic information in today's academic world. *Publications*, *9*(1), 12. https://doi.org/10.3390/publications9010012

Reuber, A. R., Tippmann, E., & Monaghan, S. (2021). Global Scaling as a Logic of Multinationalization. *Journal of International Business Studies*, *52*, 1031-1046. https://doi.org/10.1057/s41267-021-00417-2

Rialp, A., & Rialp, J. (2001). Conceptual Frameworks on SMEs' Internationalization: Past, Present and Future Trends of Research. In Axinn, C.N., & Matthyssens, P. (Eds*), Advances in International Marketing: Reassesing the Internationalization of the Firm*, 11: 49-78, Emerald, Bingley, UK. http://dx.doi.org/10.1016/S1474-7979(01)11016-1

Robertsone, G., & Lapina, I. (2023). Digital Transformation as a Catalyst for Sustainability and Open Innovation, *Journal of Open Innovation: Technology, Market, and Complexity*, *9*(1). https://doi.org/10.1016/j.joitmc.2023.100017

Sandberg, S. (2012). *Internationalization Processes of Small and Medium-Sized Enterprises. Entering and Taking Off from Emerging Markets* (Publication No.78). [Doctoral dissertation, Linnaeus University].
https://www.diva-portal.org/smash/get/diva2:504939/FULLTEXT01.pdf

Sanguineti, F., & Zucchella, A. (2022). Digital transformation and the internationalization of small and medium-sized firms. *Rivista Piccola Impresa/Small Business,* 2, 160-186.
https://doi.org/10.14596/pisb.3511

Sekliuckiene, J., & Maculskaite, S. (2013). Internationalization Decision of a Born Global: The Case of Information Technology Companies, *Social Sciences, 2*(80), 17-26. http://dx.doi.org/10.5755/j01.ss.80.2.4644

Shepherd, D. A., & Patzelt, H. (2020). A Call for Research on the Scaling of Organizations and the Scaling of Social Impact. *Entrepreneurship Theory and Practice*, *46*(2), 255–268. https://doi.org/10.1177/1042258720950599

Shneor, R. (2012). Born Global Firms, Internet, and New Forms of Internationalization. *Handbook of Research on Born Globals*. https://doi.org/10.4337/9780857938046.00020

Teltz, A. K. (2019). The impact of digitalization on the success of business internationalization relating to German small and medium sized fintechs. *Scientific Programme Committee*, 842.

Tippmann, E., Monaghan, S., & Reuber, R. A. (2023). Navigating the paradox of global scaling. *Global Strategy Journal, 13*(4), 735-773, https://doi.org/10.1002/gsj.1435

Westerlund, M. (2020). Digitalization, Internationalization and Scaling of Online SMEs. *Technology Innovation Management Review, 10*(4), 48-57. https://doi.org/10.22215/timreview/1346

Zheng, X., & Sun, A. (2022). Digitalization and Internationalization: A Study of the Manufacturing Industry in China. *Transformations in Business & Economics, 21*, no 2B (56B).

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Environmental Certification and Financial Performance in Road Passenger Transport Companies: A Comparative Analysis

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Abstract: *This research examines the relationship between environmental certification and the financial performance of road passenger transport companies during the period from 2010 to 2019. Through a comparative analysis of certified and non-certified companies, key financial ratios including return on assets (ROA), asset turnover (AT), net operating income per employee (NOIPE), and revenue growth (RG) are evaluated. The findings indicate that certified companies consistently outperform their non-certified counterparts in terms of profitability, revenue growth, and employee productivity. These results suggest that the implementation of environmental certifications can enhance competitiveness and financial outcomes, supporting the notion that environmental regulations can benefit both companies and society. It is anticipated that these findings will guide policymakers and managers in the transport sector towards more sustainable practices.*

1. INTRODUCTION

The mobility of people and goods is essential for global economic development, with road transport being the most utilised means (Eurostat, 2021). However, this mode of transport has a negative impact on the environment and public health, particularly in urban areas. For this reason, both public institutions and private organisations, as well as other stakeholders, are exerting increasing pressure on policymakers to establish stricter environmental regulations on road passenger transport companies to adopt more sustainable practices. Nevertheless, investment in more efficient and sustainable technology should not be viewed as an obstacle but as an opportunity to yield substantial benefits. As posited by the Porter hypothesis (Porter & van der Linde, 1995), environmental regulations can facilitate a "win-win" scenario whereby, in addition to societal and environmental improvements, companies can also achieve greater economic benefits by gaining competitive advantages through both differentiation and cost reduction (Hagmann et al., 2015; Phillips et al., 2019).

In this context, environmental management system certification is a widely adopted tool in RPTCs for managing their environmental responsibilities (Kovac et al., 2020). The effective adoption of certification could lead to an increase in financial profitability, stemming from internal operational improvements within the organisation, enhanced employee efficiency, investment in sustainable assets, and ultimately, savings in resources and costs (Abdallah, 2017; Phillips et al., 2019). Furthermore, certification would enhance the company's image and reputation, as it is perceived by customers as an indicator of environmental commitment, attracting clientele and consequently leading to higher sales (Iatridis & Kesidou, 2016).

Despite the growing importance of environmental commitment in road passenger transport companies, the literature addressing its relationship with financial profitability remains limited (Fernández

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Vázquez-Noguerol et al., 2018). This study aims to contribute to the expansion of research in this area by comparing the financial performance of certified and non-certified private road passenger transport companies between 2010 and 2019. Through a descriptive analysis, differences in key profitability indicators will be examined, along with aspects such as users' environmental perception, sustainable asset management, and employees' ecological behaviour in both types of companies. The results will guide decision-making on environmental policies for both public officials and sector managers.

2. THEORETICAL FRAME

To be a developed country, it is essential to have an evolved transport system that meets the needs of businesses and individuals. Indeed, in economic terms, in 2021, the transport sector accounted for approximately 5% of GDP and 5.36% of employment in Europe (Eurostat, 2021). In this regard, among the various modes of transport, road transport plays a pivotal economic role, as it facilitates the movement of the largest number of goods and passengers (Fernández Vázquez-Noguerol et al., 2018). According to Eurostat, nearly half of all transport was conducted by road (Eurostat, 2021).

However, road transport is one of the sectors with the most significant negative impact on the environment (Osietrin et al., 2015). In addition to being one of the main CO_2 emitters, accounting for 23% in 2021 (World Bank, 2021), it is a source of air, noise, and thermal pollution, leading to environmental degradation (Huang et al., 2018). This situation is projected to deteriorate further with continued economic and population growth (World Bank, 2021).

In light of this scenario, it is essential, as recommended by the European Union and the United Nations General Assembly, to develop a public transport system that meets mobility needs while minimising negative environmental impacts. In this regard, as warned by the United Nations General Assembly, the sustainability of the sector must consider economic, social, and environmental aspects (United Nations, 2015).

Given its significance, the evaluation of sustainability performance in the transport sector, from social, economic, and environmental dimensions, has attracted the attention of researchers, particularly in the environmental domain (Kumar & Anbanandam, 2020). Studies have explored environmental actions and policies in regions such as Asia, the European Union, and OECD countries, as well as emissions from various modes of transport and strategies to mitigate their environmental impact. Measures such as vehicle energy efficiency, transport and distribution management, the use of alternative fuels, and the promotion of integrated and alternative transport modes have been analysed.

However, the attention given to the economic and social dimensions has been limited (Fernández Vázquez-Noguerol et al., 2018). From an economic perspective, studies have examined transport costs and prices, as well as the economic effects of environmental actions. With a focus on the social dimension, research has addressed issues such as risks and safety, equity, and the promotion of best practices.

The interconnection between the environmental, economic, and social dimensions is evident. According to Porter and van der Linde (1995), a mutually beneficial situation can be achieved across all three dimensions. In the social realm, efforts directed towards sustainable transport translate into improvements in public health and quality of life. Moreover, these efforts will not only contribute to reducing negative environmental impacts but will also enable institutional savings and enhance the profitability of transport companies, as highlighted by various studies (Oberhofer & Dieplinger, 2014).

Consequently, environmental management can serve as a valuable differentiation strategy in the road passenger transport sector. To this end, the certification of Environmental Management Systems (EMS) by international verification bodies is among the most widely adopted measures worldwide. According to Abdallah (2017), environmental certification ensures an effective environmental management system. The greater the ecological efficiency of a company, the higher the likelihood of adopting such certification. Many transport companies have successfully managed their environmental responsibilities through this certification, which allows them to improve their environmental management (Kovac et al., 2020).

Moreover, environmental certification aids transport companies in differentiating themselves from their competitors, achieving customer acceptance and social legitimacy, thereby enhancing their image and reputation. This can enhance customer satisfaction and loyalty, potentially influencing passenger attitudes and decisions, thereby driving increased demand and sales (Hagmann et al., 2015).

Environmental certification also leads to internal operational improvements and personnel enhancements, allowing for cost reductions and the attainment of competitive advantages (Kovac et al., 2020). This process fosters continuous improvement that positively affects operational efficiency. Environmental certification necessitates internal assessments regarding resource usage and the adoption of environmental management techniques aimed at reducing negative impacts. Environmental awareness among employees can enhance their performance, and investments in technology and sustainable management can optimise operations and reduce resource consumption (Phillips et al., 2019).

Despite the importance of these factors, studies analysing the effects of environmental management on the financial profitability of passenger transport companies are limited. Thus, this document aims to expand the research on the relationship between environmental management and financial profitability. In this analysis, environmental certification based on international standards and verified by external bodies is employed as an indicator of the environmental proactivity of transport companies. While various indicators can measure environmental proactivity, certification is widely recognised in the literature as a reliable tool for this purpose (Cavero-Rubio & Amorós-Martínez, 2020). This choice minimises bias associated with the lack of an objective, standardised variable, thereby improving the reliability and comparability of the study.

In addition to examining the relationship between environmental certification and financial performance, the study also addresses the analysis of variables such as the green image of passengers, sustainable asset management, and the ecological performance of employees. This approach provides a broader perspective on how environmental certification may influence various factors, which, in turn, can contribute to the financial performance of passenger transport companies.

It is important to note that the environmental behaviour of transport companies is also conditioned by their individual characteristics. For instance, internationally operating companies often exhibit greater ecological responsibility. Therefore, as indicated by Oberhofer and Dieplinger (2014), one variable that significantly influences the implementation of environmental measures is whether the company operates on international routes. Similarly, the formation of groups or alliances among transport companies appears to have a positive impact, as such collaborations tend to foster better environmental performance.

Lastly, it is pertinent to consider the type of service offered by transport companies. In Spain, tourism is the most significant sector of the economy (World Travel & Tourism Council, 2021),

and discretionary tourist transport is the service that mobilises the most passengers, far surpassing other types of transport, such as school or healthcare transport (KPMG, 2021). Given the economic significance of coastal tourism for PRPTCs, these companies are likely to prioritise environmental certifications and sustainable practices. Institutional pressures to protect the natural environment, critical for maintaining coastal tourism's appeal, further drive these efforts.

3. METHODOLOGY AND DATA

The study sample consists of private discretionary passenger road transport companies (PRPTCs) for the period 2009-2019. This period is sufficiently extensive for a longitudinal study, avoiding distortions caused by the COVID-19 pandemic. The selection of companies was conducted in two stages. First, the Iberian Balance Sheet Analysis System database was used to identify 297 PRPTCs that met the criteria of having complete financial data. Second, it was verified whether these companies were certified under the ISO 14001 standard. Records from certification bodies such as AENOR, Bureau Veritas, TÜV Rheinland Ibérica Inspection, Certification & Testing, S.A. and SGS ICS Ibérica, S.A. were consulted to confirm certification. In some cases, direct contact was also made with the PRPTCs in order to verify their certification status. The final sample was divided into two groups: 90 certified PRPTCs (990 observations) and 207 non-certified ones (2,277 observations).

In order to determine whether the effect of an EMS certification on an PRPTCs' financial performance is mediated by two pathways: firstly, on the efficiency with which assets and employees are utilised, and secondly, on the environmental image perceived by passengers.

Based on previous literature, the most indicative and stable indicator used by many researchers to measure companies' financial profitability is the Return on Assets (ROA). According to Cavero-Rubio and Amorós-Martínez (2020), ROA is the commonly used variable to measure financial performance in environmental management research.

In line with Noh (2019), Asset Turnover (AT) was selected as the most appropriate indicator for quantifying the impact of certification on sustainable asset management. Investment in sustainable assets would result in cost reductions and increased asset returns.

Research also suggests that environmental management can enhance employees' ecological behaviour, leading to improved performance. Prajogo et al. (2014) identified net operating income per employee (NOIPE) as a relevant ratio for quantifying employee performance.

Finally, it is reasonable to propose that obtaining environmental certification could improve passengers' environmental perception of PRPTCs, thereby increasing their preference for certified companies and, consequently, the sales revenue of these companies. For this reason, and in line with the approach taken by Wang and Lin (2022), revenue growth (RG) was chosen as the representative variable to quantify the effect of environmental certification on passengers' decision making when choosing PRPTCs.

Table 1 defines the four variables in question. It sets out ROA as the dependent variable and AT, NOIPE, and RG as independent or explanatory variables for ROA.

Table 2 presents the number of observations and certified and non-certified for classifications made according to defined individual characteristics: companies operating internationally, those belonging to a group or alliance (GROUP) and those operating in coastal areas (COAST).

Table 1. Variables Analysed

Variable	Description	Abbreviation
Return on assets	Earnings Before Interest and Taxes/Total assets	ROA
Revenue growth	(Revenues year^{t} - Revenues year^{t-1})/(Revenues year^{t-1});	RG
Asset turnover	Revenues/Total assets	AT
Net operating income per employee	Net operating income/Number of employees	NOIPE

Source: Own processing

Table 2. Distribution of road passenger transport companies in the sample

Variables		CERT		NoCERT		Total	
		Observations (PRPTC)	%	Observations (PRPTC)	%	Observations (PRPTC)	%
INT	Yes	429(39)	43.33%	803(73)	35.27%	1,232(112)	37.71%
	No	561(51)	56.67%	1.474(134)	64.73%	2,035(185)	62.29%
GROUP	Yes	539(49)	54.44%	979(89)	43.00%	1,518(138)	46.46%
	No	451(41)	45.56%	1.298(118)	57.00%	1,749(159)	53.54%
COAST	Yes	363(33)	36.67%	715(65)	31.40%	1,078(98)	33.00%
	No	627(57)	63.33%	1.562(142)	68.60%	2,189(199)	67.00%
POOLED SAMPLE		990(90)	100.00%	2,277(207)	100.00%	3,267(297)	100.00%

Source: Own processing

In order to calculate the ratios for each PRPTC, the financial statements from the Iberian Balance Sheet Analysis System database were employed. The statistical analysis of these ratios was conducted using the SPSS 28.0 software. A normality test (Kolmogorov-Smirnov) was performed to assess data distribution. As the results indicated that the data followed a normal distribution, a Student's t-test was employed to compare the means of selected variables between certified and non-certified PRPTCs, as well as across different groups defined by individual characteristics: companies operating internationally, companies belonging to groups or alliances, and those operating in coastal areas. This approach enabled the identification of significant differences in financial indicators, providing a solid basis for understanding the role of environmental certification in PRPTCs' performance over the analysed period.

4. RESULTS AND DISCUSSION

Table 3 presents the median, mean, and standard deviation values for all certified (CERT) and non-certified (NoCERT) PRPTCs, as well as for each grouping based on the individual characteristics of each company. Furthermore, it presents the differences in means and the statistical significance results from the Student's t-test.

As evidenced by the findings of the analysis of the grouped sample, PRPTCs certified with ISO 14001 demonstrate on average superior financial performance compared to non-certified PRPTCs over the analysed period. These findings support the proposition that environmental certification can be a significant determinant of enhanced business profitability, as suggested by previous literature (Phillips et al., 2019; Hagmann et al., 2015).

Table 3. Descriptive statistics. Mean Differences. Student-t test

			CERT			NoCERT			Difference Student-t test
Variables		**Ratio**	**Mean**	**Median**	**Std. dev.**	**Mean**	**Median**	**Std. dev.**	
		ROA	4.98%	4.30%	4.70%	4.37%	4.03%	4.03%	0.60%*
	Yes	RG	1.92%	1.25%	9.54%	1.22%	0.54%	9.25%	0.70%***
		NOIPE	4,879.28	3,406.31	5,695.93	4,019.29	3,350.12	4,415.17	859.99*
		AT	0.890	0.880	0.298	0.909	0.859	0.332	-0.019*
INT		ROA	5.07%	4.02%	4.71%	4.33%	3.68%	4.06%	0.74%*
	No	RG	2.74%	2.66%	9.42%	1.82%	1.35%	9.49%	0.92%**
		NOIPE	5,297.25	4,313.19	5,497.80	4,039.46	3,244.33	4,467.77	1,257.79*
		AT	0.793	0.745	0.259	0.867	0.840	0.325	-0.074
		ROA	5.29%	4.26%	4.68%	4.28%	3.73%	4.10%	1.01%*
	Yes	RG	2.13%	1.55%	8.89%	1.51%	1.05%	9.35%	0.62%***
		NOIPE	5,677.70	4,346.58	5,825.85	4,146.24	3,448.68	4,786.51	1,531.45*
		AT	0.803	0.755	0.279	0.885	0.849	0.356	-0.082*
GROUP		ROA	4,73%	3,93%	4,71%	4,40%	3,88%	4,01%	0,33%***
	No	RG	2,47%	2,29%	10,19%	1,73%	1,20%	9,45%	0,74%***
		NOIPE	4,499.83	3,283.82	5,257.97	3,950.08	3,163.53	4,187.19	549,75**
		AT	0.872	0.836	0.277	0.879	0.841	0.306	-0.007
		ROA	4.90%	4.27%	4.24%	4.09%	3.51%	4.13%	0.81%*
	Yes	RG	2.00%	2.33%	9.68%	1.36%	1.19%	9.58%	0.64%***
		NOIPE	5,017.93	4,332.61	5,075.12	3,839.36	2,933.92	4,591.96	1,178.57*
		AT	0.802	0.760	0.259	0.912	0.854	0.360	-0.110*
COAST		ROA	5.11%	4.05%	4.95%	4.47%	4.02%	4.01%	0.64%*
	No	RG	2.45%	1.48%	9.40%	1.76%	1.14%	9.33%	0.69%***
		NOIPE	5,166.93	3,748.03	5,879.98	4,120.08	3,461.14	4,379.46	1,046.85*
		AT	0.854	0.817	0.290	0.868	0.841	0.312	-0.015
		ROA	5.03%	4.10%	4.70%	4.35%	3.81%	4.05%	0.68%*
POOLED SAMPLE		RG	2.29%	1.90%	9.50%	1.64%	1.15%	9.41%	0.65%**
		NOIPE	5,110.77	3,923.70	5,587.84	4,032.20	3,274.58	4,447.88	1,078.57*
		AT	0.835	0.796	0.882	0.882	0.845	0.328	-0.047*

*p < 0.01; **p < 0.05; ***p < 0.1

Source: Own calculations

With regard to return on assets (ROA), certified companies demonstrate an average of 5.03%, which is markedly higher than the 4.35% exhibited by non-certified companies ($p < 0.01$). This result corroborates the assertion put forth by Porter and van der Linde (1995) that environmental regulations, rather than being a burden, can serve to enhance operational efficiency and thereby improve profitability. The implementation of environmental certification promotes more efficient utilisation of resources, which can subsequently enhance the profitability of certified companies (Abdallah, 2017).

Revenue Growth (RG) is another indicator in which certified companies significantly outperform non-certified ones. Certified PRPTCs show an average RG of 2.29%, compared to 1.64% for non-certified companies ($p < 0.05$). This outcome is consistent with the findings of Iatridis and Kesidou (2016), who posit that environmental certification can enhance a company's image and reputation, attracting a larger consumer base with heightened environmental awareness.

The Net Operating Income per Employee (NOIPE) also exhibits a higher and statistically significant mean for certified companies. This result, in line with Prajogo et al. (2014), suggests that sustainable practices, not only contribute to a company's financial profitability but also enhance individual employee productivity. ISO 14001 certification likely fosters greater employee awareness regarding environmental practices, leading to improved performance.

The Asset Turnover (AT) indicator is the only one slightly lower for certified companies, with an average of 0.835 compared to 0.882 for non-certified companies. Although the difference is slight, it is statistically significant ($p < 0.01$), indicating that certified companies, while exhibiting greater profitability, may be employing a more conservative approach to asset utilisation. This may be attributed to the fact that investment in sustainable assets may necessitate higher initial costs, which could ultimately yield long-term benefits (Noh, 2019).

Upon analysing subgroups of companies according to their individual characteristics, similar patterns to those in the grouped sample are observed, albeit with some interesting variations. PRPTCs operating internationally exhibit even more pronounced differences between certified and non-certified companies. The mean return on assets (ROA) for certified companies is 5.07%, while non-certified companies have a ROA of 4.33%, with a statistically significant difference ($p < 0.01$). This lends support to the assertion put forth by Delmas and Toffel (2004) that companies with international operations tend to demonstrate greater ecological responsibility as a result of heightened regulatory pressure and enhanced global visibility. Moreover, the NOIPE is markedly higher in certified companies, suggesting that these organisations, in addition to being more profitable, also manage their human capital more effectively.

For PRPTCs belonging to groups or alliances, the certified companies also exhibit a higher average ROA than their non-certified counterparts, with a notable difference of 1.01 percentage points ($p < 0.01$). It appears that group membership serves to enhance the benefits derived from certification. This may be attributed to the fact that alliances facilitate the exchange of optimal environmental practices (Oberhofer & Fürst, 2012). Similarly, NOIPE is markedly higher for certified companies, thereby reinforcing the significance of environmental practices in labour efficiency within grouped companies.

Finally, there are notable differences in the performance of PRPTCs operating in coastal areas. The mean ROA for certified companies is 5.11%, in comparison to 4.47% for non-certified companies ($p < 0.01$). Furthermore, RG is markedly higher for certified companies (2.45% compared to 1.76%), indicating that certification may assist in attracting a greater number of environmentally conscious tourists, thereby increasing sales and, ultimately, profitability.

5. FUTURE RESEARCH DIRECTIONS

This study opens various avenues for future research. One avenue for further research would be to conduct a more detailed analysis through regression studies, which would allow for a more precise identification of the key variables explaining the relationship between environmental certification and financial profitability. Using econometric models would facilitate the examination of the isolated impact of certification on companies' principal financial indicators.

Furthermore, additional research could investigate the role of environmental certification in attracting investors and its correlation with the cost of capital. Certification could influence investor perceptions, fostering greater confidence and more favourable financing conditions for certified companies.

Finally, it would be beneficial to examine the influence of public policies and government incentives on the adoption of environmental certifications. Future research could analyse how regulation and subsidies influence companies' decisions to obtain certification. Additionally, examining how these measures impact financial performance could provide valuable insights for policymakers promoting sustainability in the transport sector.

6. CONCLUSION

This study has examined the relationship between environmental certification and financial profitability in private passenger road transport companies, providing empirical evidence on the benefits of ISO 14001 certification. The results show that certified companies exhibit superior financial performance in terms of return on assets, revenue growth, and operational efficiency, as measured by net operating income per employee.

These findings support the hypothesis that environmental regulations, rather than being a burden, contribute to the financial success of companies, benefiting both organisations and society. Environmental certification has been shown to be an effective tool for enhancing a company's image and reputation, optimising efficiency, and attracting a more environmentally conscious audience. The results provide an evidence base for future strategic decision-making at both the business management and public policy levels.

References

Abdallah, T. (2017). *Sustainable Mass Transit: Challenges and Opportunities in Urban Public Transportation.* Elsevier. https://doi.org/10.1016/C2022-0-01297-6

Cavero-Rubio, J. A., & Amorós-Martínez, A. (2020). Environmental certification and Spanish hotels' performance in the 2008 financial crisis. *Journal of Sustainable Tourism, 28*(5), 771-796. https://doi.org/10.1080/09669582.2019.1705316

Delmas, M., & Toffel, M. W. (2004). Stakeholders and environmental management practices: An institutional framework. *Business Strategy and the Environment, 13,* 209-222. https://doi.org/10.1002/bse.409

Eurostat. (2021). *European statistics. Database. Transport.* https://ec.europa.eu/eurostat/web/main/data/database

Fernández Vázquez-Noguerol, M., González-Boubeta, I., Domínguez-Caamaño, P., & Prado-Prado, J. C. (2018). Best practices in road transport: An exploratory study. *Journal of Industrial Engineering and Management, 11*(2), 250-261. https://doi.org/10.3926/jiem.2525

Hagmann, C., Semeijn, J., & Vellenga, D. B. (2015). Exploring the green image of airlines: Passenger perceptions and airline choice. *Journal of Air Transport Management, 43,* 37-45. https://doi.org/10.1016/j.jairtraman.2015.01.003

Huang, Y., Ng, E. C., Zhou, J. L., Surawski, N. C., Chan, E. F., & Hong, G. (2018). Eco-driving technology for sustainable road transport: A review. *Renewable and sustainable energy reviews*, *93*, 596-609. https://doi.org/10.1016/j.rser.2018.05.030

Iatridis, K., & Kesidou, E. (2016). What drives substantive versus symbolic implementation of ISO 14001 in a time of economic crisis? Insights from Greek manufacturing companies. *Journal of Business Ethics, 148*, 859–877. http://dx.doi.org/10.1007/s10551-016-3019-8

Kovac, I., Vuletic, A., & Mlinarić, D. (2020). Environmental responsibility of Croatian road freight transport enterprises. *International Journal of Retail & Distribution Management, 48*(9), 1023-1035. https://doi.org/10.1108/IJRDM-07-2019-0248

KPMG. (2021). *El autobús como elemento clave de la nueva movilidad*. https://kpmg.com/es/es/home/tendencias/2021/03/autobus-elemento-clave-nueva-normalidad.html

Kumar, A., & Anbanandam, R. (2020). Assessment of environmental and social sustainability performance of the freight transportation industry: An index-based approach. *Transport Policy, 124,* 46-60. https://doi.org/10.1016/j.tranpol.2020.01.006

Noh, Y. (2019). The effects of corporate green efforts for sustainability: an event study approach. *Sustainability, 11*(15), 4073. https://doi.org/10.3390/su11154073

Oberhofer, P., & Dieplinger, M. (2014). Sustainability in the transport and logistics sector: lacking environmental measures. *Business Strategy and the Environment, 23*(4), 236-253. https://doi.org/10.1002/bse.1769

Oberhofer, P., & Fürst, E. (2012). Environmental management in the transport sector: findings of a quantitative survey. *EuroMed Journal of Business, 7*(3), 268-279. https://doi.org/10.1108/14502191211265325

Osietrin, M. M., Bespalov, D. O., & Dorosh, M. I. (2015). Basic principles of creating a transport model of the city. *Urban Planning and Territorial Planning: Scientific and Technical Collection of KNUBA, 57,* 309-320.

Phillips, S., Thai, V. V., & Halim, Z. (2019). Airline value chain capabilities and CSR performance: the connection between CSR leadership and CSR culture with CSR performance, customer satisfaction and financial performance. *The Asian Journal of Shipping and Logistics, 35*(1), 30-40. https://doi.org/10.1016/j.ajsl.2019.03.005

Porter, M., & van der Linde, C. (1995). Toward a new conception of the environment competitiveness relationship. *The Journal of Economic Perspectives, 9*(4), 97-118. http://dx.doi.org/10.1257/jep.9.4.97

Prajogo, D., Tang, A. K. Y., & Lai, K. H. (2014). The diffusion of environmental management system and its effect on environmental management practices. *International Journal of Operations & Production Management, 34*(5), 565-585. https://doi.org/10.1108/IJOPM-10-2012-0448

United Nations. (2015). *Sustainable transport.* https://sdgs.un.org/topics/sustainable-transport

Wang, C., & Lin, Y. (2022). Does bargaining power mitigate the relationship between environmental regulation and firm performance? Evidence from China. *Journal of Cleaner Production, 331,* 129859. https://doi.org/10.1016/j.jclepro.2021.129859

World Bank. (2021). https://documents1.worldbank.org/curated/en/771941622009013802/pdf/State-and-Trends-of-Carbon-Pricing-2021.pdf

World Travel & Tourism Council. (2021). *Tourism Data and Statistics.* https://researchhub.wttc.org/product/spain-economic-impact-report

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Financial Stress and Its Role in the New Trend of AI Investing

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Abstract: *Investment asset prices are increasingly more determined not only by economic fundamentals, but also by non-financial behavioral factors, such as the investor sentiment and emotions. One of key emotions in investing is financial stress, which tends to be high during economic crises and low during periods of growth. This paper aims to identify how strong is the impact of financial stress on the growth of technology stock prices during the current AI boom. Using regression analysis and econometric modeling, including a proxy variable of Financial Stress Index (FSI) from the Federal Reserve System of St. Louis, the results showed at 5% level of significance ($p < 0.05$) a negative correlation with a coefficient of ß1=-605,67 between financial stress and AI stock prices. These findings confirm that lower levels of stress contributed to AI investment growth and provide investors implications to incorporate not purely economic factors in decision-making and investment strategies.*

1. INTRODUCTION

Accelerated digitalization has emerged as one of the most significant consequences of the COVID-19 pandemic, the central point of which is also artificial intelligence (AI). Innovations that started in the technology sector gradually spread to other industries, which attracted considerable interest from investors and created a new trend of AI investing in companies such as NVIDIA, Microsoft and Apple. In this context, related spending on artificial intelligence, exceeded the mark of 150 billion dollars in 2023 (PwC, 2023; Bloomberg Intelligence, 2023).

Although companies developing artificial intelligence have benefited from this evolution, there are increasing concerns about the extent to which this growth is sustainable and not conditioned by irrational investor behavior. Given these circumstances, this paper aims to examine how a non-financial behavioral factor in the form of financial stress affects the development of technology stock prices during the current period of AI investing. Using regression analysis and econometric modeling, we will examine whether the current lower levels of financial stress, following after the high stress periods of COVID-19 pandemic, the war in Ukraine, or the recent inflationary crisis, contribute to the ongoing growth of investing in artificial intelligence. On this basis, the results will clarify to what extent is asset valuation growth driven solely by objective fundamentals or is also influenced by investor sentiment.

2. LITERATURE REVIEW

Artificial intelligence (abbreviation AI) refers to machines simulating human intelligence, with its use rapidly expanding in industries such as healthcare, finance, and manufacturing (Russell & Norvig, 2020). As AI technologies advanced, investors increasingly focused on companies such as NVIDIA, which as a result of elevated interest in new AI technologies saw a sharp

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increase in their valuation (Kochetkov & Akhatova, 2023). This phenomenon simultaneously gave rise to what some now call "AI investing" or the "AI bubble", as the market's enthusiasm led to an unprecedented valuation (Chakravarty & Michailidis, 2024).

The behaviour of investors is a critical part of financial decision-making. While traditional financial theories assume the rationality of investment decisions, behavioural finance research suggests that this is not always the case (Barber & Odean, 2000). Studies show that investors often act irrationally, driven by behavioural biases that can lead to phenomena such as asset bubbles (Shiller, 2022). These biases are essentially divided into two categories: cognitive, stemming from errors in reasoning such as overconfidence or herding, and emotional, arising from impulses or feelings such as fear and overreaction (Loewenstein et al., 2001; Shaji & Uma, 2024).

For our research, a key emotional bias is financial stress, during which individuals' logical processes are disrupted, leading to heightened emotional responses (Kleine et al., 2024). This phenomenon is particularly important in periods of market uncertainty, such as economic crises, where stress can impair emotional control and lead to suboptimal investment strategies (Montier, 2002). It is likewise interesting that lower levels of stress in markets can also contribute to the formation of financial bubbles, as investors are less cautious and more inclined to make speculative investments (Starcke & Brand, 2012).

The specific impact of financial stress on asset prices is mainly mentioned in literature addressing periods of strong emotions such as crises or booms (Baker & Wurgler, 2007; Kelley et al., 2023), when the purchase and sale of assets are irrational and mostly carried out without proper prior analysis (Akerlof & Shiller, 2009; Pástor & Veronesi, 2009). On this basis, previous empirical studies have shown a significant negative correlation between financial stress and investment prices. For example, a study by Ludvigson and Ng (2007) found a negative coefficient of -0.45 for the period of the global financial crisis in 2008. A more recent study by Zhang et al. (2020) and Cerqueti and Ficcadenti (2024) for the era of the COVID-19 pandemic further confirmed this negative impact of stress and anxiety on the performance of financial markets.

In the context of the technological development examined by us, the period of the Dotcom technology bubble from 2000 is relevant, where, according to Hong and Stein (2003), financial stress played a substantial part, in the sense that speculation together with rapid stress fluctuations contributed to the instability and subsequent crash of the stock market. Collectively, these examples illustrate the significant role of stress in triggering and amplifying market bubbles, particularly in high-growth industries such as technology, which is also the focus of the ongoing AI investing phenomenon that we will be researching.

3. METHODOLOGY AND DATA

The main aim of the research is to identify how the non-financial behavioural factor of financial stress affects the price development of technology stocks during the current period of AI investing. We proceed from the primary hypothesis that when abstracting from external shocks (ceteris paribus) a period of positive expectations from the future of AI innovation is reflected in lower investor stress, and thus contributes to the growth of asset valuations (Hong & Stein, 2003; Kleine et al., 2024; Taffler et al., 2024).

The research utilized secondary empirical data, where the set of variables shown in Table 1 had a character of time series with the investigated period following the beginning of the AI boom from October 2022 to June 2024. At the daily frequency, this represents a sample with 403 daily observations.

Table 1. List of used variables

Variable	Label	Type	Source
AI investment price	AI_invest	Dependent	Bloomberg markets
Financial stress (proxy)	fin_stress	Independent	FED
Bond yield	bonds	Control	Yahoo Finance
GDP growth	gdp_growth	Control	FED
Unemployment	unemploy	Control	FED
Inflation	inflation	Control	FED
Interest rates	interest_rate	Control	FED

Source: Own processing

The main independent variable of financial stress is measured through the proxy variable of the Financial Stress Index (FSI), which is officially published by the Federal Reserve Bank of St. Louis and U.S. Bureau of Economic Analysis (2023). The index is compiled from 18 individual data series: seven interest rate series, six yield spreads and five other indicators. The starting value of the index is designed at the zero level, where values below zero indicate below-average tension in the market, while values above zero indicate above-average tension and a high incidence of stress.

The dependent variable in this study represents the price of the NASDAQ Composite (^NDX) technology stock index, which is quoted in US dollars and is market-capitalization weighted. The index consists of over 3,000 technology companies, including major big-tech companies such as Apple, Microsoft, Alphabet, NVIDIA and others. A detailed composition of the index, listing the first 100 companies ranked by market capitalization, is presented in Table 2.

Table 2. Structure of the AI stock index

Composition of ^NDX (by market capitalization)			
Apple Inc.	Arm Holdings plc	DoorDash, Inc.	Keurig Dr Pepper Inc.
NVIDIA Corporation	PDD Holdings Inc.	O'Reilly Automotive	Electronic Arts Inc.
Microsoft Corporation	Vertex Pharmaceutical	Workday, Inc.	Lululemon Athletica
Amazon.com, Inc.	Starbucks Corporation	CSX Corporation	Honeywell Inc.
Alphabet Inc.	Micron Technology,	Autodesk, Inc.	Exelon Corporation
Meta Platforms, Inc.	Gilead Sciences,	The Trade Desk, Inc.	Solutions Corporation
Tesla, Inc.	Analog Devices,	Charter, Inc.	The Kraft Heinz
Broadcom Inc.	Intel Corporation	Roper Technologies,	GE HealthCare
Costco Wholesale	Lam Research Corporation	Copart, Inc.	Coca-Cola
Netflix, Inc.	Cintas Corporation	NXP Semiconductors	Microchip Technology
T-Mobile US, Inc.	CrowdStrike Holdings,	Diamondback Energy,	IDEXX Laboratories,
ASML Holding N.V.	Airbnb, Inc.	Monster Beverage	CoStar Group, Inc.
Cisco Systems, Inc.	Mondelez International,	American Electric	Zscaler, Inc.
Adobe Inc.	PayPal Holdings,	Power Company, Inc.	ON Semiconductor
Advanced Micro Devices	Synopsys, Inc.	Paychex, Inc.	DexCom, Inc.
PepsiCo, Inc.	Marvell Technology,	Datadog, Inc.	Warner Bros.
Linde plc	Regeneron Pharmaceuticals	Ross Stores, Inc.	GlobalFoundries Inc.
AstraZeneca PLC	Marriott International	Line, Inc.	Biogen Inc.
Intuitive Surgical, Inc.		Bloomberg markets	Moderna, Inc.
QUALCOMM		ANSYS, Inc.	Illumina, Inc.
Booking Holdings Inc.		Xcel Energy Inc.	Dollar Tree, Inc.
		Verisk Analytics, Inc.	Walgreens Alliance, Inc.

Source: Own processing and Yahoo Finance (2024)

The applied methodology is primarily graphical and regression analysis to quantify the influence of the independent variable (x) on the development of the dependent variable (y). We implemented the initial regression in the form of a Pearson correlation matrix, where we examine the strength of the linear correlation between the variables according to the following formula originating from Benesty et al. (2009):

$$r = \frac{\sum(x_i - \bar{x}) * (y_i - \bar{y})}{\sum(x_i - \bar{x})^2 * \sum(y_i - \bar{y})^2} \quad (1)$$

In the second step of the analysis, was used the OLS multivariable linear regression (MLR) econometric model in the below depicted expression inspired by Khan and Zaman (2012) and Long et al. (2024):

$$AI_{invest} = \beta_0 + \beta_1 * fin_{stress} + \beta_2 * bonds + \beta_3 * gdp_{growth} + \beta_4 * unemploy + \\ + \beta_4 * inflation + \beta_5 * interest_{rate} + u \quad (2)$$

Where $ß_0$ = intercept, $ß_{1,2...k}$ = regression coefficients and u = error term.

The selected methodology intends to enable the quantification of predictors of the influence of chosen behavioural factors and at the same time control the estimates for other confounding elements.

4. RESEARCH RESULTS

The initial analysis of the descriptive statistics in Table 3 provides an overview of the key variables participating in this study. The dependent variable *AI_invest* exhibits a high mean value of 13,570.27 and substantial variability, as evidenced by the standard deviation of 1,858.86, which reflects significant fluctuations in AI-related investments over the observed period. In contrast, the independent variable of financial stress has a mean value of -0.525, suggesting a relatively stable environment closer to the baseline zero, though extreme peaks are associated with major crises. Other control variables, such as GDP growth and inflation, likewise demonstrate relatively stable mean values of 1.368 and 5.364, respectively, which consistently aligns with moderate economic conditions in this timeframe.

Table 3. Descriptive statistics for the variables used

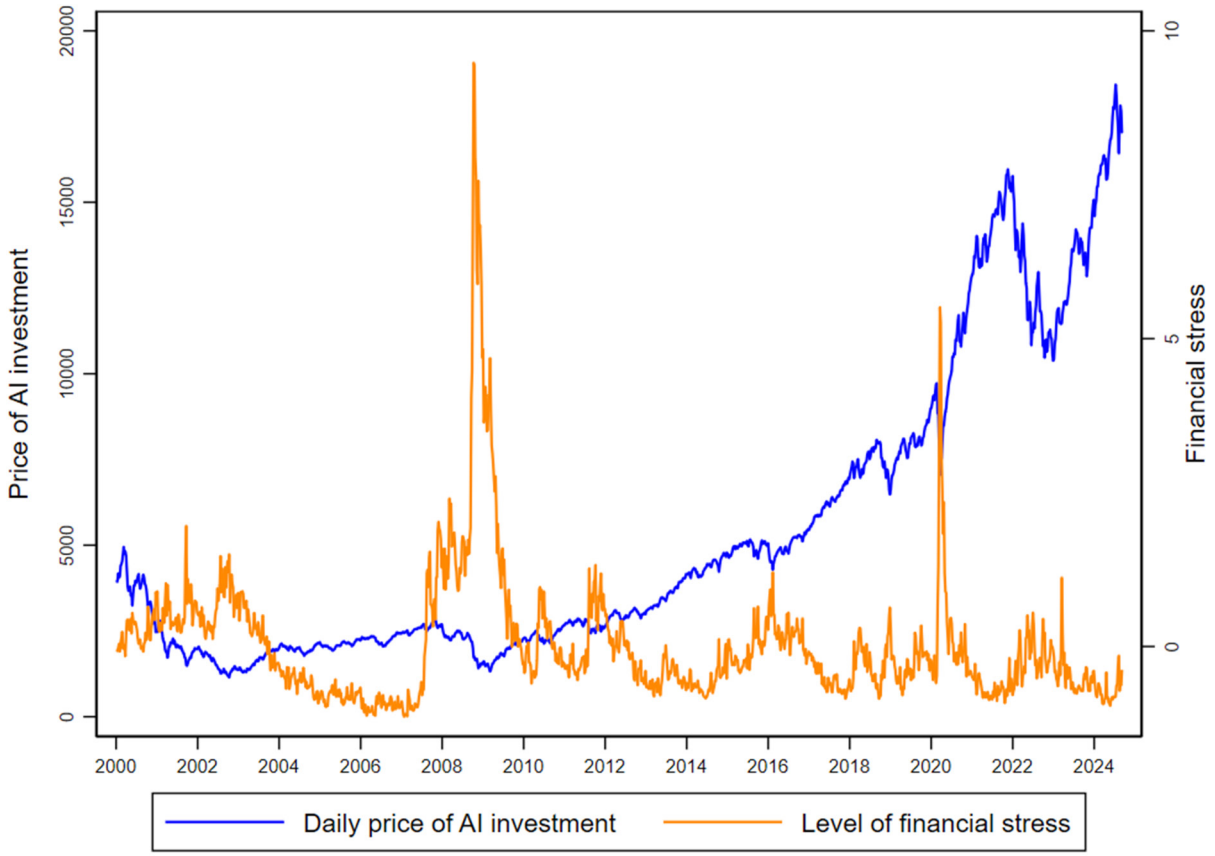
Variable	Obs	Mean	Std. Dev.	Min	Max
AI_invest	403	13570.271	1858.855	10213.29	17187.9
fin stress	403	-.525	.324	-.967	1.204
bonds	403	4.036	.402	3.287	4.988
gdp_growth	403	1.368	.356	.93	2.022
unemploy	403	3.714	.172	3.4	4
inflation	403	5.364	.826	4.403	6.538
interest_rate	403	4.99	.473	3.83	5.33

Source: Own calculations

In the subsequent long-term graphical display on Graph 1, we observe an inverse relationship between financial stress and stock prices. During major crises, such as the global crisis of 2008, the COVID-19 pandemic, or the war in Ukraine and the inflationary crisis of 2022, the level of financial stress has increased sharply, causing a smaller or larger drop in share prices. On the contrary, periods of low financial stress, such as the Internet euphoria at the beginning of the Dot-com bubble in 2000, saw a significant increase in the value of the investment. Together, these trends show that increased levels of stress lead to market declines, while low stress correlates with rising stock prices, as can potentially also be the case in the rising pattern of the ongoing AI technology phenomenon.

To quantify the current relationships in more detail, Pearson's correlation matrix was first used. Based on its results summarized in Table 4, we identify that there is a strong negative correlation

(-0.684) between AI investment return and financial stress, further supporting the inverse relationship identified earlier. Additionally, there is a strong negative correlation between the investment price and inflation (-0.925), as well as interest rates (-0.807), indicating that stock market performance weakens during periods of high inflation and rising interest rates. It then becomes all the more significant that even in such a period of economic slowdown, technology assets can achieve abnormal returns, most likely also thanks to the positive investor sentiment and lower stress levels stemming from previous arguments.



Graph 1. Long-term development of financial stress and price of technology stock index

Source: Own processing, Bloomberg Markets (2024) and Yahoo Finance (2024)

Table 4. Correlation matrix of dependencies within selected variables mix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) AI_invest	1.000						
(2) fin_stress	-0.684	1.000					
(3) bonds	0.599	-0.475	1.000				
(4) gdp_growth	-0.288	0.100	0.011	1.000			
(5) unemploy	0.866	-0.653	0.652	-0.089	1.000		
(6) inflation	-0.925	0.626	-0.771	0.232	-0.823	1.000	
(7) interest_rate	-0.807	-0.596	0.620	-0.226	0.694	-0.866	1.000

Source: Own calculations

In the last part of the research, we interpret the results of the OLS multivariate econometric model. The results summarized in Table 5 once more confirm the negative relationship between financial stress and technology stock index prices, even when taking into account the effects of other macroeconomic

factors represented as control variables. The regression coefficient for financial stress reached a statistically significant value of -605.67, at the significance level of 5% ($p < 0.05$). This indicates that a unit increase in the level of financial stress ceteris paribus results in a decrease in the price of the AI stock index by 605 units (at the current price meaning approximately 3.51%). Together with the earlier correlation analysis, we can conclude that increased financial stress negatively affects the performance of AI stock market. The AI boom is in this sense however benefiting from the opposite scenario of low stress that prompts higher investment prices, as was also observed in the graphical analysis. This is driven primarily by the optimism surrounding innovation, as well as recent mitigation of highly stressful periods such as the COVID-19 pandemic and the Ukraine crisis. All in all, these conditions then collectively create a favourable narrative for growth, particularly evident in AI-related markets.

Beyond the primary focus on financial stress, the control variables in the model likewise reveal notable impacts, similar to the correlation matrix. Both inflation (-1854.97) and interest rates (-131.38) show significant negative coefficients, underscoring their detrimental effect on investment prices. The negative coefficient for GDP growth (-327.55) further reflects the connection with a lower likelihood of interest rate cuts, indirectly pressuring AI-related investments, while unemployment remains statistically insignificant. Collectively, these results highlight the intertwined nature of investment asset prices, affirming that even in AI-driven markets, stock prices are deeply connected with broader economic factors.

Table 5. Econometric model results
Model 1: OLS, using observations 2022-10-31:2024-06-07 (T = 403)
Dependent variable: AI_invest

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	16800.1	1627.36	10.32	<0.0001	***
fin_stress	−605.606	100.653	−6.017	0.0379	**
bonds	−1240.72	98.6648	−12.58	0.1701	*
gdp_growth	−327.548	73.3140	−4.468	0.0791	*
unemploy	3368.96	2167.367	1.971	0.3071	
inflation	−1854.97	88.0898	−21.06	<0.0001	***
interest_rate	−131.379	17.3751	−2.271	0.0205	**

Mean dependent var	13570.27	S.D. dependent var	1858.855
Sum squared resid	90137.110	S.E. of regression	477.0943
R-squared	0.535109	Adjusted R-squared	0.537127
F (6, 396)	9.2753	P-value(F)	$1.1e^{-3}$
Log-likelihood	−3053.890	Akaike criterion	6121.781
Schwarz criterion	6149.773	Hannan-Quinn	6132.863
rho	0.920540	Durbin-Watson	1.169092

Source: Own calculations

In terms of model quality, the R^2 value of 0.5351 demonstrates a relatively higher level of explanatory power, which means that over 53.51 % of the variability in investment prices is due to the included variables. Regarding further econometric tests, the stationarity of the time series was confirmed, thanks to which it was not necessary to transform the data, as well as the initial assumptions about homoscedasticity, normality of residuals, and absence of autocorrelation were verified. The high F-statistic (9.2753) and highly significant p-value for the overall model ($1.1e^{-3}$) further attest to the robustness and overall quality of the model as a reliable tool for understanding how financial stress, along with other factors, affect the current formation of AI investment prices.

5. FUTURE RESEARCH DIRECTIONS

One of the main limitations of our research is the use of the FSI (Financial Stress Indicator) indicator itself, which has undergone changes in its calculation over time and therefore may affect the long-term consistency of the data. In addition, other factors that were not included in the models can also influence the formation of stock prices, which opens up space for improvements in the researched topic through future endeavours.

Future research could therefore expand on the findings by incorporating additional control variables, such as other behavioural biases like herding, fear, or overconfidence, to better understand the full spectrum of non-financial influences on stock prices. Comparing the impact of stress across different geographic regions would also provide valuable insights into how investor sensitivity varies among cultural contexts. Additionally, analysing the role of financial stress during other speculative bubbles, such as those in real estate, cryptocurrencies, or commodities markets, could help identify patterns even across sectors. Future studies may furthermore employ more qualitative methods, such as surveys or behavioural experiments, to gain deeper causal insights into investor sentiment and decision-making processes.

6. CONCLUSION

In this article, we have focused on examining how financial stress affects the continued growth in investment prices during the current wave of investor euphoria around artificial intelligence (AI). Given that previous studies have shown a significant impact of financial stress, especially in periods of crisis, the objective of our research was to identify how strong is the role of low stress in the price formation of technology stocks during this period of AI expansion.

The carried out econometric analysis revealed at the 5% level of significance ($p < 0.05$) a significant negative correlation between financial stress and the price of the AI stock index with coefficient ß1 = -605.67. The results therefore show that financial stress plays an important role in the current AI era, where AI companies benefit from low investor stress that leads to euphoria-motivated buying of shares and subsequent growth of investment prices.

The key contribution of the results lies in the investigation of a highly current financial phenomenon, where previous studies usually limited their research to crisis periods, while our paper clarified the role of stress even in times of speculative boom. The research findings therefore present important implications for investors to include behavioural factors in their investment analyses, as well as for policymakers and companies, for which an understanding of the role of emotions in decision-making allows for more realistic and effective strategies.

At a time when investment prices are increasingly influenced not only by fundamentals but also by the emotions of investors, who dangerously often make irrational decisions, it can be concluded that it has become necessary to take into account the impact of behavioural factors. In light of recent stress-inducing external shocks, such as the COVID-19 pandemic and the war in Ukraine, it is crucial to recognize how both low and high levels of stress can enhance or disrupt the trajectories of investment trends, which was in this paper emphasized the positive case of AI investing.

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References

Akerlof, G. A., & Shiller, R. J. (2009). *Animal spirits: How human psychology drives the economy, and why it matters for global capitalism*. Princeton University Press. ISBN: 978-0691145925.

Baker, M., & Wurgler, J. (2007). Investor sentiment in the stock market. *Journal of Economic Perspectives*, *21*(1), 129-151. https://doi.org/10.1257/jep.21.2.129

Barber, B. M., & Odean, T. (2000). Trading is hazardous to your wealth: The common stock investment performance of individual investors. *Journal of Finance*, *55*(3), 773-799. https://doi.org/10.1111/0022-1082.00226

Benesty, J., Chen, J., Huang, Y., & Cohen, I. (2009). Pearson Correlation Coefficient. *Springer Topics in Signal Processing*, 1-4. https://doi.org/10.1007/978-3-642-00296-0_5

Bloomberg Intelligence. (2023). AI as the next big tech bubble? Analysis of investment trends and market growth. Retrieved from https://www.bloomberg.com/intelligence/ai-investing-trends

Bloomberg Markets. (2024). Stocks – S&P500 INDEX. Retrieved from https://www.bloomberg.com/quote/SPX:IND

Cerqueti, R., & Ficcadenti, V. (2024). Anxiety about the pandemic and trust in financial markets. *The Annals of Regional Science, 72*(4), 1277-1328. https://doi.org/10.1007/s00168-023-01243-0

Chakravarty, A., & Michailidis, N. (2024). Artificial intelligence in financial services. *Journal of Technology and Investment*, *15*(1), 1-21. https://doi.org/10.1016/j.iimb.2024.04.002

Federal Reserve Bank of St. Louis and U.S. Bureau of Economic Analysis. (2023). FRED Economic series. Retrieved from https://fred.stlouisfed.org/series/

Hong, H., & Stein, J. C. (2003). Differences of opinion, short-sales constraints, and market crashes: Insights from the Dotcom bubble. *The Review of Financial Studies*, *16*(3), 497-525. https://doi.org/10.1093/rfs/hhg006

Kelley, H. H., Lee, Y., LeBaron-Black, A., Dollahite, D. C., James, S., Marks, L. D., & Hall, T. (2023). Change in Financial Stress and Relational Wellbeing During COVID-19: Exacerbating and Alleviating Influences. *Journal of Family and Economic Issues, 44*(1), 34-52. https://doi.org/10.1007/s10834-022-09822-7

Khan, M. N., & Zaman, S. (2012). Impact of Macroeconomic Variables on Stock Prices: Empirical Evidence from Karachi Stock Exchange, Pakistan. *Advances in Intelligent and Soft Computing*, 227-233. https://doi.org/10.1007/978-3-642-27966-9_32

Kleine, A.-K., Schmitt, A., & Wisse, B. M. (2024). Financial stress and quit intention: the mediating role of entrepreneurs' affective commitment. *International Entrepreneurship and Management Journal, 20*(2), 1487-1510. https://doi.org/10.1007/s11365-024-00972-8

Kochetkov, A., & Akhatova, G. (2023). Innovation: A State-of-the-Art Review and Typology. *International Journal of Innovation Studies*, *12*(3), 53-67. https://doi.org/10.1016/j.ijis.2023.05.004

Loewenstein, G. F., Weber, E. U., Hsee, C. K., & Welch, N. (2001). Risk as feelings. *Psychological Bulletin, 127*(2), 267-286. https://doi.org/10.1037/0033-2909.127.2.267

Long, W., Gao, J., Bai, K., & Lu, Z. (2024). A hybrid model for stock price prediction based on multi-view heterogeneous data. *Financial Innovation, 10*(1). https://doi.org/10.1186/s40854-023-00519-w

Ludvigson, S. C., & Ng, S. (2007). The empirical risk-return relation: A factor analysis approach. *Journal of Financial Economics, 83*(1), 171-222. https://doi.org/10.1016/j.jfineco.2005.12.002

Montier, J. (2002). *Behavioural finance: Insights into irrational minds and markets*. John Wiley & Sons. ISBN: 978-0470844878.

Pástor, Ľ., & Veronesi, P. (2009). Technological Revolutions and Stock Prices. *American Economic Review, 99*(4), 1451-1483. https://doi.org/10.1257/aer.99.4.1451

PwC. (2023). AI and the economy: Investment in AI booms amid market uncertainty. Retrieved from https://www.pwc.com/gx/en/industries/technology/publications.html

Russell, S., & Norvig, P. (2020). *Artificial Intelligence: A Modern Approach* (4th ed.). Pearson. ISBN: 978-0134610993.

Shaji, A. K., & Uma, V. R. (2024). Behavioral Bias as an Instrumental Factor in Investment Decision-An Empirical Analysis. *Studies in Systems, Decision and Control*, 807-818. https://doi.org/10.1007/978-3-031-35828-9_67

Shiller, R. J. (2022). *Narrative economics: How stories go viral and drive major economic events* (2nd ed.). Princeton University Press. ISBN: 978-0691210265.

Starcke, K., & Brand, M. (2012). Decision making under stress: A contemporary perspective. *Biobehavioural Reviews*, *36*(1), p. 1227-1331. https://doi.org/10.1016/j.neubiorev.2012.02.003

Taffler, R. J., Wang, C., & Agarwal, V. (2024). Investor emotions and market bubbles. *Review of Quantitative Finance and Accounting*. https://doi.org/10.1007/s11156-024-01309-w

Yahoo Finance. (2024). Markets. Retrieved from https://finance.yahoo.com

Zhang, D., Hu, M., & Ji, Q. (2020). Financial markets under the global pandemic of COVID-19. *Finance Research Letters, 36*, 101528. https://doi.org/10.1016/j.frl.2020.101528

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Knowledge of Capital Market Products: Initial Insights for Austrian and German Students of Generations Y & Z*

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Abstract: *Many international studies focus on financial literacy, but there are still many open questions in the research field that require further exploration. In this study, students of generations Y and Z from Austria and Germany were asked about their experiences and knowledge of capital market products. Male students and students belonging to Generation Y traded in securities significantly more often than their counterparts. Regarding the knowledge of selected capital market products, there is only a significant difference between male and female students for real estate investment funds and ex-change-traded funds (ETFs). Products like shares, bonds, and cryptocurrencies are well-known to both genders. Thus, only a partial "gender gap" could be detected. Overall, there is a lack of knowledge about several capital market products observable. Appropriate didactically prepared courses within the framework of university curricula and beyond could enhance the financial literacy level of the Austrian and German population.*

1. INTRODUCTION

In the period between 1976 and 2014 inclusive, Laeven and Valencia (2020) reported 151 systemic banking crises worldwide. Many of these events did not receive any media attention because they only affected a few countries or regions outside the industrialized world. Across the world students of generations Y and Z have experienced severe recent crises (e.g. COVID-19 pandemic, the Russia-Ukraine conflict, etc.), which have had serious consequences for the world's money flows and capital markets. All these circumstances lead to higher volatilities (Grundmann & Spitzner, 2019) and investors are in consequence exposed to higher financial risks (Lusardi, 2015b). Despite these circumstances, international studies generally show that the population has a low level of general financial knowledge (e. g. Lusardi & Mitchell, 2011).

The relevance of spreading general financial knowledge among students and the population as a whole can be argued based on the above explanations. General financial knowledge is the basis for enabling financial well-being (Bongini & Zia, 2018). Achieving this goal is becoming much more difficult due to the increasing complexity of the environment, financial products and services (Alsemgeest, 2015; Lusardi, 2015b; Lusardi & Mitchell, 2014). The current and past financial crises and turbulences in capital markets also emphasize the importance of general financial knowledge, as financial decisions have to be made despite these uncertainties (Becchetti et al., 2013; Lusardi & Mitchell, 2014). There is a consensus in the empirical literature that by increasing general

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financial literacy, people make better financial decisions (Allgood & Walstad, 2016) and their financial well-being improves as a result (Bae et al., 2022; Finke & Huston, 2014). For this reason, the majority of researchers recommend integrating general financial knowledge into curricula. This is important to prepare students for all the challenges outlined above (e g. Alsemgeest, 2015; Baglioni et al., 2018; Lusardi, 2015a; Lusardi et al., 2010). We want to contribute to the financial literacy literature by showing to which extent these generalized findings apply to Austrian and German students in the year 2023 and define policy recommendations for further improving financial literacy levels.

In this study, a survey was conducted among Austrian and German students to ascertain, as a first step, what experience and knowledge they have of selected capital market products. Based on the internationally recognized relevance of general financial education, the results provide hints for effectively implementing a pending revision of business- and economics-oriented degree program curricula. At the center of our study are the following research questions:

- Do students already have experience in buying securities and how does this differ by gender and generation?
- Are students familiar with selected capital market products and how does the level of knowledge differ depending on gender and generation?

The paper is structured as follows. Section 2 shows the positive effects of increased financial literacy documented in the literature. The data and methodology are shown in section 3. In section 4, the results are presented and discussed in light of the existing literature. Section 5 summarizes the findings of the underlying study.

2. FINANCIAL LITERACY BACKGROUND AND LITERATURE REVIEW

There is no general definition of financial literacy in the literature (e.g. Finke & Huston, 2014). The lack of a standardized definition can also be seen as a reason why there are no accurate measures to determine financial knowledge levels (Knoll & Houts, 2012). From a theoretical perspective, it can be assumed that increasing financial literacy increases general financial knowledge and improves the ability to make decisions in financial situations (Warmath & Zimmerman, 2019). People with good financial knowledge are more aware that they need to provide for their retirement and plan and save accordingly (Behrman et al., 2012; Breitbach & Walstad, 2016; Lusardi & Mitchell, 2011; van Rooij et al., 2012). This aspect is particularly important for women, as they live longer on average than men and therefore must maintain a 'financial well-being' for longer (e.g. Baglioni et al., 2018; Williams, 2016). People with a higher level of general financial education also exhibit more professional and less risky behavior regarding their understanding of debt. They understand the concept of debt and interest payments, can calculate future debt payments, and are generally less likely to be overindebted (Breitbach & Walstad, 2016; Lusardi & Tufano, 2015; Stango & Zinman, 2009; Xiao et al., 2014). These studies also stress that students can already lay the foundation for this behavior as students with a higher level of financial knowledge exhibit less risky borrowing behavior. In the area of investments, financially educated people are more likely to be able to select investment funds based on fundamental analyses and to diversify their savings to reduce risks and generate higher returns (e. g. Hastings et al., 2011; van Rooij et al., 2012).

Generally speaking, a higher level of financial literacy influences the resilience/soundness and efficiency of financial systems. Consumers who have more financial knowledge are better able to make investment and financing decisions, have a greater awareness of the relationship between risk and return, and are more confident to ask questions and scrutinize financial products (Widdowson

& Hailwood, 2007). Moreover, many empirical studies show that certain factors can be positively and negatively associated with financial literacy, for example:

- **Gender:** Several studies show a negative correlation between the female gender and general financial knowledge (Dewi, 2022; Erner et al., 2016; and Gerrans & Heaney, 2019). The inequality in knowledge between the sexes is defined as the 'gender gap' and is the most important aspect in academic and political discussions.
- **Age:** Evidence shows that financial literacy increases with age and experience (e.g. Baglioni et al., 2018).
- **Education:** People who have a higher level of education or training show a higher level of general financial literacy (Baglioni et al., 2018; Bianchi, 2018; Hastings & Mitchell, 2020).
- **Income/Wealth:** People who have a higher income and higher wealth show a higher level of financial literacy (e.g. Bianchi, 2018).

3. DATA AND METHODOLOGY

3.1. Data

To collect the data, an online questionnaire was developed based on a comprehensive literature review (e.g. DePoy & Gitlin, 2011; Greenstein & Davis, 2013) and three expert interviews. The goal was to ensure the comprehensibility of the questions and the relevance of the content as required by Hulland et al. (2018). A total of 262 Austrian and German students completed the questionnaire at the University of Applied Sciences Kufstein located in the border region of Germany. All incomplete responses were deleted, thus, further statistical analyses were only carried out with a sample of 255 full student responses (e.g. Jamshidian, 2009). Table 1 shows a summary of all variables relevant to this study.

Table 1. Variable Definition

Name	Abbreviation	Definition	Measurement
Age	AGE	Age of the respondents in years	metric
Generation	GEN	Dummy variable with 1 = Generation Y and 0 = Generation Z	nominal
Gender	GENDER	Dummy variable with 1 = female (f) and 0 = male (m)	nominal
Security purchase	SEC_BUY	Dummy variable with 1 = if a security was purchased in the past and 0 = otherwise	nominal
Knowledge of capital market products/ instruments	KNOW	Dummy variable with 1 = product or instrument is known to respondent and 0 = otherwise; 5 products were analyzed: - KNOW_SHARES, - KNOW_BONDS, - KNOW_FUNDS, - KNOW_ETFs, - KNOW_CRYPTOS	nominal

Source: Own research

3.2. Methodology

Based on the year of birth surveyed, the students could be subdivided into generations Y (1980-1994) and Z (1995-2009) as suggested by McCrindle (2014). For the KNOW variable, respondents had to answer whether or not they were familiar with five different asset classes ranging from shares, bonds, property investment funds to exchange-traded funds (ETFs) and cryptocurrencies

following Francisco (2012). In addition to frequencies and descriptive statistics, cross-tabulations were created to analyze the results. The χ^2-test was used to exclude or establish significance for the nominally scaled data as suggested by Burns and Burns (2008). Table 2 shows selected descriptive statistics for all respondents and subgroups differentiated by gender and generation. Male students are significantly older than female students. Due to the categorization of students into the two generations Y and Z, Generation Y students are, per construction, significantly older than Generation Z students.

Table 2. Descriptive Statistics

Variable	n	Mean	S.E.	Median	σ	F-stat
AGE	255	24,494	0,281	23,000	4,493	-
AGE (m)	98	25,255	0,470	24,000	4,649	4,486**
AGE (w)	157	24,019	0,346	23,000	4,340	
AGE (Y)	34	33,412	0,696	33,000	4,061	205,519***
AGE (Z)	221	23,122	0,174	23,000	2,579	

Significance levels: *** = 1 %; ** = 5 %. The last column shows the F-statistic of the Welch test. As the data on the AGE variable are not normally distributed, the use of this test for differences is recommended in line with Rasch et al. (2011), as it produces robust estimation results despite the skewness of the distribution.

Source: Own research

4. RESULTS

First, the relevance of gender and generation for security purchase decisions was analyzed. Of the 255 respondents, 134 (52.55%) have already purchased a security in the past (SEC_BUY). Furthermore, in Table 3 one can see that male students have bought a security in the past significantly more often than female students (males (m) = 76.5% of the time and females (f) = 37.6%). This is in line with the research of Fung and Durand (2014) and Farrell (2014) observing that males trade significantly more often than females. There are also statistically significant differences observable between the generations. Generation Y students have invested in securities significantly more often than Generation Z students (GenY = 70.6% of the time versus GenZ = 49.8%). Students who have already invested in security in the past are significantly older than students who have not (F-statistic according to Welch test: 7.876 (p-value = 0.005)). Thus, age plays an important role in whether or not students have already invested in capital market securities and gained first experience. Surprisingly, based on the results, there is no significant interaction effect of gender and generation on the variable SEC_BUY observable.

Table 3. Purchase of Securities – Cross-tabulation Analysis

Variable	KNOW.	m (n = 98)	f (n = 157)	m + f (n = 255)	χ^2	Cramer-V
SEC_BUY	No	23	98	121	36,712***	0,379***
	Yes	75	59	134		
Variable	**KNOW.**	**Y (n = 34)**	**Z (n = 221)**	**Y + Z (n = 255)**	**χ^2**	**Cramer-V**
SEC_BUY	No	10	111	121	5,120**	0,142**
	Yes	24	110	134		

Significance level: *** = 1%; ** = 5%

Source: Own research

Next, the influence of gender and generation on the knowledge of selected capital market products was investigated. A χ^2-test was carried out in each case to determine differences in knowledge levels (variable KNOW). The capital market products available for selection are grouped by gender and generation and shown in Table 4. There is a significant difference between the genders for

two out of five instruments, namely the property investment funds and exchange-traded funds, observable. Male students have a higher level of knowledge of these two instruments than female students. There is only one significant difference between the generations observable (at the 10% significance level) for the instrument cryptocurrencies. Generation Z students are more familiar with cryptocurrencies than Generation Y students. This difference could be explained by the fact that cryptocurrencies tend to be a newer instrument, which is also more likely to be recognized by younger generations. Similarly, there is no interaction effect between gender and generation on knowledge of the individual capital market instruments identifiable. This is a surprising finding, which may be explained by a potentially higher level of financial literacy in Austria and Germany than elsewhere in the year 2023.

Table 4. Knowledge (KNOW) of Capital Market Products/Instruments – Cross-tabulation Analysis

Variable	KNOW	m (n = 98)	f (n = 157)	m + f (n = 255)	χ^2	Cramer-V
KNOW_SHARES	No	10	12	22	0,502	0,044
	Yes	88	145	233		
KNOW_BONDS	No	36	66	102	0,707	0,053
	Yes	62	91	153		
KNOW_FUNDS	No	22	56	78	4,966**	0,140**
	Yes	76	101	177		
KNOW_ETFs	No	34	102	136	22,219***	0,295***
	Yes	64	55	119		
KNOW_CRYPTOS	No	20	41	61	1,080	0,065
	Yes	78	116	194		
Variable	**KNOW**	**Y (n = 34)**	**Z (n = 221)**	**Y + Z (n = 255)**	**χ^2**	**Cramer-V**
KNOW_SHARES	No	5	17	22	1,839	0,085
	Yes	29	204	233		
KNOW_BONDS	No	13	89	102	0,051	0,014
	Yes	21	132	153		
KNOW_FUNDS	No	11	67	78	0,058	0,015
	Yes	23	154	177		
KNOW_ETFs	No	21	115	136	1,121	0,066
	Yes	13	106	119		
KNOW_CRYPTOS	No	12	49	61	2,788*	0,105*
	Yes	22	172	194		

Significance level: *** = 1 %; ** = 5 %; * = 10 %.

Source: Own research

Regarding the second research question on the knowledge of selected capital market products, it can be seen that male students have a significantly higher level of knowledge of the instruments of property investment funds and exchange-traded funds. The 'gender gap' in knowledge describing men as having a higher level of general financial knowledge (e.g. Arellano et al., 2018; Bianchi, 2018; Gerrans & Heaney, 2019) can therefore only be partially confirmed. Nevertheless, the results show that there are deficits among female students in this area, which should be counteracted as part of higher education programs to reduce the existent partial gender gap (Bae et al., 2022; Bucher-Koenen et al., 2017). Essentially, there are hardly any differences in knowledge between the generations apart from the cryptocurrencies, meaning that it cannot be directly concluded that general financial literacy increases with age. This stands in contrast to previous results of

Baglioni et al. (2018). The aforementioned comparisons show that sample characteristics affect the findings to a large extent, therefore, future research should further distinguish the resulting differences. Based on the latter information, more personalized financial literacy courses can be developed and offered at universities and beyond. Baglioni et al. (2018), Bianchi (2018), Ergün (2018), and Martinez (2016) stress in their research that this is the greatest lever for increasing general financial education and also for closing the gender gap (Bae et al., 2022).

5. CONCLUSION

The study aimed to use selected questions to find out what experience and knowledge students have about capital market products. It could be shown that there is a significant difference in gender and also in generation when investigating the experience of students in buying securities. Male students have invested in securities significantly more often than female students. This finding is in line with the research of Fung and Durand (2014) and Farrell (2014) showing that males trade in securities more often. Females are more cautious and act less aggressively than males. Furthermore, Generation Y students have invested in securities significantly more often than Generation Z students meaning that students who have already invested in securities are significantly older than students who have not. However, the interaction effect of gender and generation cannot be proven. In contrast to previous literature, we could only observe a partial gender gap concerning capital market product knowledge and identify generational knowledge differences only concerning cryptocurrencies. Thus, sample characteristics and in particular the analyzed region impact financial literacy findings to a large extent. Future research should further distinguish the resulting differences.

Given the changes in the economic environment outlined in the introduction and the lack of knowledge about certain capital market products, it seems relevant to integrate financial knowledge into teaching programs when developing curricula at universities and beyond. The majority of empirical studies confirm that this is the greatest lever for increasing general financial education (e.g. Baglioni et al., 2018; Bianchi, 2018; Ergün, 2018; Martinez, 2016) and also for closing the gender gap (Bae et al., 2022). This means that with the right didactic implementation, not only content but also the development of skills in general (saving behavior, retirement planning, debt handling, etc.) and the acquisition and processing of relevant information (e.g. Huston, 2010; Santini et al., 2019; Warmath & Zimmerman, 2019) should be taught. Finally, students should be able to make sound financial decisions after completing financial literacy courses as suggested by Lusardi (2019) and Mireku et al. (2023).

The limitation of this study is that the variables and scales used represent rather simple measures indicating trends prevalent in specific populations. Further research could use more advanced indicators and investigate the extent to which social structures and socio-economic inequalities cause generational differences and a full or partial gender gap in financial literacy.

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References

Allgood, S., & Walstad, W. B. (2016). The effects of perceived and actual financial literacy on financial behaviors. *Economic Inquiry, 54*(1), 675-697. https://doi.org/10.1111/ecin.12255

Alsemgeest, L. (2015). Arguments for and against financial literacy education: where to go from here? *International Journal of Consumer Studies, 39*(2), 155-161. https://doi.org/10.1111/ijcs.12163

Arellano, A., Cámara, N., & Tuesta, D. (2018). Explaining the Gender Gap in Financial Literacy: The Role of Non-Cognitive Skills. *Economic Notes, 47*(2-3), 495-518. https://doi.org/10.1111/ecno.12113

Bae, K., Jang, G.-Y., Kang, H.-G., & Tan, P. (2022). Early Financial Education, Financial Literacy, and Gender Equity in Finance*. *Asia-Pacific Journal of Financial Studies, 51*(3), 372-400. https://doi.org/10.1111/ajfs.12378

Baglioni, A., Colombo, L., & Piccirilli, G. (2018). On the Anatomy of Financial Literacy in Italy. *Economic Notes, 47*(2-3), 245-304. https://doi.org/10.1111/ecno.12111

Becchetti, L., Caiazza, S., & Coviello, D. (2013). Financial education and investment attitudes in high schools: evidence from a randomized experiment. *Applied Financial Economics, 23*(10), 817-836. https://doi.org/10.1080/09603107.2013.767977

Behrman, J. R., Mitchell, O. S., Soo, C. K., & Bravo, D. (2012). How Financial Literacy Affects Household Wealth Accumulation. *American Economic Review, 102*(3), 300-304. https://doi.org/10.1257/aer.102.3.300

Bianchi, M. (2018). Financial Literacy and Portfolio Dynamics. *The Journal of Finance, 73*(2), 831-859. https://doi.org/10.1111/jofi.12605

Bongini, P., & Zia, B. (2018). Introduction: The Financial Literacy Collective. *Economic Notes, 47*(2-3), 235-244. https://doi.org/10.1111/ecno.12123

Breitbach, E., & Walstad, W. B. (2016). Financial Literacy and Financial Behavior among Young Adults in the United States. *Economic Competence and Financial Literacy of Young Adults*, 81-98. https://doi.org/10.2307/j.ctvbkk29d.7

Bucher-Koenen, T., Lusardi, A., Alessie, R., & van Rooij, M. (2017). How financially literate are women? An overview and new insights. *The Journal of Consumer Affairs, 51*(2), 255–283. https://doi.org/10.1111/joca.12121

Burns, R. B., & Burns, R. A. (2008). Business research methods and statistics using SPSS. SAGE Publications.

DePoy, E., & Gitlin, L. N. (2011). *Introduction to research: Understanding and applying multiple strategies (4th ed.)*. Elsevier.

Dewi, V. I. (2022). How do demographic and socioeconomic factors affect financial literacy and its variables? *Cogent Business & Management, 9*(1). https://doi.org/10.1080/23311975.2022.2077640

Ergün, K. (2018). Financial literacy among university students: A study in eight European countries. *International Journal of Consumer Studies, 42*(1), 2-15. https://doi.org/10.1111/ijcs.12408

Erner, C., Goedde-Menke, M., & Oberste, M. (2016). Financial literacy of high school students: Evidence from Germany. *The Journal of Economic Education, 47*(2), 95-105. https://doi.org/10.1080/00220485.2016.1146102

Farrell, J. (2014). Demographic and socioeconomic factors of investors. In K. H. Baker & V. Ricciardi (Eds.), *Investor behavior: The psychology of financial planning and investing* (pp. 117–134). Wiley. https://doi.org/10.1002/9781118813454.ch7

Finke, M. S., & Huston, S. J. (2014). Financial Literacy and Education. *Investor Behavior*, 63-82. https://doi.org/10.1002/9781118813454.ch4

Francisco, R. A. (2012). Finance for Academics. SpringerBriefs in Finance. https://doi.org/10.1007/978-1-4614-3244-9

Fung, L., & Durand, R. B. (2014). Personality Traits. *Investor Behavior*, 99-115. https://doi.org/10.1002/9781118813454.ch6

Gerrans, P., & Heaney, R. (2019). The impact of undergraduate personal finance education on individual financial literacy, attitudes and intentions. *Accounting & Finance, 59*(1), 177-217. https://doi.org/10.1111/acfi.12247

Greenstein, T. N., & Davis, S. N. (2013). Methods of Family Research. https://doi.org/10.4135/9781544308579

Grundmann, T., & Spitzner, J. (2019). Transparente und vorausschauende Restrukturierung mit Szenarioanalyse. In M. W. Exler & M. Situm (Eds.), *Restrukturierungs- und Turnaround-Management: Strategien, Erfolgsfaktoren und Best Practice für die Transformation* (pp. 117–134). Springer Gabler.

Hastings, J., & Mitchell, O. S. (2020). How financial literacy and impatience shape retirement wealth and investment behaviors. *Journal of Pension Economics and Finance, 19*(1), 1–20. https://doi.org/10.1017/s1474747218000227

Hastings, J., Mitchell, O. S., & Chyn, E. (2011). Fees, Framing, and Financial Literacy in the Choice of Pension Manager. *Financial Literacy: Implications for Retirement Security and the Financial Marketplace*, 100-115. https://doi.org/10.1093/acprof:oso/9780199696819.003.0006

Hulland, J., Baumgartner, H., & Smith, K. M. (2018). Marketing survey research best practices: Evidence and recommendations from a review of JAMS articles. *Journal of the Academy of Marketing Science, 46*(6), 92–108. https://doi.org/10.1007/s11747-017-0532-y

Huston, S. J. (2010). Measuring financial literacy. *The Journal of Consumer Affairs, 44*(2), 296–316. https://doi.org/10.1111/j.1745-6606.2010.01170.x

Jamshidian, M. (2009). Strategies for analysis of incomplete data. In M. Hardy & A. Bryman (Eds.), *The handbook of data analysis* (pp. 113–145). SAGE Publications.

Knoll, M. A. Z., & Houts, C. R. (2012). The Financial Knowledge Scale: An Application of Item Response Theory to the Assessment of Financial Literacy. *Journal of Consumer Affairs, 46*(3), 381-410. https://doi.org/10.1111/j.1745-6606.2012.01241.x

Laeven, L., & Valencia, F. (2020). Systemic banking crises database II. *IMF Economic Review, 68*(2), 307–361. https://doi.org/10.1057/s41308-020-00107-3

Lusardi, A. (2015a). Financial Literacy: Do People Know the ABCs of Finance? *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2585246

Lusardi, A. (2015b). Financial literacy skills for the 21st century: Evidence from PISA. *The Journal of Consumer Affairs, 49*(3), 639–659. https://doi.org/10.1111/joca.12099

Lusardi, A. (2019). Financial literacy and the need for financial education: evidence and implications. *Swiss Journal of Economics and Statistics, 155*(1). https://doi.org/10.1186/s41937-019-0027-5

Lusardi, A., & Mitchell, O. S. (2011). Financial literacy around the world: An overview. *Journal of Pension Economics & Finance, 10*(4), 497–508. https://doi.org/10.1017/S1474747211000448

Lusardi, A., & Mitchell, O. S. (2014). The economic importance of financial literacy: Theory and evidence. *Journal of Economic Literature, 52*(1), 5–44. https://doi.org/10.1257/jel.52.1.5

Lusardi, A., Mitchell, O. S., & Curto, V. (2010). Financial literacy among the young. *The Journal of Consumer Affairs, 44*(2), 358–380. https://doi.org/10.1111/j.1745-6606.2010.01173.x

Lusardi, A., & Tufano, P. (2015). Debt literacy, financial experiences, and overindebtedness. *Journal of Pension Economics & Finance, 14*(4), 329–365. https://doi.org/10.1017/S1474747215000232

Martinez, V. (2016). Financial literacy among our students: Assessing and improving their knowledge. *Journal of Financial Education, 42*(3/4), 291–303.

McCrindle, M. (2014). *The ABC of XYZ: Understanding the global generations* (3rd ed.). McCrindle Research.

Mireku, K., Appiah, F., & Agana, J. A. (2023). Is there a link between financial literacy and financial behaviour? *Cogent Economics & Finance, 11*(1). https://doi.org/10.1080/23322039.2023.2188712

Rasch, D., Kubinger, K. D., & Moder, K. (2011). The two-sample t test: pre-testing its assumptions does not pay off. *Statistical Papers, 52*(1), 219-231. https://doi.org/10.1007/s00362-009-0224-x

Santini, F. D. O., Ladeira, W. J., Mette, F. M. B., & Ponchio, M. C. (2019). The antecedents and consequences of financial literacy: a meta-analysis. *International Journal of Bank Marketing, 37*(6), 1462-1479. https://doi.org/10.1108/ijbm-10-2018-0281

Stango, V., & Zinman, J. (2009). What Do Consumers Really Pay on Their Checking and Credit Card Accounts? Explicit, Implicit, and Avoidable Costs. *American Economic Review, 99*(2), 424-429. https://doi.org/10.1257/aer.99.2.424

van Rooij, M. C. J., Lusardi, A., & Alessie, R. J. M. (2012). Financial Literacy, Retirement Planning and Household Wealth. *The Economic Journal, 122*(560), 449-478. https://doi.org/10.1111/j.1468-0297.2012.02501.x

Warmath, D., & Zimmerman, D. (2019). Financial Literacy as More than Knowledge: The Development of a Formative Scale through the Lens of Bloom's Domains of Knowledge. *Journal of Consumer Affairs, 53*(4), 1602-1629. https://doi.org/10.1111/joca.12286

Widdowson, D., & Hailwood, K. (2007). Financial literacy and its role in promoting a sound financial system. *Reserve Bank of New Zealand Bulletin, 70*(2), 37–47.

Williams, T. (2016). Closing the Gender Financial Literacy Gap for College Students. *Women in Higher Education, 25*(10), 6-13. https://doi.org/10.1002/whe.20360

Xiao, J. J., Ahn, S. Y., Serido, J., & Shim, S. (2014). Earlier financial literacy and later financial behavior of college students. *International Journal of Consumer Studies, 38*(6), 593–601. https://doi.org/10.1111/ijcs.12122

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Discrimination in AI-Driven HRM Systems: Ethical Implications and Solutions

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Abstract: *The implementation of Artificial Intelligence (AI) in Human Resource Management has gained significant traction, offering efficiency and precision in recruitment, performance evaluation, and employee management processes. However, concerns regarding the potential for discrimination and bias within AI-driven HRM systems have become a pressing issue. AI systems, while designed to be neutral, can perpetuate or even exacerbate discriminatory patterns based on race, gender, age, or socioeconomic status due to biased training data or flawed algorithmic designs. The research examines the key factors contributing to discriminatory outcomes in AI-driven HRM systems, including the lack of diversity in training datasets, the reinforcement of historical inequalities, and the absence of transparency in AI decision-making processes. It further analyzes the ethical challenges that arise when these biases result in unequal treatment of job candidates and employees, thus undermining fairness and inclusivity within organizations. To address these issues, the study proposes solutions to mitigate bias and discrimination in AI-enhanced HRM. These solutions include developing more diverse and representative datasets, implementing auditing mechanisms to identify and rectify biases, and increasing transparency in AI systems to ensure accountability in HR practices.*

1. INTRODUCTION

The digital transformation of human resource management (HRM) is not a recent phenomenon. Initially, information and communication technologies were used for administrative tasks and later evolved to support recruitment, selection, and career development. However, ongoing technological advancements have driven a deeper digital transformation of HRM, with artificial intelligence (AI) playing a significant role (Kaur et al., 2023). AI refers to the development of sophisticated technologies that, through vast datasets and complex learning algorithms, can replicate human thinking, often with superior efficiency (Chukwuka & Dibie, 2024; Soni, 2022). When integrated into business operations, particularly within HRM, AI can enhance employee productivity and overall organizational performance (Orosoo et al., 2023).

Artificial intelligence in human resource management (AI-HRM) involves the integration of machine learning concepts and algorithm-driven decision-making based on data provided by managers. AI-HRM is characterized by three key aspects. First, it relies on large volumes of data. Second, it involves the development of advanced software solutions, programs, and systems. Third, it enables the automation of certain HR functions (Pavlović, 2023). However, like any data-driven process, AI-HRM can present challenges if HR managers fail to provide objective, unbiased, and accurate data. Poor-quality or biased data may lead to employee discrimination in various ways, potentially creating organizational issues with ethical implications (Köchling & Wehner, 2020). Based on these considerations, this paper aims to examine the potential forms of discrimination that may arise from AI-HRM and the associated ethical implications, in order to propose solutions that can reduce or eliminate this problem.

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2. AI-HRM

Digitization and digital transformation compel companies to adopt modern technological solutions to stay competitive. This applies to HRM as well, where human resource managers must implement intelligent technologies, such as artificial intelligence, to attract, develop, and retain top talent (Orosoo et al., 2023). At its core, AI automates repetitive and time-consuming administrative tasks, often monotonous. By delegating these functions to AI, HR managers can focus on more strategic and creative responsibilities (Chukwuka & Dibie, 2024).

AI significantly enhances HR functions, particularly in recruitment, onboarding, and performance management. In recruitment, AI automates repetitive tasks like resume screening and interview scheduling, reducing hiring time and improving candidate selection (Islam & Tamzid, 2023). AI-powered chatbots interact with applicants, aligning their profiles with job requirements and enhancing application completion rates (Orosoo et al., 2023). Additionally, machine learning helps rediscover past candidates for new roles, optimizing talent acquisition (Islam & Tamzid, 2023). For onboarding, AI simplifies formalities, personalizes training schedules, and provides key organizational information through chatbots, improving integration and retention (Mer, 2023). AI-driven systems ensure new hires receive relevant information anytime, minimizing administrative burdens (Islam & Tamzid, 2023). AI also enhances performance management by reducing biases in evaluations and providing real-time insights (Orosoo et al., 2023). Amazon, for example, uses AI and machine learning to enhance its hiring process by offering personalized job recommendations and online assessments. Machine learning helps candidates find roles matching their skills and experience early on, while also reducing time spent manually reviewing resumes. AI algorithms suggest suitable roles and online assessments help candidates demonstrate their abilities, driving fairer and more inclusive outcomes. Amazon ensures these tools are developed with fairness in mind, regularly analyzing results to benefit all candidates, regardless of demographic background (Amazon, 2023).

Mer (2023) highlights several positive effects of AI-HRM, including improved employee retention, cost reduction, accelerated business processes through automation, and increased productivity. AI-HRM eliminates routine administrative tasks, which often lead to monotony and the development of negative workplace behaviors. Additionally, it enables personalized learning and facilitates the identification of employee talents, enhancing overall organizational knowledge and human capital (Islam & Tamzid, 2023). However, implementing AI solutions in business is not straightforward. Experts with specialized IT knowledge are required to develop AI systems and train users, making the process time-consuming and financially demanding (Pavlović, 2023). The use of AI also necessitates additional training for managers and users, often encountering resistance to change, which is further exacerbated by various ethical concerns (Soni, 2022).

3. DISCRIMINATION AND ETHICAL DILEMMAS IN AI-HRM

One of the major challenges in applying artificial intelligence to human resource management is the perception of the HR department as conventional, where existing human resource information systems (HRIS) are considered sufficient (Orosoo et al., 2023). This mindset can lead to resistance from employees and managers, preventing the adoption of AI in employee management and, consequently, resulting in the loss of potential benefits. The resistance is further amplified by the need for additional learning and training, which many employees may not be willing to undertake. It is important to note that the learning process is ongoing, not static, and does not end with the completion of initial training, as AI technology continues to evolve (Islam & Tamzid,

2023). This continuous need for upskilling can lead to negative changes in employee behavior, potentially affecting individual productivity, interpersonal relationships, organizational climate, and overall performance.

Beyond the aforementioned issues, there are more specific problems associated with AI-HRM. The primary concern begins with biased data. The application of artificial intelligence is driven by the need to automate, accelerate, or improve task efficiency. Unlike humans, AI can process vast amounts of data quickly and make intelligent decisions based on specific insights derived from it. To achieve optimal results, however, it is crucial to provide the AI system with high-quality, unbiased data (Fig. 1). But, unlike humans, AI systems cannot think or form beliefs. They operate algorithmically based on their training data, without any inherent capacity for reasoning or reflection. Given this context, users must approach AI outputs with a critical eye and evaluate them with human judgment (Silberg & Manyika, 2019). If the data is flawed or biased, for any reason, AI may favor one group of data and, as a result, discriminate against employees based on gender, age, education, race, social status, or other factors (Tuffaha, 2023). Machine learning algorithms, which underpin the processing and use of large volumes of data, are trained to interpret data as instructed by users. The algorithm itself operates with the data provided, without evaluating its quality (European Network Against Racism, 2020). There are three main types of machine learning algorithms. Supervised relies on labeled input data, where human experts provide correct outputs, allowing the algorithm to learn patterns and make predictions, such as classification or regression tasks. Unsupervised, on the other hand, works without labeled data, identifying patterns and structures independently to group or analyze themes. Lastly, reinforcement learning differs by using trial-and-error interactions with a dynamic environment, learning optimal behaviors based on feedback rather than predefined input-output pairs (Köchling & Wehner, 2020). When properly tested, retested, and implemented, machine learning algorithms can enhance decision-making in many areas, including employee management. However, when working with complex goals, algorithms must be designed with simplicity and care to avoid any form of prejudice or discrimination (European Network Against Racism, 2020).

However, the problem may become even more significant when considering generative AI, a system capable of independently generating text, images, and other content based on the analysis of large data sets and the patterns within them (Ashraf, 2024). Some experts in generative AI predict that, in the coming years, up to 90% of internet content could be automatically generated (Nicoletti & Bass, 2023). The "hallucination" effect in generative AI refers to the phenomenon where AI models generate inaccurate or misleading information, a problem compounded by the influence of misinformation within the training data. As a result, AI systems may uncritically reproduce and amplify these inaccuracies. Detecting disinformation has become increasingly complex due to inadequate filtering mechanisms and low-quality training data, highlighting the need for improved detection methods and stronger regulatory initiatives (Dubois, 2024).

There are two key aspects of algorithmic decision-making: first, the need for quality, objective, and unbiased data; and second, the importance of careful system design (Miasato & Reis Silva, 2020). If the data does not meet these criteria, bias can occur. In the context of AI, this bias manifests in three forms: data bias, methodology bias, and socio-cultural bias (Tuffaha, 2023). The primary cause of these biases lies in the input data. Since algorithms learn from historical data, they begin with a neutral stance, not assessing the quality of the data itself. Therefore, it is the responsibility of managers or employees to evaluate the data's adequacy and quality. For example, consider a candidate recruitment system. In developing this system, HR managers use a large dataset of CVs from previous applicants. Based on patterns in historical data, the system may inadvertently

continue to discriminate, reducing the chances for certain groups. For instance, if a particular position has historically been dominated by men, the system may be more likely to favor male candidates for selection, potentially overlooking a woman who may possess more knowledge and experience (Köchling & Wehner, 2020).

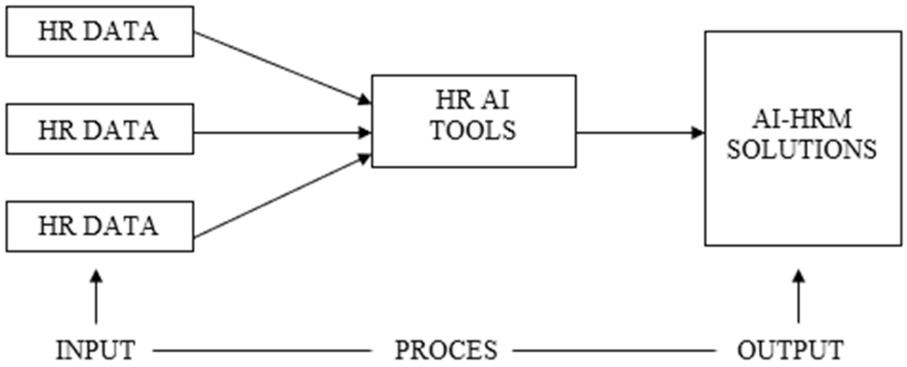

Figure 1. AI-HRM
Source: Hinge et al. (2023, p. 558)

Discrimination and ethical dilemmas also arise in other areas of HRM. For instance, when publishing job vacancies, the issue of targeted job advertisements must be considered. Digital job ads allow companies to create tailored ads aimed at attracting specific candidates. While targeted advertising can increase reach and attract more applicants, it also reduces the diversity of applicants. Certain socio-demographic groups may be unaware of job opportunities, and if targeted attributes are used as proxies for race, gender, or other socio-demographic and cultural variables, qualified candidates may be excluded from consideration (European Network Against Racism, 2020). In this way, AI-HRM can prevent companies from accessing valuable human capital. Once targeted candidates are reached, HR managers often face a large volume of data, which can be fed into the AI system. This introduces another ethical dilemma. To function effectively, an AI system needs a large volume of high-quality data. However, this data is often sensitive, subjecting its collection, storage, and processing to strict legal regulations. There is a risk that AI systems may misuse this data in various ways. On the other hand, employees may choose not to provide this information, hindering the development of AI-HRM (Du, 2024; El-Ghoul et al., 2024). A notable example of AI bias in HR is Amazon's AI recruitment tool, which was biased against women. The tool, designed to automate the recruitment process by evaluating CVs and recommending the best candidates, favored male applicants due to its training on CVs that primarily came from men. As a result, the system penalized CVs containing the word "female" and downgraded graduates from women's colleges (Du, 2024). Amazon's managers eventually concluded that the recruitment system was not gender-neutral. This issue arose because the AI models were trained using patterns from a decade of CV submissions (Larsson et al., 2024; Miasato & Reis Silva, 2020). To resolve such issues, strong transparency in the collection and use of employee data is crucial. Bloomberg used Stable Diffusion to generate thousands of images related to jobs and crime. The model created visual representations of workers in 14 professions, generating 300 images for each - seven high-paying and seven low-paying jobs in the U.S., along with three crime-related categories. The analysis revealed that images associated with high-paying jobs often depicted people with lighter skin tones, while those with darker skin tones were more frequently shown in categories like "fast food worker" and "social worker" (Nicoletti & Bass, 2023).

Today, chatbots and video systems are widely used in HRM. Chatbots help candidates by providing information, scheduling interviews, and evaluating applications. However, they have limitations in understanding the language nuances of certain groups. For instance, a system designed to work in

English may unintentionally exclude a candidate if their accent causes them to pronounce words differently than what the system expects. As the European Network Against Racism (2020) highlights, speech recognition software is more prone to errors with Black individuals, misinterpreting 25-45% of words, which makes accurate communication challenging. Similarly, AI systems that analyze video interviews assess both verbal and non-verbal signals. If certain groups of employees with specific speech and gesture patterns were favored in the past, the algorithms may continue to favor candidates exhibiting similar characteristics, reinforcing existing biases.

AI-HRM can also create challenges within the employee reward system. While HR managers may use AI to create more intelligent and fair compensation decisions, biased data can lead to several potential issues (Sachan et al., 2024; Tuffaha, 2023):

- Neglecting the overall picture of an employee's productivity**:** the system may overlook certain employee performances, potentially skewing the data on overall productivity. As a result, an employee might receive either more or fewer rewards than they deserve.
- Reduction in fairness in the reward system**:** biases in the data can result in unfair compensation distribution, undermining the system's effectiveness.
- Diminished reliability of the performance evaluation process**:** if the AI system relies on biased or incomplete data, it can impact the accuracy of performance evaluations, which are key to making fair compensation decisions.
- Increased anxiety among employees regarding future rewards and job security**:** employees may become concerned that AI-driven systems could unfairly impact their rewards and job stability.

At the same time, using AI-HRM systems to improve employee safety can have unintended negative effects. According to the OECD (2024), AI safety monitoring systems can increase pressure on workers, leading to stress and encouraging them to neglect safety standards. For instance, if the system determines that tasks can be completed more quickly, it can place pressure on employees to work faster, even when this is not justified. Additionally, unfair or non-transparent decisions without a clear appeals process further exacerbate stress. Automating routine tasks can also eliminate short breaks, making shifts mentally exhausting and increasing the risk of physical injury. A similar situation occurred with Uber's AI tracking systems, which monitored employee speed based on movement, braking, and other parameters. The system concluded that women drove slower on the same routes than men (Pavlović, 2023). However, various factors on the same route can affect driving speed, making it unfair to conclude that men are inherently better drivers and should receive more rewards than women. To meet the system's expectations, women might feel pressured to drive faster, which could increase the likelihood of accidents.

Problems can also arise during employee training and development. AI-HRM can help identify knowledge gaps and create personalized learning systems to facilitate employee training and career growth. However, issues may arise with personalized learning. Mistakes in defining training needs can occur when performance evaluations and employee characteristics are inaccurately linked to the required knowledge, skills, and abilities, such as training style, personality type, prior knowledge, or professional experience. Misidentifying an employee's preferred learning method and style can also reduce the effectiveness of training (Tuffaha, 2023). Similarly, AI-HRM can create challenges when evaluating performance. An algorithm trained using biased ratings from an HR manager may generate systematically biased predictions about future job performance (Kim & Bodie, 2021). If the system is fed data from employees who achieve "top performance", it can set unrealistic standards that other employees can struggle to meet. As a result, the system may discriminate against employees who don't meet these high-performance standards, excluding them from rewards or career advancement opportunities (European Network Against Racism, 2020).

The aforementioned issues with discrimination and ethics can lead to legal consequences. Poorly implemented AI-HRM systems can expose companies to legal risks related to data collection, discrimination, labor relations, and labor laws (Du, 2024). At the same time, these issues can trigger unwanted changes in employee behavior. For example, AI may reduce employees' autonomy, dignity, and equality in relation to their colleagues (OECD, 2024), which can result in a decline in motivation and job satisfaction.

4. POTENTIAL SOLUTIONS TO PROBLEMS

In identifying potential solutions to the challenges of applying AI-HRM, it is essential to prioritize the knowledge and skills of both system developers and human resources managers, as well as ensure the use of objective, precise, and high-quality data. The various activities and functions for which AI-HRM is employed require a tailored approach to problem-solving, addressing each area with specific strategies and considerations.

The use of AI-HRM has streamlined hiring processes, but it also presents risks of bias and discrimination. To ensure fairness and inclusivity, organizations must implement strategies to reduce these issues at different stages of recruitment. One major concern is online targeting and CV screening, where AI systems may unintentionally reinforce existing biases by relying on historical data. To prevent this, companies should incorporate diverse data points beyond their existing workforce characteristics. Additionally, they should carefully vet the criteria used by AI to ensure that it does not disproportionately exclude certain demographics. Instead of eliminating sensitive attributes like gender or ethnicity, organizations should monitor how often candidates from diverse backgrounds are being rejected to identify potential bias and make necessary adjustments. Another challenge lies in interview scheduling and initial candidate interactions, which are often handled by automated systems such as chatbots and email automation. To maintain fairness, companies must ensure transparency by clearly stating when candidates are communicating with AI instead of humans. Additionally, candidates should be asked for their consent before engaging with automated hiring tools. Providing an option to override AI-based communication and interact with a human recruiter can further enhance fairness and accommodate applicants who may face challenges with automated systems (European Network Against Racism, 2020).

Organizations must ensure that AI-HRM systems are fair, transparent, and compliant with regulations. One key approach is using diverse datasets to train AI, reducing bias and discrimination in hiring. Regular audits should be conducted, and multidisciplinary teams, including data scientists, ethicists, and HR professionals, should oversee AI implementation to ensure fairness. Data privacy is another critical concern. Organizations should adopt strong data protection measures, such as encryption and anonymization, while ensuring transparency in data usage. Informing employees about how their data is collected and processed fosters trust and compliance with regulations like GDPR. AI systems must also be explainable. Providing clear documentation on AI decision-making helps build trust among employees. Additionally, organizations should establish mechanisms allowing employees to challenge AI-driven decisions, promoting accountability. To address job displacement due to AI, companies should invest in reskilling and upskilling programs. Career transition support and the creation of new AI-related roles can help mitigate job insecurity. Open communication about AI's impact is essential to reducing employee anxiety and resistance. From a policy perspective, organizations must ensure compliance with AI-related regulations. Regular reviews of AI systems by compliance teams or legal experts help align practices with evolving laws. Developing ethical guidelines for AI use, covering bias, privacy, and transparency, provides a framework for responsible decision-making. Lastly, stakeholder engagement is crucial. Involving employees, regulators, and AI experts in discussions ensures diverse

perspectives are considered. Regular feedback sessions can help organizations anticipate challenges and align AI practices with ethical and societal expectations (Du, 2024).

When using AI for relationship building with candidates, it is crucial to inform applicants that they are interacting with an AI system rather than a human. Providing opt-out alternatives for biometric data collection helps protect candidate privacy and prevents potential discrimination. Additionally, addressing structural biases by incorporating more diverse candidates in the development of AI criteria ensures that hiring models do not disproportionately favor certain groups over others. In video interview screening, companies should offer alternatives for biometrics and avoid platforms that use unreliable facial or voice analysis tools. Ensuring structured and consistent interviews, where all candidates are asked the same questions and evaluated using a standardized scorecard, reduces the risk of bias. AI-based assessments must be carefully analyzed to counterbalance any psychometric limitations that may disadvantage underrepresented groups. For performance evaluation, organizations must differentiate between the gold standard used in recruitment and benchmarks for regular performance assessments. AI algorithms should be designed with this distinction in mind to ensure fair staff retention and career progression opportunities (European Network Against Racism, 2020).

Many countries develop national regulations to guide AI development, ensuring its ethical and responsible use. These regulations also shape AI applications in human resource management. In the Republic of Serbia, the *Ethical Guidelines for the Development, Implementation, and Use of Trustworthy and Responsible Artificial Intelligence* provide a framework for AI governance. These guidelines apply to various stakeholders, including AI developers, users, and those affected by AI systems. This includes individuals using AI in their professional work, those impacted directly (such as public service recipients), and those indirectly affected (such as participants in medical research). Additionally, the general public is considered within the ethical framework. For AI systems to be trustworthy, they must be explainable, verifiable, and accountable to humans. The guidelines emphasize dignity, harm prevention, and compliance with core principles such as oversight, technical reliability, data protection, transparency, non-discrimination, societal well-being, and accountability. Meeting these conditions ensures that AI in HRM and other fields is used responsibly and fairly (National AI platform, 2023).

5. CONCLUSION

The integration of AI in Human Resource Management presents both significant opportunities and considerable challenges. While AI systems can streamline processes such as recruitment, training, and employee performance evaluation, they also raise ethical concerns, particularly regarding bias and discrimination. The most prominent issue is the use of biased data, which can perpetuate existing inequalities in recruitment, compensation, and performance evaluation. As AI systems are trained on historical data, they can inadvertently reinforce discriminatory practices unless careful attention is paid to data quality and the design of algorithms. Additionally, AI-driven HR practices such as targeted job ads and automated interviews can inadvertently exclude qualified candidates from underrepresented groups, further limiting diversity in the workplace. To address these challenges, organizations must prioritize fairness, transparency, and inclusivity in the development and deployment of AI-HRM systems. This includes using diverse datasets, conducting regular audits, and involving multidisciplinary teams to oversee the design and implementation of AI tools. Ensuring transparency in AI decision-making and allowing employees to challenge AI-based outcomes can help maintain trust and fairness. Moreover, companies must protect sensitive employee data through robust privacy measures while complying with relevant legal frameworks. Ethical guidelines and regulatory frameworks play a crucial role in shaping the responsible use of AI in HRM. By adhering to principles such as non-discrimination, accountability, and societal well-being, organizations can mitigate the

risks of AI bias and discrimination. Ultimately, the successful adoption of AI in HRM depends on a balanced approach that combines technological innovation with a commitment to ethical standards.

This paper contributes to the theoretical understanding of AI's ethical implications in Human Resource Management. It explores how biases in data and algorithmic decision-making affect various HR processes. Analyzing the ethical dilemmas of AI-HRM, provides a conceptual framework for identifying discrimination types - data, methodology, and socio-cultural bias, highlighting the intersection of technology, ethics, and HR practices. This work advances existing theories on AI ethics by offering a detailed examination of its potential risks and challenges in organizational settings, guiding future research in this evolving field. This study offers practical insights into addressing AI-related discrimination in HRM. It provides actionable strategies for organizations to reduce bias, such as using diverse datasets, conducting regular audits, and ensuring transparency in AI decision-making. Additionally, it suggests developing clear guidelines for AI deployment, including employee consent and alternatives to automated interactions. The paper highlights the importance of robust data protection measures and stakeholder engagement in shaping responsible AI practices. By proposing these practical solutions, the research serves as a valuable resource for HR professionals and organizations seeking to implement AI technologies ethically and effectively within their workforce management systems.

The limitation of this study is its focus on theoretical frameworks and ethical implications without extensive empirical data from organizations actively using AI in HRM. The findings are based on existing literature, which may not fully capture real-world challenges and solutions in diverse organizational contexts. Additionally, the rapid development of AI technology may result in the proposed solutions becoming outdated as new algorithms and methodologies emerge. Future research should explore empirical case studies of AI-HRM implementation, evaluating the effectiveness of bias-reducing strategies in different industries. Moreover, ongoing updates to ethical guidelines and AI algorithms should be explored, ensuring they remain relevant in a rapidly changing technological landscape.

References

Amazon. (2023, June 5). How Amazon leverages AI and ML to enhance the hiring experience for candidates? Retrieved from https://www.aboutamazon.com/news/workplace/how-amazon-leverages-ai-and-ml-to-enhance-the-hiring-experience-for-candidates

Ashraf, M. (2024). Generative AI: Challenges and the road ahead. *International Journal of Science and Research (IJSR), 13*(10), 716-725. https://doi.org/10.21275/SR241009154508

Chukwuka, E. J., & Dibie, K. E. (2024). Strategic Role of Artificial Intelligence (AI) on Human Resource Management (HR) Employee Performance Evaluation Function. *International Journal of Entrepreneurship and Business Innovation, 7*(2), 269-282. https://doi.org/10.52589/ijebi-het5styk

Du, J. (2024). Ethical and legal challenges of AI in human resource management. *Journal of Computing and Electronic Information Management, 13*(2), 71–77. https://doi.org/10.54097/83j64ub9

Dubois, D. (2024). Paradoxes of generative AI: Both promise and threat to academic freedom. *AAUP Journal of Academic Freedom, 15*, 1-15.

El-Ghoul, M., Almassri, M. M., El-Habibi, M. F., Al-Qadi, M. H., Abou Eloun, A., Abu-Nasser, B. S., & Abu-Naser, S. S. (2024). AI in HRM: Revolutionizing Recruitment, Performance Management, and Employee Engagement.

European Network Against Racism. (2020). *Artificial intelligence in HR: How to address racial biases and algorithmic discrimination in HR?* European Network Against Racism.

Hinge, P., Salunkhe, H., & Boralkar, M. (2023). Artificial Intelligence (AI) in Hrm (Human Resources Management): A Sentiment Analysis Approach. In *Proceedings of the International*

Conference on Applications of Machine Intelligence and Data Analytics (ICAMIDA 2022) (pp. 557-568). https://doi.org/10.2991/978-94-6463-136-4_47

Islam, M. T., & Tamzid, M. (2023). Artificial intelligence in human resource management. In: *Management education for achieving sustainable development goals in the context of Bangladesh* (pp. 61-80). https://doi.org/10.57240/dujmbk04

Kaur, M., AG, R., AG, R., & Gandolfi, F. (2023). Research on artificial intelligence in human resource management: Trends and prospects. *Global Journal of Management and Business Research: A Administration and Management, 23*(5), 31–46.

Kim, P. T., & Bodie, M. T. (2021). Artificial intelligence and the challenges of workplace discrimination and privacy. *Journal of Labor & Employment Law, 2*, 289–315.

Köchling, A., & Wehner, M. C. (2020). Discriminated by an algorithm: a systematic review of discrimination and fairness by algorithmic decision-making in the context of HR recruitment and HR development. *Business Research*, 13(3), 795-848. https://doi.org/10.1007/s40685-020-00134-w

Larsson, S., White, J. M., & Ingram Bogusz, C. (2024). The Artificial recruiter: risks of discrimination in employers' use of AI and automated decision-making. *Social Inclusion*, *12*. https://doi.org/10.17645/si.7471

Mer, A. (2023). Artificial Intelligence in Human Resource Management: Recent Trends and Research Agenda. *Contemporary Studies in Economic and Financial Analysis*, 31-56. https://doi.org/10.1108/s1569-37592023000111b003

Miasato, A., & Reis Silva, F. (2020). Artificial Intelligence as an Instrument of Discrimination in Workforce Recruitment. *Acta Universitatis Sapientiae Legal Studies*, 8(2), 191-212. https://doi.org/10.47745/ausleg.2019.8.2.04

National AI platform. (2023). *Ethical Guidelines for the Development, Implementation, and Use of Trustworthy and Responsible Artificial Intelligence*. National AI platform.

Nicoletti, L., & Bass, D. (2023, June 9). Humans are biased. Generative AI is even worse. Stable Diffusion's text-to-image model amplifies stereotypes about race and gender — here's why that matters. Bloomberg, Retrieved from https://www.bloomberg.com/graphics/2023-generative-ai-bias/

OECD. (2024). *Using AI in the workplace - opportunities, risks and policy responses*. OECD Publishing.

Orosoo, M., Raash, N., Santosh, K., Kaur, C., Alkhalaf Bani-Younis, J. M., & Rengarajan, M. (2023). Exploring the influence of artificial intelligence technology in managing human resource management. *Journal of Theoretical and Applied Information Technology, 101*(23), 7847–7855.

Pavlović, G. (2023). Algorithmic human resource management: characteristics, possibilities and challenges. *International Scientific Conference: Knowledge Based Sustainable Development – ERAZ*, Prague, 147-155. https://doi.org/10.31410/ERAZ.S.P.2023.147

Sachan, V. S., Katiyar, A., Somashekher, C., Chauhan, A. S., & Bhima, C. K. (2024). The role of artificial intelligence in HRM: Opportunities, challenges, and ethical considerations. *Educational Administration: Theory and Practice, 30*(4), 7427–7435.

Silberg, J., & Manyika, J. (2019, June 6). Tackling bias in artificial intelligence (and in humans). McKinsey & Company. Retrieved from https://www.mckinsey.com/featured-insights/artificial-intelligence/tackling-bias-in-artificial-intelligence-and-in-humans

Soni, J. (2022). A study on the impact of artificial intelligence on human resource management. *International Journal of Research and Analytical Reviews, 9*(2), 149–168.

Tuffaha, M. (2023). The Impact of Artificial Intelligence Bias on Human Resource Management Functions: Systematic Literature Review and Future Research Directions. *European Journal of Business and Innovation Research, 11*(4), 35-58. https://doi.org/10.37745/ejbir.2013/vol11n43558

DOI: https://doi.org/10.31410/ITEMA.S.P.2024.119

Geography of Digital Nomadism – How Digital Nomads Choose Their Destinations and How the Destinations Attract Them

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Abstract: *Remote work, which existed even before the Covid-19 pandemic, although as an exotic practice and a distant prospect for the future, suddenly became mainstream in the period 2020-2022. With the withdrawal of lockdown practices, some employees continued with full remote work, some switched to a hybrid way of working, and others switched to remote work, not from their home but from distant destinations, realising that in remote work, location is irrelevant and that they can "tailor" it according to their needs. This type of employees, who are now very present, especially in the creative industries, are called digital nomads, and although research about them is more and more numerous, very little has been discussed about the geographical dimension of digital nomadism, i.e. how they choose destinations for work and life, and how, in a new environment, destinations try to attract them. Digital nomads choose their destinations for life and work according to numerous parameters, such as connectivity, climate, working conditions, vacation conditions, cultural and entertainment events, infrastructure, traffic connections, visa regime, real estate rental prices, the possibility of finding coworking space, connection with other digital nomads, living expenses and travel expenses to the home country or main office country. Destinations quickly realised that, as in tourism, they could become interesting to digital nomads by granting special visas, building coworking spaces, advertising their benefits, etc. because digital nomads bring financial gain to the destination. This paper will try to explain how digital nomads choose destinations and how the destinations try to attract digital nomads.*

1. INTRODUCTION

Nowadays, after the Covid-19 pandemic, remote work has become largely normalised (Bhatia et al., 2022), at least in the form of hybrid work (partly from home, partly in the office) but it has become, in many cases, completely irrelevant where someone works - from home or from some distant destination to which they have moved, and this form of work began to appear more and more often and called "digital nomads" (Cook, 2023). Admittedly, the term "digital nomad" itself was coined almost 30 years ago in the work of Makimoto and Manners (1997), as a form of a new lifestyle (Hannonen, 2024) in the then-growing atmosphere of digitisation and the dot.com boom. In the past five years, digitisation has gained great momentum and acceleration (Bürgel et al., 2023), which has created a new work dynamic. Therefore, for digital nomads, the location is irrelevant, and they can "tailor" it according to their needs, especially in the creative industries (Milošević & Babić, 2025).

Digital nomads, therefore, travel and work from remote locations, or move to remote locations and permanently reside there, in a voluntary manner (Aroles et al., 2019), performing work for

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clients or companies that are not in their place of residence or their country - thus, permanently or semi-permanently staying in a "traveling" location (Hannonen, 2024).

If this phenomenon has only recently come to the attention of the academic public, it is important to note that most of the works were oriented toward the experiences of digital nomads themselves and their relationship with work, and little has been written about their relationship with the destination, the influence they have on destinations, the influence that destinations have on them and the economic aspects of digital nomadism on local economies, and in this way the topic is complicated, posing new challenges to destination management (Zhou et al., 2024). The so-called "smart destinations", due to the great benefits of attracting digital nomads to their places, have started to behave competitively (Hannonen et al., 2023).

In this sense, digital nomads are employees who choose their work location depending on many diverse factors, including climate, working conditions, coworking centers, residence costs, visa regime, the cost of a flight home or to the central location where the office of the company they work for is located (if there is one, that is, if they do not combine jobs and represent "perfectly independent" digital nomads), connection with other expats and digital nomads (they attract each other, as is the case with Russians in Serbia or Georgia), and even their children's education (Mancinelli, 2020). As they have been choosing destinations for a long time, it was a question of the moment when the process will become two-way, that is, when the destinations will begin to actively participate in the competition for the favor of digital nomads, not only with visa regimes, and not only with the minimum income that is necessary for permanent residence (Planet Nomad, 2024) but also with a whole series of conditions that we have mentioned.

The paper aims to explore the interconnectivity between the destinations and the digital nomads themselves, i.e. to find out how digital nomads choose their destinations and what the destinations (including potential destinations that want to "jump the wagon" and join the "destination market" of digital nomads) do to attract them. The paper claims that the digital nomads are influenced by many factors, both objective (situational) and subjective (personal) ones, and the destinations have become increasingly agile and proactive in their ways to attract them, resulting in many unexpected results (at least for the general public, which is often superficial).

2. LITERATURE OVERVIEW

Digital nomadism is itself a multi-layered phenomenon, which is often not well understood. Namely, before the Covid-19 pandemic, there was a common opinion that digital nomadism is some kind of "luxury" where young people want to travel but also work during that period - so, more like a form of travel, with which the people work (Richards, 2015). This is far from accurate. The literature was very sparse about them (the first article was published only in 2002 by Sørensen, who links their appearance and very existence to "digital services" (Sørensen, 2002), there were no serious discussions about digital nomadism until sometime in 2016 or 2017 (Hannonen, 2024). Meanwhile, several subtypes of digital nomads have been defined, such as workcation (portmanteau of work + vacation), which coincides with the basic notion of digital nomads from 10 or more years ago (Cook, 2023). Over time, researchers began to single out workcationers of digital nomads and exclude them from the definition, (Pecsek, 2018), and the biggest difference and differentiation factor was the length of their stay at the destination (workcationers stayed for a shorter time, and digital nomads for a longer time), and the level of engagement with the destination (workcationers were less engaged, they were only guests, while digital nomads are already real, although sometimes temporary residents of given destinations) (Bassyiouny & Wilkesmann, 2023).

At first, digital nomadism was understood as a group of Westerners with "good passports" travelling the world for fun and for the climate (Hannonen, 2024), but everything changed with the pandemic and after it, when a huge cohort of creative workers entered the market as digital nomads (Hannonen et al., 2023). This coincided with the cessation of travel or its slowdown, and destinations suddenly had to react by attracting "another type of foreign tourists" - who are not tourists - that is, by inviting foreign experts from the technological sector and creative industries to permanently settle in their destinations (locations) (Buhalis et al., 2023). Destinations quickly realized that they could become interesting to digital nomads by granting special visas, building coworking spaces, advertising their benefits, etc. It is all because digital nomads bring financial gain to the destination, and thus the competition to win their favor began (Li et al., 2023).

If there was any research in the literature on the topic of digital nomads and the destinations where they are located, mostly the research relied on the thoughts of digital nomads, that is, on the so-called "demand side" (Zhou et al., 2024), i.e. on their choices, connected with motivational factors (Adams & Bloch, 2022), but the focus quickly shifted to the destination side, that is, the "supply side" (Zhou et al., 2024). Digital nomadism has therefore revived both traditional destinations and peripheral ones that were not popular before, which gave a huge incentive to all destinations to join the competition for digital nomads (Lacárcel et al., 2024), since the choice of the right destination is a very complex task for digital nomads themselves, and is highly personalized, just like shopping or tourism (Chevtaeva & Denizci-Guillet, 2021). Some researchers found that the huge number of options and the lack of precise methods and information made the choices of digital nomads regarding destinations extremely arbitrary and very complex (Hensellek & Puchala, 2021; Zhang et al., 2021).

Digital nomads rely on social networks and social media (Lexhagen & Conti, 2022) and UGC to evaluate their choices and evaluate information about destinations, primarily Facebook, Instagram, TikTok or Reddit, but also YouTube (Lacárcel et al., 2024). They seek authentic experiences and authentic testimonies (Willment, 2020), and are constantly in search of evaluating information during the selection process, a trait that makes them inherently similar to Generation Z in their thinking, even though many digital nomads are over 40 or 50 years old. There are also platforms that digital nomads use specifically to share their experiences, such as Nomadlist, NomadX, Nomad Capitalist, and Nomad Embassy (Zhou et al., 2024).

In this sense, destinations must become innovative in their approach, and make an effort to showcase the best of what they have or to invent something new that would make them more competitive in this new market. They must apply destination innovation methods (Hjalager, 2010) to the emerging digital nomad market and identify product or service innovations, the management or marketing innovations, and marketing initiatives "include top-down branding, as destinations have established digital nomad associations, marketing campaigns, and targeted digital nomad events" (Zhou et al., 2024).

3. RESULTS AND DISCUSSION

It has also been noticed that digital nomads often have a regional experience of their new destinations, i.e. residences, so the destinations have adapted to it, and started to act following the cross-border view of the world (Kozak & Buhalis, 2019), i.e. the destinations have started to adapt to it despite regional micro-differences and intolerances (for example, the Russians see the "Balkans" as a region, the British "Iberia" (Spain and Portugal) or the "Caribbean" (independently of the territorial unit) as a region, etc. They also first decide on the most visible destinations, i.e.

the traditional ones - thus, as early leaders in the market, Madeira and the Canary Islands, the possessions of Portugal and Spain, were the first to be "launched" as digital nomad destinations as early leaders. Namely, they launched the "Digital Nomad Madeira" and "Nomad City Gran Canaria" projects, but after the initial success, it turned out that there was a decline, since the local industries could not keep up (Almeida & Belezas, 2022; Zhou et al., 2024). Also, some authors have noticed a clear seasonality in the choice of residence of digital nomads - departure from a destination where there is a rainy and warm season, arrival in the summer or winter period in the Mediterranean or Scandinavia and the like (McKercher, 2023).

In order to include more and more variables, Hannonen et al. (2023) applied stakeholder theory to the case of Spain in 2023, representing them as "new locals" or "new residents", and found that local stakeholders played a large role in the accommodation factor for "new locals", but also that there was a strong correlation between stakeholder specialization and accommodation preferences (Hannonen et al., 2023; Zhou et al., 2024).

The visa regime played a major role in the choice of destinations for digital nomads (Kuzey et al., 2019), as well as the mandatory earnings that destinations made official for obtaining a Digital Nomad Visa (Milošević et al., 2024). It appears under different names in different countries but has the same meaning, for example, White Card (Hungary), or Nomad Digital Residence (Antigua and Barbuda) (Hannonen, 2024). Differences in mentality can also be seen here, although all countries loudly promoted their visa policy: for example, Estonia had an "entrepreneurship angle", while the Caribbean islands had a "tourism angle" when setting visa requirements. Namely, Estonia wanted to attract new businesses, and the Caribbean wanted to make up for the lack of tourists that was a consequence of the pandemic, before the era of "revenge tourism" (Hannonen, 2024). Malaysia, for its part, played on the card of accelerated digitization of the state (Bednorz, 2023).

Coworkcation is another thing that plays a big role in the choice of destination, and it is completely on the supply side of the spectrum. States have tried to create as many coworking spaces as possible, so that digital nomads get a sense of community in a kind of "community expat centers", since like-minded people can be found here and the atmosphere is cosmopolitan (Hannonen et al., 2023). Such centers began to withdraw some of the elements of transnational gentrification (Milošević et al., 2024) because, for example, in Novi Sad, Russians created their coworking places in places where pubs used to be closed during the pandemic (example: the former "Izba", which became the "Martin" coworking center). Similar locations appear in other places, very often milk and coffee bars where exotic coffees, teas and cakes are served and where locals rarely go, since the menus are not tailored to their taste - typical examples of the emergence of such coworking spaces are Lisbon or Bali (Busuttil & Hannonen, 2024).

Zhou et al. found in their research that the list of the best countries for digital nomads does not agree with the list of top tourist destinations, but neither with the list of the best countries for "doing business", thus showing that there are many other, hidden decision-making factors in digital nomadism. Namely, Anguilla, Croatia, or Antigua and Barbuda are not among the world's Top 10 most popular tourist destinations, but they are favorites for digital nomads (Zhou et al., 2024). Geographical locations favor Mediterranean countries, while Eastern European countries ranked high due to the cost of living and security (Croatia is a combination of both factors here, so its high position is not surprising). African countries play on low costs and exoticism, which should compensate for reduced security. Some of the "winners" here include destinations in peripheral areas and emerging destinations since they have been involved very seriously as places that are not traditionally attractive, but receive a significant influx of funds through digital nomads (Zerva

et al., 2023). The cost of living played a huge role, and this is where the so-called "geoarbitrage" - since digital nomads choose a location where the money they know they will earn will last longer (Hannonen, 2024; Holleran, 2022; Mancinelli, 2020), avoiding Western countries (Woldoff & Litchfield, 2021), and this practice is called "lifestyle hacking" or "geo-hacking" (Cook, 2022). The countries of the Global South play this card when luring digital nomads (Hannonen, 2024), and here again, Croatia proved to be the winner. Also, the idea is to keep money in the country and offer lower taxes: Costa Rica offers only 10-15% tax compared to the usual 30% for locals, Portugal looks to digital nomads to spend at least 183 days in the country and send less than 60% of their income home (or abroad), while Greece gives a 50% tax discount if you stay for at least two years (Zhou et al., 2024).

In their research, Lacárcel et al asserted, analyzing UGC on X (ex-Twitter), that all destination attraction factors can be divided into three groups (positive, neutral and negative), and that there are 11 of them in total, and that 6 of them are positive (employment, retirement, gastronomy, co-working, work motivation, culture), one factor is neutral (customer service), and four negative topics (connectivity, work hours, visa issues, loneliness) (Lacárcel et al., 2024). In both the research of Zhou et al. (2024) and Lacárcel et al. (2024), cultural immersion had a great impact, and social inequalities like in the Caribbean or Africa, or the lack of connectivity had a negative impact on the choice, and these are weak points that destinations must fix. The top 20 countries on the list in the research conducted by Zhou et al. (2024) are: Portugal, Croatia, Mexico, Spain, Colombia, Thailand, Greece, Antigua and Barbuda, Panama and Brazil. Serbia is in a solid 43rd place, but Montenegro is 36th and Albania is 32nd, which means that Serbia can do better (Zhou et al., 2024). Some ski resorts in countries that we would not favor at first glance, such as Bansko in Bulgaria, are winners with innovative policies, coworking spaces and atmosphere, because now there are at least 300 digital nomads there at any given moment, and even a Digital Nomad Fest is regularly held (Gill, 2023).

4. CONCLUSION

Digital nomads are a motley crew: they have wildly varying parameters for choosing their preferred destination. They form a completely new market niche in tourism and business, blending both concepts into one unique form. It is quite a stunning opportunity for destinations to compete and apply an innovative marketing mix and methods to attract this new bunch of often affluent or young people. Some cities and towns, even resorts have flourished recently, like some unexpected leaders in the world of digital nomadism, like Bansko in Bulgaria as a ski resort and town, and Croatia as a whole – which emerged as a digital nomad superpower. Some places in decay even have become trendy and fleshy after they came.

On the flip side, the digital nomads often disrupt the economic process in the destination, creating some new places with high prices and customs not fitting locals, which sometimes leads to so-called transnational gentrification or ghettoization. It was all shown in Serbia when the Russians flooded the country after the start of the Russo-Ukrainian war, but on the other hand, they brought financial injections to the destinations that were more often hungry for fresh capital.

Destinations fight for digital nomads pretty much the same way they fight for tourists. Digital nomads bring fresh energy and revive the destinations, increasing the number of cultural events, restaurants, pubs, etc., and can be considered a "gift from Heaven" for many destinations in the world, many of them experiencing heavy depopulation trends. However, the choice of destination by digital nomads is highly personalized and almost elusive, and there is much to be done in this

ever-changing field to fully determine the patterns of their choices. On the other hand, destination marketing has a new, dynamic task in front of it to match the demand side with the ever-richer supply side and new benefits for digital nomads.

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References

Adams, K. M., & Bloch, N. (2022). Problematizing Siloed Mobilities. *Intersections of Tourism, Migration, and Exile*, 1-30. https://doi.org/10.4324/9781003182689-1

Almeida, J., & Belezas, F. (2022). The Rise of Half-Tourists and their Impact on the Tourism Strategies of Peripheral Territories. *Tourism, Hospitality & Event Management*, 181-191. https://doi.org/10.1007/978-3-030-89232-6_9

Aroles, J., Mitev, N., & de Vaujany, F.-X. (2019). Mapping themes in the study of new work practices. *New Technology, Work and Employment, 34*(3), 285-299. https://doi.org/10.1111/ntwe.12146

Bassyiouny, M., & Wilkesmann, M. (2023). Going on workation–is tourism research ready to take off? Exploring an emerging phenomenon of hybrid tourism. *Tourism Management Perspectives, 46*(2023), 101096.

Bednorz, J. (2023). Digital Nomad Visas with Jan Bednorz. Academia Experience Podcast. https://www.youtube.com/watch?v=oL-LJ4Rdkts

Bhatia, A., Roy, B., & Kumar, A. (2022). A review of tourism sustainability in the era of Covid-19. *Journal of Statistics and Management Systems, 25*(8), 1871-1888. https://doi.org/10.1080/09720510.2021.1995196

Buhalis, D., O'Connor, P., & Leung, R. (2023). Smart hospitality: from smart cities and smart tourism towards agile business ecosystems in networked destinations. *International Journal of Contemporary Hospitality Management, 35*(1), 369-393. https://doi.org/10.1108/ijchm-04-2022-0497

Bürgel, T. R., Hiebl, M. R. W., & Pielsticker, D. I. (2023). Digitalization and entrepreneurial firms' resilience to pandemic crises: Evidence from COVID-19 and the German Mittelstand. *Technological Forecasting and Social Change, 186*, 122135. https://doi.org/10.1016/j.techfore.2022.122135

Busuttil, S., & Hannonen, O. (2024, January 2). Local responses to global nomads. *Pursuit*.

Chevtaeva, E., & Denizci-Guillet, B. (2021). Digital nomads' lifestyles and coworkation. *Journal of Destination Marketing & Management, 21*, 100633. https://doi.org/10.1016/j.jdmm.2021.100633

Cook, D. (2022). Breaking the contract: Digital nomads and the state. *Critique of Anthropology*, *42*(3), 304–323. https://doi.org/10.1177/0308275X221120172

Cook, D. (2023). What is a digital nomad? Definition and taxonomy in the era of mainstream remote work. *World Leisure Journal, 65*(2), 256-275. https://doi.org/10.1080/16078055.2023.2190608

Gill, A. (2023). Bansko: Bulgaria's unlikely new digital nomad hub, BBC, https://www.bbc.com/travel/article/20231003-bansko-bulgarias-unlikely-new-digital-nomad-hub

Hannonen, O. (2024). Emergent geographies of digital nomadism: conceptual framing, insights and implications for tourism. *Tourism Geographies*, 1–11. https://doi.org/10.1080/14616688.2023.2299845

Hannonen, O., Aguiar Quintana, T., & Lehto, X. Y. (2023). A supplier side view of digital nomadism: The case of destination Gran Canaria. *Tourism Management, 97*, 104744. https://doi.org/10.1016/j.tourman.2023.104744

Hensellek, S., & Puchala, N. (2021). The Emergence of the Digital Nomad: A Review and Analysis of the Opportunities and Risks of Digital Nomadism. *Human Resource Management*, 195-214. https://doi.org/10.1007/978-3-030-62167-4_11

Hjalager, A.-M. (2010). A review of innovation research in tourism. *Tourism Management, 31*(1), 1-12. https://doi.org/10.1016/j.tourman.2009.08.012

Holleran, M. (2022). Pandemics and geoarbitrage: digital nomadism before and after COVID-19. *City, 26*(5-6), 831-847. https://doi.org/10.1080/13604813.2022.2124713

Kozak, M., & Buhalis, D. (2019). Cross-border tourism destination marketing: Prerequisites and critical success factors. *Journal of Destination Marketing & Management, 14*, 100392. https://doi.org/10.1016/j.jdmm.2019.100392

Kuzey, C., Karaman, A. S., & Akman, E. (2019). Elucidating the impact of visa regimes: A decision tree analysis. *Tourism Management Perspectives, 29*, 148-156. https://doi.org/10.1016/j.tmp.2018.11.008

Lacárcel, F. J. S., Huete, R., & Zerva, K. (2024). Decoding digital nomad destination decisions through user-generated content. *Technological Forecasting and Social Change, 200*, 123098. https://doi.org/10.1016/j.techfore.2023.123098

Lexhagen, M., & Conti, E. (2022). Instagramming, Encyclopedia of tourism management and marketing, Edward Elgar Publishing, Cheltenham, 711-714.

Li, N., Su, T., Li, G., & Paris, C. M. (2023). A new travel group—digital nomad: Concept, evolution, and research progress. *Tourism Tribune*, *38*(1), 122–133.

Makimoto, T., & Manners, D. (1997). *Digital nomad*. John Wiley & Sons.

Mancinelli, F. (2020). Digital nomads: freedom, responsibility and the neoliberal order. *Information Technology & Tourism, 22*(3), 417-437. https://doi.org/10.1007/s40558-020-00174-2

McKercher, B. (2023). Age or generation? Understanding behaviour differences. *Annals of Tourism Research, 103*, 103656. https://doi.org/10.1016/j.annals.2023.103656

Milošević, Ž., & Babić, A. (2025). (Self-) management of the ICT-supported digital nomadism in creative industries. INTERNATIONAL Conference on Business, Management, and Economics Engineering Future-BME, 258-266. https://doi.org/10.24867/future-bme-2024-028 258-266. 10.24867/FUTURE-BME-2024-028.

Milošević, Ž., Ivanišević, A., Lošonc, A., Bolesnikov, M., & Pavlović, A. (2024). Digital Nomadism in a Contemporary Business Environment. In C. A. Nastase, A. Monda, & R. Dias (Eds.), *International Scientific Conference – EMAN 2024: Vol 8. Selected Papers* (pp. 171-178). Association of Economists and Managers of the Balkans. https://doi.org/10.31410/EMAN.S.P.2024.171

Pecsek, B. (2018). Working on holiday: the theory and practice of workcation. *Balkans Journal of Emerging Trends in Social Sciences* (Vol 1, No 1), 1-13. https://doi.org/10.31410/balkans.jetss.2018.1.1.1-13 Working on holiday: the theory and practice of workcation.

Planet Nomad. (2024). https://www.planet-nomad.com/es/visas-para-nomadas-digitales

Richards, G. (2015). The new global nomads: Youth travel in a globalizing world. *Tourism Recreation Research*, *40*(3), 340–352. https://doi.org/10.1080/02508281.2015.1075724

Sørensen, C. (2002). Digital nomads and mobile services.

Willment, N. (2020). The travel blogger as digital nomad: (Re-)imagining workplace performances of digital nomadism within travel blogging work. *Information Technology & Tourism, 22*(3), 391-416. https://doi.org/10.1007/s40558-020-00173-3

Woldoff, R. A., & Litchfield, R. C. (2021). *Digital nomads: In search of freedom, community, and meaningful work in the new economy*. Oxford University Press.

Zerva, K., Huete, R., & Segovia-Pérez, M. (2023). Digital Nomad Tourism: The Experience of Living at the Destination. *Springer Proceedings in Business and Economics*, 15-26. https://doi.org/10.1007/978-3-031-19656-0_2

Zhang, Y., Gao, J., Cole, S., & Ricci, P. (2021). How the Spread of User-Generated Contents (UGC) Shapes International Tourism Distribution: Using Agent-Based Modeling to Inform Strategic UGC Marketing. *Journal of Travel Research, 60*(7), 1469-1491. https://doi.org/10.1177/0047287520951639

Zhou, L., Buhalis, D., Fan, D. X. F., Ladkin, A., & Lian, X. (2024). Attracting digital nomads: Smart destination strategies, innovation and competitiveness. *Journal of Destination Marketing & Management, 31*, 100850. https://doi.org/10.1016/j.jdmm.2023.100850

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Effects of High Work Involvement on Employees' Affective Organizational Commitment

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Abstract: *In the context of modern human resource management theories, the analysis of high employee work involvement and affective organizational commitment is essential for understanding the dynamics between employees and organizational performance. This paper analyzes the concepts of human resource management based on modern paradigms, such as high employee involvement and affective organizational commitment. The primary goal of the research is to examine the interaction between high work involvement and affective organizational commitment of employees. The key research question was posed in the context of the impact of high work involvement on the affective commitment of employees. The paper consists of a theoretical and an empirical segment. As part of the theoretical part, a systematic review of previous research on the topic of high work involvement and affective organizational commitment was carried out. Empirical research was conducted on a sample of 139 employees, including managers and professionals, within the IT sector in the Republic of Serbia. Data collection was carried out through an electronic questionnaire during May 2024. Data analysis was conducted using the PLS-SEM method within the Smart PLS software to test the postulated relationships. The research results indicated the existence of a direct positive influence of high work involvement on affective organizational commitment. Employees who are actively involved in decision-making and problem-solving processes showed significantly higher commitment and loyalty to the organization, which suggests that high involvement can be a key factor in improving organizational commitment.*

1. INTRODUCTION

In modern organizations, human capital is a key factor in achieving competitive advantage and long-term success. In this context, high work involvement has become an increasingly important practice that enables organizations to improve the efficiency and motivation of their employees (Bayraktar et al., 2018). This practice involves engaging employees in decision-making processes related to their work, which directly influences their level of motivation and commitment to the organization (Vance, 2006). High work involvement is increasingly recognized as a key element for improving efficiency and achieving strategic organizational goals, especially in the context of the IT sector (Jevtić & Gašić, 2024). Organizational commitment represents a key aspect of employee attitudes within an organization, relating to their positive emotions and engagement with the organization as a whole, rather than just with the job itself, as is the case with job satisfaction. This form of commitment involves a deep emotional connection employees have with the organization, manifested in their willingness to make sacrifices for its benefit. Organizational commitment goes beyond mere job satisfaction, encompassing employees' willingness to engage

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on a deeper level, often aligning their efforts with the organization's interests, which may include greater dedication, extra effort, and loyalty. Committed employees are not only satisfied with their work tasks, but this satisfaction also positively impacts their personal lives, as they feel connected to the organization's values, mission, and goals, which contributes to their overall happiness and fulfilment (Meyer & Allen, 2001). The goal of this research is to examine how high work involvement affects the affective commitment of employees in the IT sector of Serbia, with the hypothesis that high work involvement positively influences this commitment.

2. HIGH WORK INVOLVEMENT AND AFFECTIVE ORGANIZATIONAL COMMITMENT

The practice of high work involvement represents a managerial approach aimed at engaging employees in decision-making processes related to their work, primarily to increase their work motivation. Given the growing importance of human capital and strategic human resource management as one of the key sources of an organization's strategic capabilities, the practice of high work involvement has become a significant part of organizations (Lawler, 2003). According to Bayraktar et al. (2018), high work involvement refers to work and employment practices designed to enhance the empowerment, awareness, motivation, and skills of employees. According to Renkema et al. (2021), the practice of high employee involvement supports employee engagement in the organization's business and influences the increase in organizational commitment by appealing to intrinsic motives, developing employee competencies that support strategy implementation, thus complementing the strategic function of human resources through improving the efficiency of strategic management. Pil and MacDuffie (1996) define high-involvement jobs as a system of managerial practices that, along with employee skills, motivation, and information, result in a workforce that is a source of competitive advantage. Wright et al. (2001) discussed that researchers should explore the role of high-involvement employees in managing internal human resources and use it as a competitive advantage over time. High-involvement management is seen as a key discovery in modern management, having a profound effect on individual employee performance and the organization as a whole.

According to Bayraktar et al. (2018) the multidimensional configuration of high work involvement practices, employee involvement is observed through the lenses of recognition, empowerment, competency development, information sharing, and fair reward practices. Recognition practices have become one of the most important non-monetary forms of reward that organizations grant to employees as a means of compensating their efforts, achievements, and suggestions. Recognition practices are applied to increase employee commitment and organizational performance. Empowerment practices allow employees to make daily decisions regarding work-related activities, which enhances employee performance by generating intrinsic motivation and stimulating positive work attitudes, particularly emotional engagement (Paré & Tremblay, 2007). Competency development practices are recognized as key human resource management practices that increase commitment and, consequently, employee performance through job rotation, mentoring programs, training, and development practices (Behery, 2011). Information-sharing practices also have a positive effect on employees, as they signal that the organization trusts and values its employees (Renkema et al., 2021). Fair reward practices include considerations of fairness in compensation procedures, performance evaluations, and job assignments, signaling that the organization treats employees justly (Boxall et al., 2019).

According to Karatepe (2013) and Kilroy et al. (2016), high work involvement refers to work and employment practices designed to enhance employees' empowerment, awareness, motivation, and skills. Kim and Sung-Choon (2013) argue that the practice of high employee involvement supports their integration into the organization's operations and contributes to increased organizational commitment by appealing to intrinsic motives, fostering the development of employee

competencies that aid in strategy implementation, and thus complementing the strategic function of human resources by improving the efficiency of strategic management. From an economic perspective, high work involvement is considered the most cost-effective and efficient method of motivation, as employees are more likely to be engaged in their work when they are involved in decision-making processes, leading to a stronger sense of belonging to the organization. Lawler (2003) emphasizes employee participation in decision-making, as it increases employee commitment and satisfaction, which, in turn, positively impacts their performance and benefits the organization.

In the last two decades, the concept of organizational commitment has attracted significant attention. Mathieu and Zajac (1990) confirmed that the concept of organizational commitment has prompted numerous empirical studies that cover both its consequences and antecedents. The increased interest in the literature on organizational commitment resulted from the belief that this concept is an important part of the psychological conditions of employees, as it is believed that employees who experience high organizational commitment exhibit positive workplace behaviors, such as high job performance and engagement in activities that benefit the organization (Paré & Tremblay, 2007).

According to Paré and Tremblay (2007) and Renkema et al. (2021), organizational commitment includes three types: affective commitment, continuance commitment, and normative commitment. Affective organizational commitment refers to an employee's emotional attachment to the organization, their identification with it, and their involvement in the organization (Kwon et al., 2010).

High work involvement practices can enhance employees' affective commitment by facilitating their participation in the organization and their connection to the employer, which is why they are considered attractive organizational practices. Employees who are committed to their organization are willing to put in extra effort to make the organization more efficient, effective, and innovative (Wright & Kehoe, 2008). Affective commitment reflects the attitude employees have towards the organization, while normative and continuance commitment reflects attitudes directed towards the outcomes of behavior (Stazyk et al., 2011). Affective commitment is crucial for employees to demonstrate discretionary behaviors, such as innovative behavior, as committed employees are more likely to stay in the organization and, therefore, more likely to reciprocate by engaging in innovative behaviors (Jafri, 2010). Thus, high work involvement practices are positively associated with affective commitment, leading to an improvement in innovative behavior. Employees with strong affective commitment stay in the organization because they want to, those with strong continuance commitment stay because they have to, and those with strong normative commitment stay because they feel they should (Renkema et al., 2021). Considering the subject and purpose of this study, as well as previous research on the topic, the primary hypothesis to be tested is:

H: High work involvement leads to positive effects on the affective organizational commitment of employees in the IT sector in Serbia.

3. METHODOLOGY

In this section, the sampling method will be presented, the way participants had the opportunity to respond to the questions, the timeframe for sample collection, as well as the presentation and description of the sample.

In the process of researching the effects of high work involvement on affective organizational commitment, an electronic questionnaire, "Google Forms" was used. The questionnaire consists of two parts. The first part included questions such as gender, age, education level, position within

the organization, organization size, market served by the organization, work experience, and work patterns within the organization. The second part of the questionnaire presented statements related to the assessment of high work involvement and affective organizational commitment. High work involvement is the independent variable, while affective organizational commitment is the dependent variable. For the purposes of the research and measurement, a Likert scale was used, ranging from 1 to 5, where 1 represents "strongly disagree," 2 "disagree," 3 "neutral," 4 "agree," and 5 "strongly agree" (Joshi et al., 2015). The questionnaire link was exclusively distributed to employees in the IT sector of the Republic of Serbia.

The questionnaire related to the effects of high work involvement on the affective organizational commitment of employees was exclusively intended for managers and skilled workers (software engineers) in the IT sector of the Republic of Serbia. The questionnaire was completed by 139 employees, including managers and skilled workers in the IT sector within the territory of the Republic of Serbia. Sample collection lasted throughout May 2024. The sample primarily consisted of a higher representation of male respondents (57.6%), younger employees aged 18 to 25 (37.4%), those with completed four-year academic studies (39.6%), and employees in the position of skilled workers – software engineers (66.9%). The sample predominantly consisted of employees in small organizations (33.8%). In the sample structure, employees' work experience ranged from 1 to 5 years. The most dominant work pattern in the observed sample was the hybrid work model, combining work from home and office-based work (61.2%).

4. RESULTS AND DISCUSSION

To present the results of the research on the effects of high work involvement on employees' affective organizational commitment, two statistical software programs were used: "SPSS IBM" and "Smart PLS." The research aimed to determine the direct effect of high work involvement on employees' affective organizational commitment. Table 1 displays the descriptive statistics for the observed variables.

Table 1. Descriptive statistics for observed variables

	N	Minimum	Maximum	Mean	Std. Deviation
High work involvement practice	139	1,00	4,83	2,2527	0,83012
Affestive organizational commitment	139	1,00	4,38	2,8467	0,61566

Source: Own research

Using the statistical software "SPSS IBM," descriptive statistics are presented, including the minimum, maximum, mean, and standard deviation.

Figure 1 shows the research model, which includes the two observed variables, the statements that the variables encompass, as well as the bootstrapping results.

Table 2 includes standard deviation, t-statistic, and p-value. The results obtained using the statistical software "Smart PLS" indicate a statistically significant positive effect of high work involvement on affective organizational commitment (β=0.690, t=15.594, p=0.000). Therefore, it can be concluded that high work involvement positively impacts affective organizational commitment. Consequently, the hypothesis about the existence of a positive effect between the observed variables can be confirmed. This positive effect can be explained by the fact that high work involvement allows employees to actively participate in decision-making processes, which gives them a greater sense of control and value within the organization. Through such engagement, employees

develop a stronger emotional connection with the organization's goals and values, resulting in increased commitment and a desire to contribute to the achievement of these goals. Increased affective organizational commitment can lead to positive outcomes within the organization, such as higher work motivation, better productivity, and lower employee turnover. Employees who are emotionally connected to the organization are more likely to stay, invest their effort in their work with greater enthusiasm, and take initiative in improving organizational processes. These findings provide valuable guidance for managers in the IT sector, who can use high work involvement practices as a tool to enhance employee loyalty and engagement, which will result in better business outcomes and innovation.

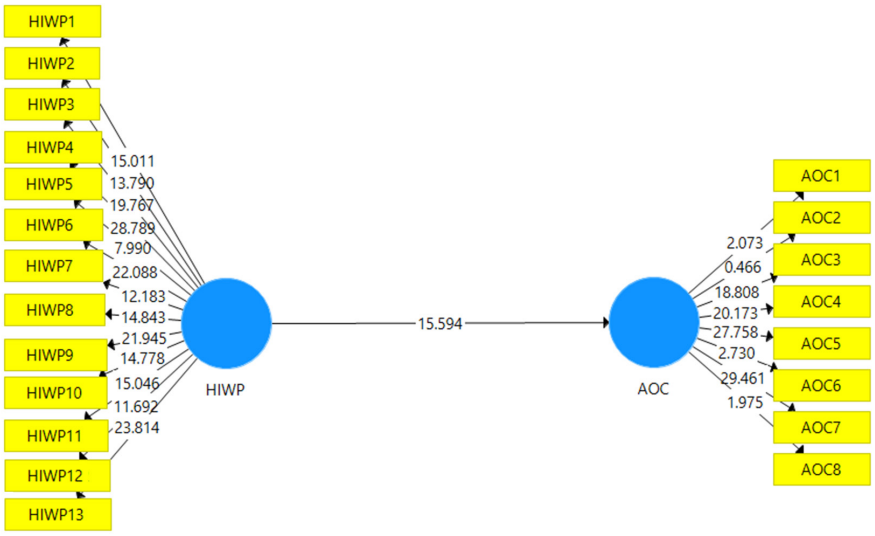

Figure 1. The path model with bootstrapping results

Source: Own research

Table 2. Statistical significance testing – direct effect

	Original sample	St. deviation	T statistics	p-values	Hypothesis
High involvment work practices Affective organizational commitment	0,690	0,044	15,594	0,000	H: Accepted

Source: Own research

5. CONCLUSION

The research confirmed that high work involvement has a significant positive effect on employees' affective organizational commitment in the IT sector Republic of Serbia. Statistical data show that involving employees in decision-making increases their emotional connection to the organization, leading to higher engagement, loyalty, and productivity. High work involvement practices, such as empowerment, recognition of achievements, and information sharing, enhance employee motivation and reduce turnover. Employee commitment is an important form of attitude within an organization that, according to research by authors in this field, has positioned itself as a significant driver of change and a foundation for efficient and effective business operations in modern business and human resource management conditions. It focuses on individuals who, with their knowledge, abilities, and readiness for change and innovation, contribute to the organization's competitiveness. These results suggest that managers in the IT sector can use these practices to improve business outcomes and innovation.

References

Bayraktar, C. A., Karacay, G., Araci, O., & Calisir, F. (2018). Exploring the relationship between high-involvement human resource practices and affective commitment within non-Western service context. *International Journal of Work Organisation and Emotion, 9*(3), 283. https://doi.org/10.1504/ijwoe.2018.094686

Behery, M. (2011). High involvement work practices that really count: perspectives from the UAE. *International Journal of Commerce and Management, 21*(1), 21-45. https://doi.org/10.1108/10569211111111685

Boxall, P., Huo, M.-L., Macky, K., & Winterton, J. (2019). Chapter 1 High-involvement Work Processes and Systems: A Review of Theory, Distribution, Outcomes, and Tensions. *Research in Personnel and Human Resources Management*, 1-52. https://doi.org/10.1108/s0742-730120190000037002

Jafri, M. H. (2010). Organizational commitment and employee's innovative behavior: A study in retail sector. *Journal of Management Research*, *10*(1), 62-68.

Jevtić, T., & Gašić, D. (2024). The Effects of High Work Involvement on the Well-Being of It Sector Employees in the Republic of Serbia. Proceedings of the 29th International Scientific Conference Strategic Management and Decision Support Systems in Strategic Management. https://doi.org/10.46541/978-86-7233-428-9_418

Joshi, A., Kale, S., Chandel, S., & Pal, D. (2015). Likert Scale: Explored and Explained. *British Journal of Applied Science & Technology, 7*(4), 396-403. https://doi.org/10.9734/bjast/2015/14975

Karatepe, O. M. (2013). High-performance work practices and hotel employee performance: The mediation of work engagement. *International Journal of Hospitality Management, 32*, 132-140. https://doi.org/10.1016/j.ijhm.2012.05.003

Kilroy, S., Flood, P. C., Bosak, J., & Chênevert, D. (2016). Perceptions of high-involvement work practices and burnout: the mediating role of job demands. *Human Resource Management Journal, 26*(4), 408-424. https://doi.org/10.1111/1748-8583.12112

Kim, H., & Sung-Choon, K. (2013). Strategic HR functions and firm performance: The moderating effects of high-involvement work practices. *Asia Pacific Journal of Management, 30*(1), 91-113. https://doi.org/10.1007/s10490-011-9264-6

Kwon, K., Bae, J., & Lawler, J. J. (2010). High Commitment HR Practices and Top Performers: Impacts on Organizational Commitment. *Management International Review, 50*(1), 57-80. https://doi.org/10.1007/s11575-009-0023-6

Lawler, E. E. (2003). Reward practices and performance management system effectiveness. *Organizational Dynamics, 32*(4), 396-404. https://doi.org/10.1016/j.orgdyn.2003.08.007

Mathieu, J. E., & Zajac, D. M. (1990). A review and meta-analysis of the antecedents, correlates, and consequences of organizational commitment. *Psychological Bulletin, 108*(2), 171-194. https://doi.org/10.1037//0033-2909.108.2.171

Meyer, J. P., & Allen, N. J. (2001). Organizational commitment. Personnel psychology and human resource management: A reader for students and practitioners, 289, 342.

Paré, G., & Tremblay, M. (2007). The Influence of High-Involvement Human Resources Practices, Procedural Justice, Organizational Commitment, and Citizenship Behaviors on Information Technology Professionals' Turnover Intentions. *Group & Organization Management, 32*(3), 326-357. https://doi.org/10.1177/1059601106286875

Pil, F. K., & MacDuffie, J. P. (1996). The adoption of high-involvement work practices. *Industrial Relations: A journal of economy and society, 35*(3), 423-455. 455. https://doi.org/10.1111/j.1468-232x.1996.tb00414.x

Renkema, M., Leede, J., & Van Zyl, L. E. (2021). High-involvement HRM and innovative behaviour: The mediating roles of nursing staff's autonomy and affective commitment. *Journal of Nursing Management, 29*(8), 2499-2514. https://doi.org/10.1111/jonm.13390

Stazyk, E. C., Pandey, S. K., & Wright, B. E. (2011). Understanding Affective Organizational Commitment: The Importance of Institutional Context. *The American Review of Public Administration, 41*(6), 603-624. https://doi.org/10.1177/0275074011398119

Vance, R. J. (2006). Employee engagement and commitment. *SHRM foundation*, *1*(1), 1-53.

Wright, P. M., Dunford, B. B., & Snell, S. A. (2001). Human resources and the resource based view of the firm. *Journal of Management, 27*(6), 701-721. https://doi.org/10.1177/014920630102700607

Wright, P. M., & Kehoe, R. R. (2008). Human resource practices and organizational commitment: A deeper examination. *Asia Pacific Journal of Human Resources, 46*(1), 6-20. https://doi.org/10.1177/1038411107086540

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The Impact of ESG Frameworks and AI Technologies on Communication Satisfaction, Job Satisfaction, and Job Performance in the Retail Sector: An SEM Approach

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Artificial intelligence in retail

Abstract:

Purpose: *This study explores how Environmental, Social, and Governance (ESG) frameworks and Artificial Intelligence (AI) technologies influence communication satisfaction, job satisfaction, and job performance in the retail sector.*

Design/Methodology/Approach: *Using a structured questionnaire, data was collected from 656 customer-facing employees in Delhi via convenience sampling. Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM) were conducted using IBM AMOS 21.0.*

Findings: *Communication satisfaction positively affects job satisfaction and job performance. Job satisfaction mediates this relationship, while ESG and AI act as moderators, strengthening these effects.*

Originality/Value: *The study introduces ESG and AI as moderating variables in a less-explored communication-performance framework.*

1. INTRODUCTION

Retail sales employees are key to customer satisfaction and business success. This study investigates how Communication Satisfaction (CS) influences Job Performance (JP), with Job Satisfaction (JS) as a mediator. Effective communication enhances clarity, engagement, and efficiency, while poor communication hampers morale and productivity. Using data from customer-facing employees, Structural Equation Modeling (SEM) reveals that Environmental, Social, and Governance (ESG) frameworks and Artificial Intelligence (AI) technologies significantly moderate these relationships. ESG fosters transparency, while AI improves information flow. The study offers actionable insights for retail managers to strengthen communication systems, enhance employee outcomes, and maintain competitive advantage in a dynamic retail environment.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

2.1. Communication Satisfaction (CS)

Communication Satisfaction (CS) reflects employees' contentment with organizational communication. Evolving from effectiveness-focused models, CS now encompasses informational and relational aspects, measured through validated tools like the CSQ, aiding communication audits and enhancing organizational performance and employee engagement.

2.2. Job Satisfaction (JS)

Job Satisfaction (JS) stems from psychological and organizational factors, linked to motivation and achievement. Measurement tools identify key areas: interpersonal relations, work conditions, compensation, career growth, and training opportunities.

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2.3. Job Performance (JP)

Job Performance (JP) is task execution using resources, shaped by behaviors like attendance. It includes task and contextual performance, assessed through tools to enhance organizational outcomes.

2.4. ESG Frameworks (ESG)

ESG frameworks promote sustainability, transparency, and risk reduction, attracting talent and enhancing long-term value. They serve as both ethical commitments and strategic tools improving communication satisfaction.

2.5. AI Technologies

AI enhances real-time communication and decision-making in retail. Integrated with ESG, tools like chatbots and analytics boost service quality, job performance, satisfaction, and workplace transparency.

2.6. Relationship between the Variables

Table 1. Relationship between the Variables - Job performance (JP), Job satisfaction (JS), and Communication satisfaction (CS)

Dimension	Key Relationship	Supporting Studies	Notes
CS and JS	Positive relationship; CS significantly impacts JS.	Muchinsky (1977), Pincus (1986), Pettit et al. (1997)	Employee communication satisfaction leads to contentment with work and greater job engagement.
CS and JP	Direct relationship; CS enhances JP, but the impact depends on organizational communication practices.	Bosu et al. (2019), Ratia and Tuzlukaya (2019), Goris (2007)	Effective communication helps employees achieve better performance by reducing misunderstandings and fostering clarity.
JS and JP	Interdependent relationship; higher JS results in improved JP, and vice versa.	Judge et al. (2001), Wright and Cropanzano (2000), Tabassum et al. (2016), Vroom (1964)	Satisfied employees are more likely to perform well, and good performance further enhances satisfaction.
CS, JS, and JP	JS mediates the relationship between CS and JP.	Pincus (1986), Davar and Bala (2012), Platis et al.(2015), Lamond et al. (2009), Salleh et al. (2012)	Communication satisfaction leads to JS, which in turn positively impacts job performance.
Role of Supervisors	Supervisor communication style directly affects the influence of CS on JS.	Foehrenbach and Rosenberg (1982), Pettit et al. (1997)	Supervisors play a crucial role in shaping communication satisfaction and its subsequent impact on job satisfaction.
Cultural Context	The relationship between CS, JS, and JP varies across cultural and industry-specific contexts.	Lamond et al. (2009), Salleh et al. (2012), Abdulwahab (2016), Yvonne et al. (2014), Bin (2015)	Research highlights industry-specific (e.g., Chinese and Malaysian retail sectors) and cultural nuances in communication and performance links.

Source: Own research

Table 2. Transformative Impact of ESG Practices on Job performance (JP), Job satisfaction (JS), and Communication satisfaction (CS)

Study	Key Variables/ Focus	Key Findings	Implications
An Empirical Study on Corporate ESG Behavior and Employee Satisfaction: A Moderating Mediation Model. (Zhang et al., 2024)	Corporate ESG behaviors, employee satisfaction, transparency, internal control, executive awareness, education	ESG behaviors enhance employee satisfaction. Transparency and internal control are pivotal. Higher executive environmental awareness and employee education strengthen ESG and satisfaction relationships.	ESG practices should focus on transparency and internal mechanisms. Educational initiatives for employees and leadership can amplify the positive impact of ESG
The Effects of ESG Activities on Job Satisfaction, Organizational Trust, and Turnover Intention. (Seo et al., 2022)	ESG activities, job satisfaction, organizational trust, turnover intention	Social ESG activities significantly impact job satisfaction. Governance positively affects organizational trust. Job satisfaction improves trust and reduces turnover intention.	ESG strategies should emphasize social and governance aspects. Job satisfaction and trust should be key metrics for ESG-driven organizational effectiveness.
ESG and Employee Engagement: How Sustainable Practices Can Boost Morale and Productivity. (Directors' Institute, 2024)	ESG, employee engagement, morale, productivity	ESG initiatives increase employee engagement and align them with organizational goals. Sustainable practices foster a positive culture, boosting morale and productivity.	Companies should involve employees in ESG initiatives and communicate ESG principles clearly to enhance engagement and performance.
Sustainability Starts at the Top: How Green Transformational Leadership Shapes Corporate Social Responsibility and Environmental Performance (Xu et al., 2024)	CSR, environmental performance, green transformational leadership (GTL), pro-environmental behavior	CSR enhances environmental performance through GTL, which motivates employees to engage in pro-environmental behaviors.	Integrating CSR with green leadership initiatives is vital for sustainable business practices. Leadership should model and inspire pro-environmental values among employees.

Source: Own research

Key links exist between communication satisfaction, trust, turnover, and performance. ESG practices, guided by transparent leadership, enhance satisfaction and align culture for positive employee outcomes.

Table 3. Pivotal Role of AI on Job performance (JP), Job satisfaction (JS), and Communication satisfaction (CS)

Study	Key Variables/Focus	Key Findings	Implications
Revolutionizing Retail: HR Tactics for Improved Employee and Customer Engagement (Afolabi et al., 2023)	HR strategies, employee engagement, customer satisfaction, workplace culture	Employee engagement directly influences customer satisfaction and loyalty. Key HR strategies include training, recognition, rewards, and a positive culture.	Retailers should invest in innovative HR strategies to enhance both employee and customer engagement, driving sustainable growth and competitive advantage.
Role of Technological Intervention in Employee Retention: With Special Reference to AI-Driven Solutions (Krishna et al., 2022)	AI-driven solutions, employee engagement platforms, data analytics, ethical issues	Technological tools improve retention by enhancing engagement, but strategic and human-centered implementation is critical. Ethical issues like data privacy need careful handling.	Companies must use technology thoughtfully to improve retention while addressing ethical concerns and fostering a balanced human-tech approach.

Study	Key Variables/Focus	Key Findings	Implications
AI in HRM: Case Study Analysis (Gryncewicz et al., 2023)	AI algorithms, recruitment, employee engagement, retention prediction	AI supports better recruitment, engagement, and retention. Interpretable algorithms like decision trees play a key role but cannot replace human judgment.	AI should be integrated as a supportive tool in HRM for efficiency while maintaining a balance with human oversight.
The Role of Artificial Intelligence in Enhancing Job Performance: Ethical Implications and Practical Applications (Faiz & Gasmi, 2024)	AI applications, ethical implications, job displacement, privacy	AI boosts productivity, decision-making, and routine task automation. However, it raises ethical concerns such as job displacement and data bias.	Organizations need to establish ethical guidelines for AI adoption, ensuring productivity gains while mitigating risks.
A Study of Artificial Intelligence on Employee Performance and Work Engagement: the Moderating Role of Change Leadership (Wijayati et al., 2022)	AI adoption, change leadership, work engagement, employee performance	AI enhances performance and engagement, with change leadership moderating its effects. Leadership is critical during rapid changes.	Organizations should emphasize leadership development and strategic AI adoption to ensure success and minimize disruption.
Artificial Intelligence as a Boundary-Crossing Object for Employee Engagement and Performance (Prentice et al., 2023)	AI tools, job engagement, service performance, job security	AI positively impacts engagement and performance, mediated by service quality. Job security moderates these effects, enhancing engagement.	HR and service marketers should focus on job security and AI integration to maximize employee performance and satisfaction.
The Impact of AI on Internal Communication within an Organization (Alkhateeb et al., 2023)	AI in communication, team efficiency, flexibility, human touch	AI improves efficiency and clarity but risks depersonalization and disengagement. Balancing AI and human interaction is essential.	Organizations should align AI communication strategies with employee readiness and focus on preserving the human element.

Source: Own research

AI boosts communication, job satisfaction, and performance by enhancing efficiency and decisions, but ethical use and human-centered leadership are key to success.

2.7. Hypothesis Formulation

Based on the preceding discussion, the following hypotheses have been proposed:

H1: Communication satisfaction (CS) has a significant positive influence on job satisfaction (JS), with the integration of ESG and AI enhancing this relationship.

H2: Communication satisfaction (CS) has a significant positive influence on job performance (JP), with ESG and AI initiatives acting as moderators.

H3: Job satisfaction (JS) has a significant positive influence on job performance (JP), with ESG and AI contributing to this effect.

H4: Job satisfaction (JS) mediates the relationship between communication satisfaction (CS) and job performance (JP), with ESG and AI amplifying the mediating effect.

Figure 1 depicts the study's conceptual framework.

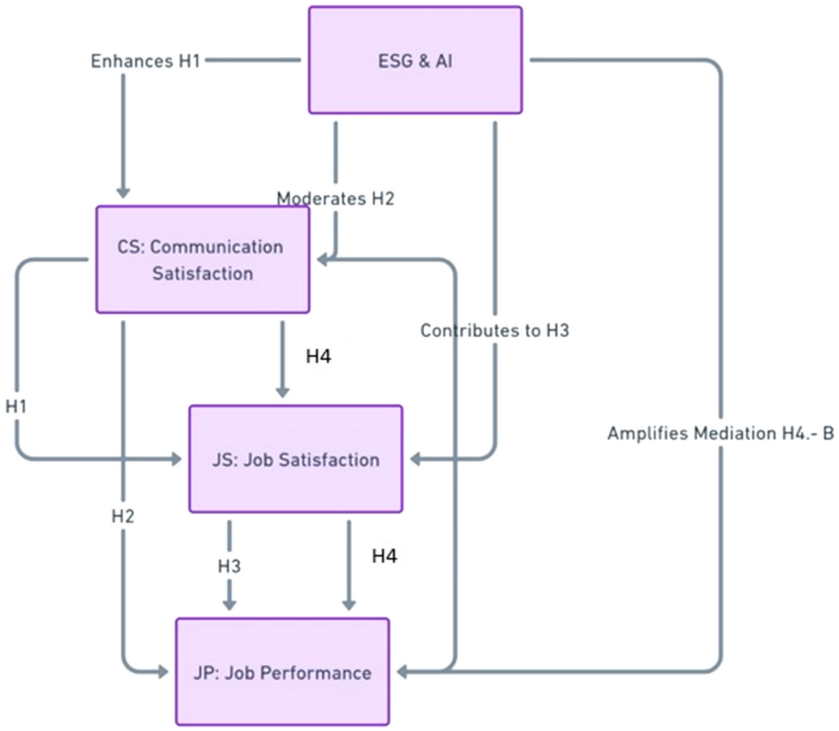

Figure 1. Proposed Model
Source: Own research

3. METHOD

3.1. Sample

The study focused on sales department employees in retail organizations across Delhi-NCR, India. The study was conducted from February 2023 to April 2024. Eligible organizations had operated for at least five years, and respondents had a minimum of one year of experience. A structured questionnaire was distributed to 750 individuals, with 656 valid responses, resulting in an 87.5% response rate. The sample consisted of 57.3% males, with an average age of 24.5 years (SD = 7.6), and an average organizational tenure of 2.5 years (SD = 1.7). Most participants were graduates (40.5%) and unmarried (53.2%).

3.2. Measures

Validated scales were adapted to measure key constructs:

- **Communication Satisfaction (CS):** Measured using 21 items across six dimensions (e.g., Communication Environment, Information from Supervisors).
- **Job Satisfaction (JS):** Measured using 21 items grouped into five categories (e.g., growth, working conditions).
- **Job Performance (JP):** Evaluated through four dimensions (e.g., Contextual and Task Performance).
- **ESG Practices:** Covered environmental, social, governance practices, and general ESG perceptions.
- **AI Technologies:** Assessed through dimensions like AI understanding (AU), ease of use (EU), and performance enhancement (PE).

All items were rated on a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree).

4. DATA ANALYSIS AND RESULTS

Data were analyzed using a two-step SEM approach (Anderson & Gerbing, 1988) via IBM AMOS 21.0, including CFA to validate measurement models. All variables showed acceptable normality and reliability.

4.1. Measurement Models

All components showed acceptable skewness-kurtosis; CFA confirmed first and second-order measurement model validity.

The dataset with all 83 items across all the dimensions of 5 constructs, shows fairly consistent mean scores mostly between 3.3 and 3.8, indicating generally positive but moderate agreement levels. Standard deviations hover around 1.0, suggesting moderate variability in responses across items. The negative skewness and negative kurtosis values for most items imply that responses are slightly left-skewed (more high scores) and platykurtic (flatter distribution than normal), reflecting a tendency toward mild agreement with less extreme opinions.

Initially, first-order CFAs showed poor fit; after removing low-loading items, revised models demonstrated acceptable fit.

Table 4. First Order CFA Results

Fit Index	Recommended Criterion (Hu & Bentler, 1999)	First order CFA for JP		First order CFA for JS		First order CFA for CS		First order CFA for ESG		First order CFA for AI	
		Initial Model	Improved Model	Initial Model	Improved Model	Initial Model	Improved Model	Initial Model	Improved Model	Initial Model	Improved Model
$\chi 2$	NS at $p<0.05$	698.770	320.107	416.5	364.775	439.110	376.138	500.234	310.205	460.111	285.134
df (Degrees of Freedom)	N/A	179	109	174	155	98	84	150	105	140	95
$\chi 2/df$	<5	3.904	2.937	2.394	2.353	4.481	4.478	3.335	2.954	3.286	3.001
RMR [Root mean residual]	<0.10	0.065	0.037	0.045	0.035	0.051	0.040	0.040	0.038	0.042	0.035
CFI [Confirmatory fit index]	>0.90	0.921	0.962	0.862	0.967	0.939	0.946	0.945	0.960	0.937	0.965
RMSEA [Root mean square error of approximation]	<0.08	0.067	0.054	0.046	0.045	0.073	0.073	0.062	0.055	0.060	0.052
TLI [Tucker–Lewis index]	>0.90	0.907	.953	0.854	0.959	0.925	0.932	0.938	0.953	0.930	0.958

*Fit index didn't meet the acceptable threshold.

Source: Own research

Validity and reliability testing showed all five constructs had significant factor loadings, high CR, Cronbach's alpha, and AVE values—confirming strong convergent validity and reliable measurement across dimensions.

Table 5 gives the details of one construct (CS). A similar result has been obtained from the other construct as well.

Table 5. Validity and Reliability

Construct	Factor/Dimension	Standardized Factor Loading	Item	Critical Ratio	Composite Reliability (CR)	Cronbach's Alpha	Average Variance Extracted (AVE)
CS	CE	0.747	CE1	…	0.808	0.807	0.583
		0.776	CE2	18.231***			
		0.768	CE3	18.081***			
	IRM	0.779	IRM1	…	0.832	0.831	0.622
		0.803	IRM2	20.118***			
		0.783	IRM3	19.677***			
	IRC	0.755	IRC1	…	0.789	0.787	0.555
		0.785	IRC2	17.235***			
		0.693	IRC3	15.84***			
	IRCM	0.691	IRCM1	…	0.811	0.810	0.517
		0.707	IRCM2	15.586***			
		0.726	IRCM3	15.92***			
		0.751	IRCM4	16.35***			
	IRP	0.734	IRP1	…	0.840	0.839	0.568
		0.761	IRP2	18.237***			
		0.763	IRP4	18.278***			
		0.756	IRP5	18.107***			
	QC	0.819	QC1	…	0.835	0.834	0.628
		0.762	QC2	20.256***			
		0.795	QC3	21.218***			

Source: Own research

Discriminant validity was confirmed as inter-factor correlations stayed below 0.85 and AVE square roots exceeded correlations.

Table 6. Discriminant Validity

Job Performance (JP)

Factor/Dimension	TP	CP	AP	CB
TP	**0.773**			
CP	0.659	**0.759**		
AP	0.414	0.550	**0.807**	
CB	-0.391	-0.339	-0.254	**0.834**

Job Satisfaction (JS)

Factor/Dimension	WC	RMSC	SB	GO	TD
WC	**0.792**				
RMSC	0.613	**0.729**			
SB	0.505	0.586	**0.809**		
GO	0.629	0.690	0.604	**0.748**	
TD	0.612	0.717	0.582	0.712	**0.759**

Communication Satisfaction (CS)

Factor/Dimension	CE	IRM	IRC	IRCM	IRP	QC
CE	**0.764**					
IRM	0.718	**0.788**				
IRC	0.520	0.594	**0.745**			
IRCM	0.630	0.577	0.473	**0.719**		
IRP	0.629	0.651	0.514	0.614	**0.754**	
QC	0.665	0.599	0.545	0.694	0.699	**0.792**

Environmental, Social and Governance (ESG) Framework

Factor/Dimension	EP	SP	GP	GEP
EP	**0.723**			
SP	0.671	**0.809**		
GP	0.682	0.514	**0.819**	
GEP	0.656	0.518	0.690	**0.718**

Artificial Intelligence (AI)

Factor/Dimension	AU	EU	IJS	PE	GAIP
AU	**0.762**				
EU	0.643	**0.756**			
IJS	0.601	0.556	**0.821**		
PE	0.694	0.531	0.581	**0.773**	
GAIP	0.423	0.460	0.314	0.671	**0.752**

Note: Factor Correlation Matrix with squared roots of AVE on the diagonal

Source: Own research

Second-order CFA confirmed valid higher-order structures; all fit indices met criteria, with significant factor loadings across constructs, including CB's negative but significant loading with JP.

Table 7. Second Order CFA Results

Fit Index	Second order CFA for CS	Second order CFA for JS	Second order CFA for JP	Second order CFA for ESG	Second order CFA for AI
df (Degrees of Freedom)	164	114	86	155	98
$\chi 2$	413.285	325.874	388.102	364.775	439.110
$\chi 2/df$	2.520	2.859	4.513	2.353	4.481
TLI [Tucker–Lewis index]	0.954	0.955	0.932	0.959	0.925
CFI [Confirmatory fit index]	0.960	0.962	0.944	0.967	0.939
RMSEA [Root mean square error of approximation]	0.048	0.053	0.073	0.045	0.073
RMR [Root mean residual]	0.041	0.038	0.045	0.035	0.051

Source: Own research

Interpretation:

- **Degrees of Freedom (df)**: **CS** has the highest df at **164**, followed by **ESG** at **155**, while **AI** has **98**. A higher df indicates a more complex model.
- **Chi-Square (χ^2)**: **CS (413.285)** and **JS (325.874)** have better chi-square values compared to **ESG (364.775)** and **AI (439.110)**, though all values are acceptable.
- **χ^2/df**: Values below 5 are considered acceptable. **CS (2.520)**, **JS (2.859)**, and **ESG (2.353)** show good model fit, while **JP (4.513)** and **AI (4.481)** are slightly higher but within an acceptable range.
- **TLI** and **CFI**: Both **TLI** and **CFI** are above the recommended threshold of 0.90 for all components, indicating a strong model fit across the board. **ESG** has the best fit with **TLI (0.959)** and **CFI (0.967)**.
- **RMSEA**: Values below 0.08 indicate a good fit. **CS (0.048)**, **JS (0.053)**, and **ESG (0.045)** show excellent fit, while **JP (0.073)** and **AI (0.073)** are within the acceptable range.
- **RMR**: Values below 0.10 are acceptable, with **CS (0.041)**, **JS (0.038)**, **JP (0.045)**, **ESG (0.035)**, and **AI (0.051)** all falling within this range, indicating good model fit.

Table 8. Second Order CFA Parameter Estimates

Construct	Dimension	Standardized Factor Loading	Critical Ratio
JP	TP	0.756	…
	CP	0.874	11.099***
	AP	0.601	10.64***
	CB	-0.532	-8.333***
CS	CE	0.815	…
	IRM	0.797	13.59***
	IRC	0.686	11.971***
	IRP	0.821	13.557***
	IRCM	0.764	12.402***
	QC	0.826	14.445***
JS	WC	0.723	…
	RMSC	0.821	13.517***
	SB	0.691	12.561***
	GO	0.873	13.501***
	TD	0.871	13.878***
ESG	EP	0.707	19.480***
	SP	0.720	18.330***
	GP	0.715	17.225***
	GEP	0.729	18.881***
AI	AU	0.707	20.311***
	EU	0.712	18.776***
	IJS	0.731	19.435***
	PE	0.730	20.587***
	GAIP	0.745	20.765***

*** p<0.001

Source: Own research

Table 9. Path Coefficients

Table 9.1. Direct Path Coefficients (Standardized Regression Weight)

Path	Standardized Regression Weight	Critical Ratio (CR)	Significance (p-value)
CS =>JS	0.675	12.841	0.0001
CS =>JP	0.615	11.327	0.0002
JS =>JP	0.712	14.027	0.0001

Table 9.2. Moderation Effect (Interaction Terms)

Moderation Path	Standardized Regression Weight	Critical Ratio (CR)	Significance (p-value)
CS*ESG =>JS	0.89	2.04	0.0414
CS*AI =>JS	0.92	2.79	0.0053
CS*ESG =>JP	0.76	2.89	0.0039
CS*AI => JP	0.79	2.75	0.0060

Table 9.3. Mediation Effect (Indirect Paths)

Mediation Path	Indirect Effect	Confidence Interval	Significance (p-value)
CS=>JS => JP	0.015	(0.05,0.25)	0.001
ESG/AI amplify JS mediation	0.012	(0.03,0.21)	0.004

*** p<0.001

Source: Own research

Interpretation:

- **Path Strength and Significance:** Standardized regression weights above 0.60 indicate strong relationships. Critical ratios exceeding 1.96 with $p < 0.001$ confirm statistical significance.
- **Direct and Moderation Effects:** All reported paths show statistically significant relationships.
- **Mediation Effect:** Communication Satisfaction indirectly improves Job Performance by 0.015 units through Job Satisfaction. The confidence interval (0.05–0.25), excluding zero, confirms a statistically significant and meaningful mediation effect.

4.2. Structural Model

The structural model (Figure 2) provides robust evidence supporting the four hypotheses, highlighting the direct, moderated, and mediated relationships among communication satisfaction (CS), job satisfaction (JS), job performance (JP), ESG, and AI.

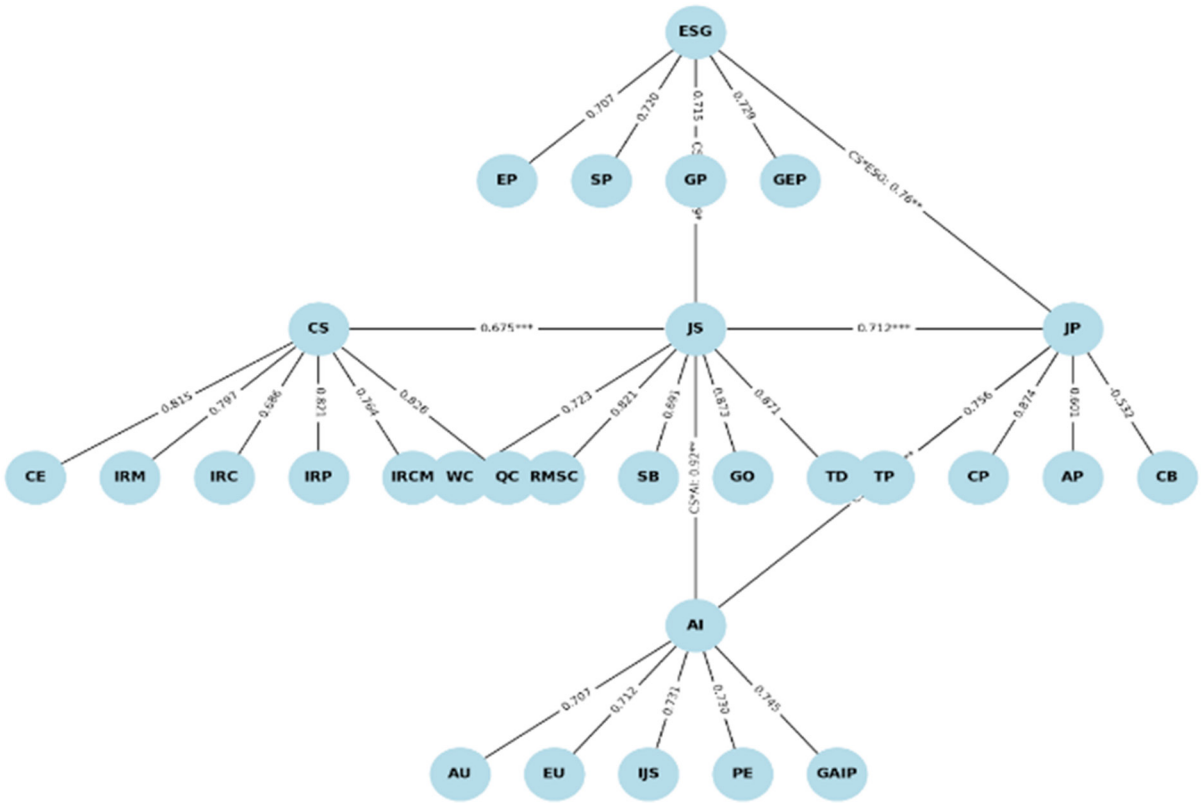

Figure 2. Path Analysis
Source: Own research

H1: CS Positively Impacts JS, Enhanced by ESG and AI
The direct path from Communication Satisfaction (CS) to Job Satisfaction (JS) is significant ($\beta = 0.675$, $p < 0.001$), supporting H1. Moderation effects of ESG ($\beta = 0.89$, $p = 0.041$) and AI ($\beta = 0.92$, $p = 0.005$) strengthen this relationship, highlighting the positive influence of sustainability and technology.

H2: CS Positively Impacts JP, Moderated by ESG and AI
CS also significantly predicts Job Performance (JP) ($\beta = 0.615$, $p < 0.001$). Moderation by ESG ($\beta = 0.76$, $p = 0.004$) and AI ($\beta = 0.79$, $p = 0.006$) confirms enhanced impact under sustainable and tech-integrated environments.

H3: JS Positively Influences JP, Reinforced by ESG and AI
JS positively affects JP ($\beta = 0.712$, $p < 0.001$), further strengthened through associations with ESG ($\beta = 0.664$) and AI ($\beta = 0.695$).

H4: JS Mediates CS → JP, Amplified by ESG and AI
JS significantly mediates the CS–JP link (Indirect $\beta = 0.015$, CI = 0.05–0.25). ESG and AI amplify this effect (Indirect $\beta = 0.012$, CI = 0.03–0.21).

This study confirms CS's strong impact on JS and JP, with ESG and AI significantly enhancing these effects. JS mediates CS–JP, highlighting its central role in sustainable, tech-driven organizational performance.

5. CONCLUSION AND SCOPE FOR FUTURE RESEARCH

This study establishes that communication satisfaction, when supported by ESG frameworks and AI technologies, significantly improves job satisfaction and job performance. ESG and AI act as enhancers, amplifying these relationships. Job satisfaction also plays a mediating role, further underlining its importance in organizational dynamics. These findings highlight the strategic value of integrating communication, sustainability, and technology to create high-performing and engaged workplaces.

The negative correlation between Counterproductive Behavior and other performance dimensions calls for deeper exploration. Future studies could adopt longitudinal methods, industry-specific approaches, or cross-cultural perspectives to enrich understanding of ESG and AI's long-term impact.

References

Abdulwahab, S. (2016). The relationship between job satisfaction, job performance and employee engagement: An explorative study. *Issues in Business Management and Economics, 4*(1), 1–8.

Afolabi, J. O. A., Olatoye, F. O., Eboigbe, E. O., Abdul, A. A., & Daraojimba, H. O. (2023). Revolutionizing retail: hr tactics for improved employee and customer engagement. *International Journal of Applied Research in Social Sciences*, *5*(10), 487-514.

Alkhateeb, M., Duné, E., & Akriem, E. (2023). The impact of AI on internal communication within an organization: A critical examination of AI adoption.

Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin, 103*(3), 411–423. https://doi.org/10.1037//0033-2909.103.3.411

Bin, A. S. (2015). The relationship between job satisfaction, job performance and employee engagement: An explorative study. *Issues in Business Management and Economics, 4*(1), 1–8.

Bosu, R. R., Abhicharattibutra, K., & Wichaikhum, O. A. (2019). Communication satisfaction and job performance among nurses in tertiary level hospitals, the People's Republic of Bangladesh. *Nursing Journal, 46*(1), 193–205.

Davar, S. C., & Bala, R. (2012). Relationship between job satisfaction & job performance: A meta-analysis. *Indian Journal of Industrial Relations*, 290–305.

Directors' Institute. (2024, July 17). *ESG and employee engagement: How sustainable practices can boost morale and productivity.* Directors' Institute. https://www.directors-institute.com/post/esg-and-employee-engagement-how-sustainable-practices-can-boost-morale-and-productivity

Faiz, M., & Gasmi, S. (2024, July). *The role of artificial intelligence in enhancing job performance: Ethical implications and practical applications*. ResearchGate. https://doi.org/10.13140/RG.2.2.30163.39209

Foehrenbach, J., & Rosenberg, K. (1982). How are we doing? *Journal of Organizational Communication, 12*, 3–9.

Goris, J. R. (2007). Effects of satisfaction with communication on the relationship between individual-job congruence and job performance/satisfaction. *Journal of Management Development, 26*(8), 737–752. https://doi.org/10.1108/02621710710777255

Gryncewicz, W., Zygała, R., & Pilch, A. (2023). AI in HRM: case study analysis. Preliminary research. *Procedia Computer Science*, *225*, 2351-2360. https://doi.org/10.1016/j.procs.2023.10.226

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural equation modeling: a multidisciplinary journal*, *6*(1), 1-55. https://doi.org/10.1080/10705519909540118

Judge, T. A., Thoresen, C. J., Bono, J. E., & Patton, G. K. (2001). The job satisfaction–job performance relationship: A qualitative and quantitative review. *Psychological Bulletin, 127*(3), 376-407. https://doi.org/10.1037//0033-2909.127.3.376

Krishna, C., Veeralakshmi, B., & Upadhyay, R. (2022). Role of technological intervention in employee retention: With special reference to AI-driven solutions. *NeuroQuantology, 20*(3), 1170–1175

Lamond, D., Zheng, C., & Tian-Foreman, W. A. (2009). Job satisfaction and turnover in the Chinese retail industry. *Chinese Management Studies*.

Muchinsky, P. M. (1977). Organizational communication: Relationships to organizational climate and job satisfaction. *Academy of Management Journal, 20*(4), 592–607. https://doi.org/10.2307/255359

Pettit, J. D., Goris, J. R., & Vaught, B. (1997). An examination of organizational communication as a moderator of the relationship between job performance and job satisfaction. *The Journal of Business Communication, 34*(1), 81–98. https://doi.org/10.1177/002194369703400105

Pincus, J. D. (1986). Communication satisfaction, job satisfaction, and job performance. *Human Communication Research, 12*(3), 395–419. https://doi.org/10.1111/j.1468-2958.1986.tb00084.x

Platis, C., Reklitis, P., & Zimeras, S. (2015). Relation between job satisfaction and job performance in healthcare services. *Procedia - Social and Behavioral Sciences, 175*, 480–487. https://doi.org/10.1016/j.sbspro.2015.01.1226

Prentice, C., Wong, I. A., & Lin, Z. C. (2023). Artificial intelligence as a boundary-crossing object for employee engagement and performance. *Journal of Retailing and Consumer Services*, *73*, 103376. https://doi.org/10.1016/j.jretconser.2023.103376

Ratia, L. R., & Tuzlukaya, S. E. (2019). The relationship of the dimensions of job satisfaction to job performance: A case study of a multinational company in Lesotho. *Journal of Research in Emerging Markets, 1*(3), 8–19. https://doi.org/10.30585/jrems.v1i3.356

Salleh, R., Nair, M. S., & Harun, H. (2012). Job satisfaction, organizational commitment, and turnover intention: A case study on employees of a retail company in Malaysia. *World Academy of Science, Engineering and Technology, 72*(12), 316–323.

Seo, W., Oh, J., & Kim, Y. (2022). The Effects of ESG Activities on Job Satisfaction, Organizational Trust, and Turnover Intention. *The Journal of Internet Electronic Commerce Resarch, 22*(1), 197-213. https://doi.org/10.37272/jiecr.2022.02.22.1.197

Tabassum, U., Khan, B., Sherani, A. W., & Khan, I. (2016). The relationship between job satisfaction and job performance among employees: A case of commercial banks in Punjab City, Pakistan.

Vroom, V. H. (1964). *Work and motivation*. Wiley.

Wijayati, D. T., Rahman, Z., Fahrullah, A. R., Rahman, M. F. W., Arifah, I. D. C., & Kautsar, A. (2022). A study of artificial intelligence on employee performance and work engagement: the moderating role of change leadership. *International Journal of Manpower*, *43*(2), 486-512. https://doi.org/10.1108/ijm-07-2021-0423

Wright, T. A., & Cropanzano, R. (2000). Psychological well-being and job satisfaction as predictors of job performance. *Journal of Occupational Health Psychology, 5*(1), 84–94. https://doi.org/10.1037//1076-8998.5.1.84

Xu, X., Akbar, A., & Sokolova, M. (2024). Sustainability Starts at the Top: How Green Transformational Leadership Shapes Corporate Social Responsibility and Environmental Performance. *Polish Journal of Environmental Studies*. https://doi.org/10.15244/pjoes/190002

Yvonne, W., Rahman, R. H. A., & Long, C. S. (2014). Employee job satisfaction and job performance: A case study in a franchised retail-chain organization. *Research Journal of Applied Sciences, Engineering and Technology, 8*(17), 1875–1883. https://doi.org/10.19026/rjaset.8.1176

Zhang, T., Zhang, J., & Tu, S. (2024). An Empirical Study on Corporate ESG Behavior and Employee Satisfaction: A Moderating Mediation Model. *Behavioral Sciences*, *14*(4), 274. https://doi.org/10.3390/bs14040274

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Understanding the Psychological Well-Being of Expatriates in Times of Natural Crisis, the case of Albania & Montenegro

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Abstract: *Expatriates, or "expats," are a key segment of the global workforce, working abroad through employer-arranged or self-initiated assignments. International Human Resource Management (IHRM) research has highlighted the challenges expatriates face, including cultural adaptation, role performance, and personal relationships, as well as their vulnerability to crises. While the impact of human-made crises like political instability has been studied, natural crises' effects on expatriates' psychological well-being remain underexplored. The Covid-19 pandemic emphasized the need to understand expatriates' psychological resilience during natural crises. Building on Bader and Berg's (2014) terrorism-related stress model, Tripathi and Singh (2022) proposed a framework identifying stressors expatriates may face during natural crises and their impact on well-being and performance.*

This study applies their framework to expatriates in Albania and Montenegro during the pandemic, using a survey to: a) assess the relevance of psychological and situational stressors; b) evaluate the relevance of perceived organizational, family, and social network support as support factors; and c) analyze relationships between stressors, support factors, and expatriates' psychological well-being. The findings enhance understanding of expatriates' experiences during natural crises and inform improved support mechanisms.

1. INTRODUCTION

Expatriates, often referred to as "expats," are an important category of the modern global workforce. These individuals are professionals or skilled workers who take on roles outside their home country, either through work assignments scheduled by their employers (Harzing, 2001a; Hill, 2023; Vazquez & McGaughey, 2016) or independently as self-initiated expatriates (Boriçi Begani & Berberi, 2020; Mayrhofer et al., 2012).

For over three decades, research in International Human Resource Management (IHRM) has focused on the challenges faced by expatriates sent abroad by multinational companies to manage their foreign subsidiaries. Various authors have emphasized that expatriates encounter unique pressures compared to other employees, such as the need to learn a foreign language, adapt to new cultural and institutional environments, perform effectively in their roles, and manage personal and family relationships (Biswas, 2022; McNulty et al., 2019). Consequently, McNulty et al. (2019) note that expatriates are generally more vulnerable to crises than other categories of employees. However, so far, research on expatriates' exposure to crises has primarily focused on the effects of human-made crises (such as political instability or terrorism). As highlighted by Tripathi and Singh (2022), Koveshnikov et al. (2022) and Chan et al. (2023), the impact of natural crises on their psychological well-being and consequently on their performance or intentions to withdraw from their task, is scarcely explored.

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The advent of Covid 19, with devastating, unprecedented and unexpected psychological, social and economic consequences on many people's lives, drew the attention of many researchers focusing on expatriation, particularly regarding the impact of this natural crisis on expatriates' psychological well-being. Tripathi and Singh (2022), based on the terrorism-related model of Bader and Berg (2014), have proposed a framework of potential stressors that may be encountered by expatriates during natural crises, such as Covid-19, together with their impact on expatriates' well-being and performance. This paper aims to adopt the framework developed by the above-mentioned authors and examine if it holds in the case of expatriates living and working in Albania and Montenegro.

For that purpose, a survey was conducted with a group of expatriates who have been living and working in Albania and Montenegro during the pandemic outbreak. Through our research, we tend to: a) first, explore if the psychological and situational stressors proposed by Tripathi and Singh (2022) are relevant as well in the case of expatriates in Albania and Montenegro, using a factor and reliability analysis; b) evaluate the relevance of perceived organizational support, family support, and social networks as support factors through factor and reliability analysis; and c) investigate the relationships between the stressors and the social support factors and expatriates' psychological well-being;

2. LITERATURE REVIEW

2.1. Expatriates and IHRM: Overview of Expatriates' Roles and Challenges

In a globalized world, effective IHRM has become critical for multinational corporations (MNCs) to achieve strategic goals and strengthen market positions (Boriçi Begani & Berberi, 2020; Caligiuri et al., 2020; Collings & Sheeran, 2020). Expatriates—employees relocated from headquarters to manage foreign subsidiaries for 1-5 years—are integral to this strategy (Vegh et al., 2023). Their roles encompass position filling, management development, and organizational growth, contributing to knowledge transfer, communication, and cohesion across MNC geographies (Edstrom & Galbraith, 1977; Harzing, 2001b).

However, expatriation poses significant challenges, including cultural adaptation, family adjustment, and career reintegration, which can lead to failure rates of 30%-50% (Harzing & Christensen, 2004; Morin & Talbot, 2023). Cultural shock, stemming from differences in values, behaviors, and business practices, can impair decision-making and subsidiary performance (Chen, 2019; Giorgi et al., 2020). Families, especially spouses, face similar adaptation difficulties, often affecting the expatriate's success (Czinkota et al., 2021).

Strategies to mitigate these issues include selecting adaptable candidates, pre-departure cross-cultural training, and comprehensive family support programs, such as dual career initiatives and relocation assistance (McNulty & Moeller, 2018; Wild & Wild, 2023). Additionally, effective repatriation programs with career counseling and reintegration training can enhance expatriates' return experiences, reducing turnover and optimizing return on investment (Mehreen et al., 2024). These arguments highlight the strategic importance of managing expatriates effectively to ensure organizational success in international contexts.

2.2. Crisis Impact on Expatriates: Previous Research on Human-Made Crises and the Gap in Natural Crises

Expatriates face numerous challenges during foreign assignments, including exposure to crises that disrupt both their personal and professional lives. Crises, as defined by Tripathi et al. (2021),

Biswas (2022), and Vegh et al. (2023), referring to Lerbinger (2012) are unpredictable events with unknown causes and impacts, making them difficult to manage. While research has extensively covered human-made crises like terrorism and political instability, natural crises—such as pandemics, natural disasters, and environmental catastrophes—remain underexplored (Chan et al., 2023; Koveshnikov et al., 2022; Tripathi & Singh, 2022).

Human-made crises have been studied primarily to understand their effects on expatriates and organizational strategies to mitigate these impacts. For instance, Bader and Berg (2013, 2014) examined how terrorism influences expatriates' decision-making, performance, and well-being, noting that terrorism-induced stress and fear negatively affect productivity. Similarly, Lauring et al. (2016) and Bader et al. (2019) highlighted the importance of organizational support, such as safety measures and social inclusion, to counteract expatriates' withdrawal tendencies in high-risk regions. McNulty et al. (2019) emphasized the need for comprehensive crisis management plans, including evacuation protocols and mental health support, particularly for expatriates in conflict zones.

Natural crises, however, demand further research. Events like the COVID-19 pandemic underline their unpredictable nature and widespread impact. Expatriates faced travel bans, social isolation, and heightened stress, intensifying the usual challenges of expatriation and affecting their mental health, job performance, and retention decisions (Faeth & Kittler, 2020; Koveshnikov & Lehtonen, 2024). While organizations often have established protocols for human-made crises, their responses to natural disasters are less documented. Therefore, addressing this gap is crucial to minimizing negative natural crisis impacts on expatriates and enhancing organizational resilience.

2.3. Tripathi and Singh (2022) Framework: Description of the Proposed Stressors and Their Impact on Well-Being. Hypotheses for the Case of Albania & Montenegro

The framework by Tripathi and Singh (2022) provides valuable insights into stressors affecting expatriates' psychological well-being during crises like COVID-19. Building on Lazarus and Folkman's (1984) stress theory and Bader and Berg's (2014) work on expatriates in terrorism-endangered countries, they identify two key stressor categories: ***psychological*** and ***situational***. *Psychological stressors*, such as fear and uncertainty, arise from events challenging emotional stability, with COVID-19 amplifying these due to infection risks, economic concerns, and information overload (Huff, 2022; Monroe & Slavich, 2016). Studies on past similar crises like SARS and Ebola (Kisely et al., 2020) support the same argument, highlighting heightened stress among healthcare workers and individuals facing unpredictable threats (Freedy et al., 1994; Coelho et al., 2020). As various authors have suggested (Caligiuri et al., 2020; Chan et al., 2023; Koveshnikov et al., 2022; Tripathi & Singh, 2022), expatriates, living and working away from their home countries, or sometimes even away from their families, are prone to be more severely exposed to the pandemic's above-mentioned stress risks. Therefore, in accordance with Tripathi and Singh (2022), we are tempted to state that natural crises like COVID-19 cause stress to expatriates through psychological stressors, such as fear of health, economic impacts, and fear of pandemic-related uncertainty.

Situational stressors on the other hand include living conditions or pandemic severity in host countries. Travel restrictions during COVID-19 increased expatriates' isolation and concerns for family well-being (Chan et al., 2023; Koveshnikov et al., 2022). Living in severely affected regions led to higher stress levels, as shown in the study of Nguyen and Andresen (2023). The latter revealed that the severity of the pandemic in different countries along with the respective measures undertaken in each of them to face the situation, had a significant impact on the level of stress experienced by expatriates as well as their overall well-being. These factors, paralleling

challenges encountered in hostile environments (Bader & Berg, 2014), intensified stress for expatriates (Faeth & Kittler, 2020). Based on these arguments and in compliance with Tripathi and Singh (2022) we are inclined to assume that natural crises like COVID-19 cause stress to expatriates through situational stressors living conditions or severity of the crisis in the host country.

Psychological well-being (PWB), defined as the optimal functioning or healthy psychological state enabling individuals to achieve their full potential (Ryff, 1989; Ryff & Keyes, 1995), is significantly influenced by stress. Research consistently highlights the negative correlation between stress and PWB, where heightened stress levels undermine individuals' ability to maintain a balanced and fulfilling mental state. During the COVID-19 pandemic, expatriates experienced elevated stress levels. This heightened stress, as noted by Tripathi and Singh (2022), detrimentally impacted their PWB, further complicating their ability to adapt, cope, and function effectively in their host countries.

However, there are coping mechanisms and support systems which can significantly moderate the above-mentioned stressors. *Perceived organizational support* (POS), defined as employees' belief in their organization's care for their well-being, reduces stress and enhances resilience (Rhoades & Eisenberger, 2002). Strategies like addressing adjustment needs, career support, and financial security for expatriates have proven effective (Tripathi & Singh, 2022). *Supervisors' trust-building* and communication have also fostered resilience, as have *familial interactions* and *social networks*, which alleviate loneliness and strengthen belonging (Czinkota et al., 2021). Based on these arguments, we are prone to believe in the critical role that organizational, supervisory, familial and social resources have in improving the psychological well-being of expatriates during crises, including Covid 19 pandemic. In accordance with all the above arguments, we are inclined to propose the following hypothesis and conceptual model for the case of Albania & Montenegro:

H1. *There is a significant relationship among the psychological stressors, the situational stressors, the social support factors and the expatriates' psychological well-being.*

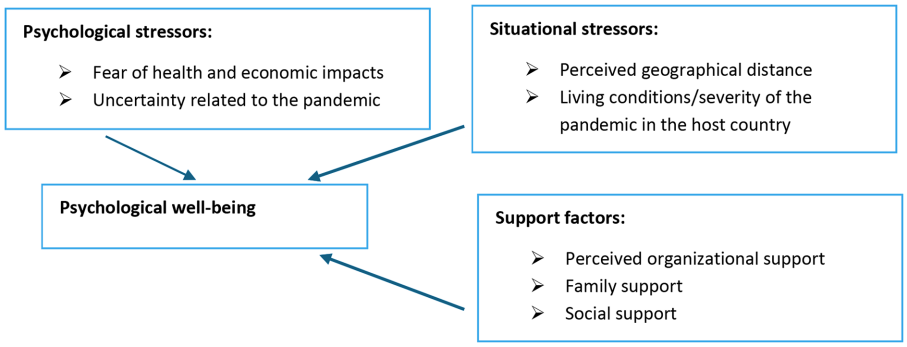

Figure 1. Proposed research model

Source: Own processing

3. RESEARCH METHODOLOGY

3.1. Sample and data collection

A quantitative research approach was used to investigate the psychological well-being (PWB) of expatriates in Albania and Montenegro during the COVID-19 pandemic, using the conceptual model proposed above. A structured survey was administered to expatriates living and working in these countries during the pandemic outbreak. Participants were recruited from multinational corporations,

NGOs, and international organizations with expatriate employees in Albania and Montenegro. The survey included demographic questions and scales adapted from existing validated instruments, such as Ryff's Psychological Well-Being Scale (Ryff & Keyes, 1995) for measuring PWB, and scales assessing psychological and situational stressors as well as social support factors based on the above adapted Tripathi and Singh (2022) framework. To measure psychological stressors participants were asked to rate their levels of agreement on statements related to anxiety and fear about health, job security, economic impacts, depression, and uncertainty during COVID-19, using a 5-point Likert scale. Regarding situational stressors, they were asked about their ability to adjust daily life and work routines, adequacy of resources and living conditions, or the perceived severity of the pandemic in the host country. Responses were also measured on a 5-point Likert scale. Social support factors were evaluated by exploring participants' feelings of isolation and the sufficiency of social support received from friends, colleagues, supervisors, and headquarters. Again, a 5-point Likert scale was used. Adapted from Ryff and Keyes (1995), this section of the questionnaire focused on PWB dimensions such as self-acceptance, autonomy, environmental mastery, positive relationships, purpose in life, and personal growth. Both positively and negatively worded statements were included, and participants rated their agreement using a 5-point Likert scale. The data collection process, conducted by the authors, took place between June and December 2024. A total of 80 questionnaires were distributed; however, 20 were deemed incomplete and excluded from the analysis. Consequently, only data from 60 properly completed questionnaires were included in the final analysis.

The collected data were analyzed using factor and reliability analysis to confirm the relevance of stressors in the case of Albania and Montenegro. Then regression analysis was performed to explore the relationships between stressors and PWB, as well as the moderating impact of POS, family support, and social networks on these relationships. This methodology aligns with the research objectives, offering insights into the unique experiences of expatriates during a natural crisis and providing practical implications for improving expatriate management during such events.

3.2. Demographic Profile

Regarding the demographic characteristics of the respondents, we must emphasize that a significant proportion of the respondents (66.7%) were male. Regarding age distribution, 13.3% of the respondents were aged 30-40 years, 46.6% were aged 40-50 years, 33.4% were aged 50-60 years, and 6.7% were aged 60-70 years. In terms of nationality, the majority of respondents were Italian (46.7%), followed by Greek (20%), Turkish (13.3%), and others (20%) from Kosovo[5], the Czech Republic, and Bulgaria. Concerning job positions, 60% of the respondents were top-level managers (e.g., CEOs, Entrepreneurs, Owners, Presidents), 26.7% were middle-level managers, and 13.3% were operational-level employees. The data were coded and analyzed using SPSS.

3.3. Measures

Psychological Stressors PSYS. This variable was operationalized as a multidimensional construct based on the adapted Tripathi and Singh (2022) framework proposed in this paper. Items used to measure this dimension are as follows: 1. I felt anxious and afraid about my health and that of my family members. 2. I felt anxious and afraid about my job security. 3. I felt anxious and afraid about the economic consequences of the pandemic. 4. I often felt depressed due to the ongoing situation. 5. I felt anxious and afraid about the uncertainty related to the duration and the impact of Covid 19. A five-point Likert scale (1 = "strongly disagree"; 5 = "strongly agree") was used to measure all these items.

[5] Under the UN Resolution 1244.

Situational Stressors SITS. This variable was operationalized as a multidimensional construct based as well on the adapted Tripathi and Singh (2022) framework. Items used to measure this dimension are as follows: 1. I had adequate resources (water, food, and medical supplies) to manage the situation during the pandemic crisis. 2. I had adequate living conditions during the pandemic crisis. 3. I was able to adapt my daily life routine effectively during the Covid-19 pandemic. 4. I managed to adjust my daily work routine to meet the challenges posed by the Covid-19 pandemic. A five-point Likert scale (1 = "strongly disagree"; 5 = "strongly agree") was used to measure all these items.

Social Support Factors SOSF. This variable was operationalized as a multidimensional construct using based too on the adapted Tripathi and Singh (2022) framework. Items used to measure this dimension are as follows :1. I felt isolated from my family and friends at the home country during the pandemic of Covid 19. 2. I received sufficient social support from my friends and colleagues in the host country (Albania/Montenegro). 3. I received sufficient social support from my colleagues at the headquarters of the company I was working for. 4. I received sufficient social support from the supervisors (managers) at the headquarters of the company I was working for. A five-point Likert scale (1 = "strongly disagree"; 5 = "strongly agree") was used to measure all these items.

Psychological Well-being. This variable was operationalized as a multidimensional construct using a version of the scale developed by Ryff and Keyes (1995). Items used to measure this dimension are as follows: 1. When I look at my story after the pandemic, I am pleased with how things have turned out. 2. In many ways I feel disappointed about my achievements after the pandemic situation. (R) 3. People would describe me as a giving person, willing to share my time with others. 4. Maintaining close social relationships has been difficult and frustrating for me during and after the pandemic. (R) 5. I have confidence in my own opinions, even if they are different from the way most other people think. 6. I tend to be influenced by people with strong opinions. (R) 7. In general, I feel I am in charge of the situation in which I live. 8. The demands of everyday life often get me down. (R) 9. Some people wander aimlessly through life, but I am not one of them. 10. I sometimes feel as if I've done all there is to do in life. (R) 11. For me, life has been a continuous process of learning, changing, and growth. 12. I gave up trying to make big improvements or changes in my life a long time ago. (R). A five-point Likert scale (1 = "strongly disagree"; 5 = "strongly agree") was used to measure all these items. The negatively worded items (R) were reverse-coded before analysis to align them with the intended construct measurement.

4. RESULTS AND FINDINGS

4.1. Factor and Reliability Analysis

Factor analysis is a statistical technique used to identify underlying relationships between measured variables by grouping them into latent constructs or factors (Meyers et al., 2013). This method provides a means to consolidate scattered information from multiple variables into a smaller, more manageable number of factors. This study used factor analysis with Varimax rotation. When performing such an analysis, importance should be paid to the factorial weights of each item. Each item had a factor loading higher than 0.70.

To measure each of the independent variables, five items were included in the questionnaire. A principal component analysis, using eigenvalues greater than one criterion, revealed a simple structure; however, one or two of the items were dropped since they had a factor loading of lower than 0.4. We dropped that item/s and ran another principal component analysis. To measure reliability,

we used the coefficient Cronbach Alpha. The measure "Psychological Stressors PSYS" reported the highest level of Cronbach alpha (0.890). On the other hand, Cronbach alpha for the measure "Social Stressors SOFS" was 0.857, for the measure "Situational Stressors SITS" was 0.779. All of these levels indicate adequate reliability (Hair et al., 2010).

Table 1. Summary of measurement scales

Constructs	Items	Cronbach Alpha	Factor loading
Psychological Stressors PSYS	PSYS 1. I felt anxious and afraid about my health and that of my family members. PSYS 2. I felt anxious and afraid about my job security. PSYS 3. I felt anxious and afraid about the economic consequences of the pandemic. PSYS 4. I often felt depressed due to the ongoing situation.	0.890	0.843 0.860 0.918 0.855
Situational Stressors SITS	SITS 1. I had adequate resources (water, food, and medical supplies) to manage the situation during the pandemic crisis. SITS 2. I was able to adapt my daily life routine effectively during the Covid-19 pandemic. SITS 3. I managed to adjust my daily work routine to meet the challenges posed by the Covid-19 pandemic	0.779	0.801 0.858 0.845
Social Support Factors SOSF	SOFS 1. I received sufficient social support from my friends and colleagues in the host country (Albania/Montenegro). SOFS 2. I received sufficient social support from my colleagues at the headquarters of the company I was working for. SOFS 3. I received sufficient social support from the supervisors (managers) at the headquarters of the company I was working for.	0.857	0.798 0.926 0.926

Source: Own processing

To measure "Psychological Well-being" as the dependent variable, twelve items were included in the questionnaire: 1. When I look at my story after the pandemic, I am pleased with how things have turned out. 2. In many ways I feel disappointed about my achievements after the pandemic situation. (R) 3. People would describe me as a giving person, willing to share my time with others. 4. Maintaining close social relationships was difficult and frustrating for me during and after the pandemic. (R) 5. I have confidence in my own opinions, even if they are different from the way most other people think. 6. I tend to be influenced by people with strong opinions. (R) 7. In general, I feel I am in charge of the situation in which I live. 8. The demands of everyday life often get me down. (R) 9. Some people wander aimlessly through life, but I am not one of them. 10. I sometimes feel as if I've done all there is to do in life. (R) 11. For me, life has been a continuous process of learning, changing, and growth. 12. I gave up trying to make big improvements or changes in my life a long time ago. (R). The following procedure was applied to recode the negatively worded items (R): responses on the five-point Likert scale (1 = "strongly disagree" to 5 = "strongly agree") were adjusted as follows: a response of 1 ("strongly disagree") was converted to 5 ("strongly agree"), a response of 2 ("disagree") was converted to 4 ("agree"), a response of 3 ("neutral") remained unchanged, a response of 4 ("agree") was converted to 2 ("disagree"), and a response of 5 ("strongly agree") was converted to 1 ("strongly disagree").

4.2. Regression Analysis

To explore the potential factors impacting Psychological Well-being, we performed multiple regression analyses, using Psychological Well-being (perceived) as the dependent variable. The six factors: age, gender, Psychological Stressors PSYS, Situational Stressors SITS, Social Support

Factors SOSF, and SITSSOSF (these variables interact because one influences the effect of the other) were used as independent variables. Below we present all the variables that were found to be significant.

$$PW = -3.467 + 0.047A - 0.470G - 0.762PSYS + 0.415SITS + 1.493SOSF - 0.184SITS * SOSF$$
$$t = (-7.723) \quad (8.343) \quad (-4.028) \quad (-14.506) \quad (3.117) \quad (11.041) \quad (-5.142)$$
$$p = \mathbf{(0.000)} \quad \mathbf{(0.000)} \quad \mathbf{(0.000)} \quad \mathbf{(0.000)} \quad \mathbf{(0.003)} \quad \mathbf{(0.000)} \quad \mathbf{(0.000)}$$

The results indicated that the model was highly significant (F (6,53) = 133.824, p = 0.000); adjusted R2 was 92.9%. The significant variables were age (p = 0.000), gender (p = 0.000), Psychological Stressors PSYS (p = 0.000), Situational Stressors SITS (p = 0.003), Social Support Factors SOSF (p = 0.000), and SITSSOCS (p = 0.000). Consequently, hypothesis H1 was supported given that we found all factors to have a strong significant impact on Psychological Well-being.

5. FUTURE RESEARCH DIRECTIONS

This study has provided significant insights into the psychological well-being of expatriates in Albania and Montenegro during the COVID-19 pandemic. By applying an adapted version of Tripathi and Singh's (2022) framework, the research identified key psychological and situational stressors impacting expatriates' well-being and evidenced the importance of perceived organizational support, family support, and social networks as support factors in enhancing expatriates' psychological resilience.

However, the study faced several limitations that suggest directions for future research. The relatively small sample size and the focus on expatriates in Albania and Montenegro may limit the generalizability of the findings. Future research should aim to include larger and more diverse samples to enhance the strength of the results. Additionally, the cross-sectional design of the study does not account for changes in expatriates' psychological well-being over time. Longitudinal studies are needed to track these changes and provide a more comprehensive understanding of expatriates' adaptation processes. Moreover, the study's context was specific to the COVID-19 pandemic, which may have unique characteristics compared to other types of natural crises. Future research should explore different types of crises to validate the findings across various scenarios.

6. CONCLUSION

This study has explored the psychological well-being of expatriates in Albania and Montenegro during the COVID-19 pandemic. By utilizing an adjusted version of Tripathi and Singh's (2022) framework, the research identified key psychological and situational stressors that affect expatriates' well-being. The findings highlight the crucial role of perceived organizational support, family support, and social networks as support factors in boosting expatriates' psychological resilience. The study found that major psychological stressors included fear and anxiety about health, job security, and economic impacts. Significant situational stressors were the living conditions or the perceived severity of the pandemic in the host country. Support from organizations, family, and social networks on the other hand resulted essential in improving expatriates' psychological well-being.

However, the study had some limitations, such as a small sample size, a focus on a specific geographical region, and a cross-sectional design. These limitations suggest several directions for future research. Longitudinal studies could track changes in expatriates' well-being over time. Research should also explore diverse expatriate populations and the impact of different types of

crises. Overall, this research enhances our understanding of expatriates' experiences during natural crises and offers practical insights for improving support mechanisms in crisis-prone contexts. Addressing the identified limitations in future studies will further strengthen the findings and help develop targeted interventions to support expatriates' psychological well-being.

References

Bader, A. K., Reade, C., & Froese, F. J. (2019). Terrorism and expatriate withdrawal cognitions: The differential role of perceived work and non-work constraints. *International Journal of Human Resource Management, 30*(11), 1769-1793. https://doi.org/10.1080/09585192.2016.1233448

Bader, B., & Berg, N. (2013). The influence of terrorism on expatriate performance: A qualitative study of German expatriates. *International Journal of Human Resource Management, 24*(3), 146-161.

Bader, B., & Berg, N. (2014). The influence of terrorism on expatriate performance: a conceptual approach. *The International Journal of Human Resource Management, 25*(4), 539-557. https://doi.org/10.1080/09585192.2013.814702

Biswas, T. (2022). Understanding work well-being during COVID-19 pandemic : A study in expatriates and non-expatriates. *Personalmanagement und Arbeits- und Organisationspsychologie*, 143-157. https://doi.org/10.20378/irb-55775

Boriçi Begani, A., & Berberi, A. (2020). Forms of international assignments applied by foreign companies operating in Albania. *Regional Science Inquiry, 12*(1), 129-141.

Caligiuri, P., De Cieri, H., Minbaeva, D., Verbeke, A., & Zimmermann, A. (2020). International HRM insights for navigating the COVID-19 pandemic: Implications for future research and practice. *Journal of International Business Studies, 51*(5), 697-713. https://doi.org/10.1057/s41267-020-00335-9

Chan, H. L., Zawawi, D., & Toh Pei Sung, S. (2023). Perceived non-work constraints and withdrawal intention among expatriates during the COVID-19 pandemic: Moderating role of resilience and marital status. *The Journal of Behavioral Science, 18*(2), 1-14.

Chen, M. (2019). The impact of expatriates' cross-cultural adjustment on work stress and job involvement in the high-tech industry. *Frontiers in Psychology, 10*, 2228. https://doi.org/10.3389/fpsyg.2019.02228

Coelho, C. M., Suttiwan, P., Arato, N., & Zsido, A. N. (2020). On the nature of fear and anxiety triggered by COVID-19. *Frontiers in Psychology, 11*, 581314. https://doi.org/10.3389/fpsyg.2020.581314

Collings, D. G., & Sheeran, R. (2020). Research insights: Global mobility in a post-COVID world. *Irish Journal of Management, 39*(2), 77–84. https://doi.org/10.2478/ijm-2020-0002

Czinkota, M. R., Ronkainen, I. A., & Gupta, S. (2021). International Business. https://doi.org/10.1017/9781108667487

Edstrom, A., & Galbraith, J. R. (1977). Transfer of Managers as a Coordination and Control Strategy in Multinational Organizations. *Administrative Science Quarterly, 22*(2), 248. https://doi.org/10.2307/2391959

Faeth, P. C., & Kittler, M. G. (2020). Expatriate management in hostile environments from a multi-stakeholder perspective: A systematic review. *Journal of Global Mobility, 8*(1),

Freedy, J. R., Saladin, M. E., Kilpatrick, D. G., Resnick, H. S., & Saunders, B. E. (1994). Understanding acute psychological distress following natural disaster. *Journal of Traumatic Stress, 7*(2), 257-273. https://doi.org/10.1002/jts.2490070207

Giorgi, G., Lecca, L. I., Ariza-Montes, A., Di Massimo, C., Campagna, M., Finstad, G. L., Arcangeli, G., & Mucci, N. (2020). The dark and the light side of the expatriate's cross-cultural adjustment:

A novel framework including perceived organizational support, work-related stress, and innovation. *Sustainability, 12*(7), 2969. https://doi.org/10.3390/su12072969

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2010). Multivariate data analysis. Upper Saddle River, NJ: Prentice Hall.

Harzing, A.-W. (2001a). Of bears, bumble-bees, and spiders: the role of expatriates in controlling foreign subsidiaries. *Journal of World Business, 36*(4), 366-379. https://doi.org/10.1016/s1090-9516(01)00061-x

Harzing, A.-W. (2001b). Who's in Charge? An Empirical Study of Executive Staffing Practices in Foreign Subsidiaries. *Human Resource Management, 40*(2), 139-158. https://doi.org/10.1002/hrm.1004

Harzing, A.-W., & Christensen, C. (2004). Expatriate failure: Time to abandon the concept? *Career Development International, 9*(7), 616–626. https://doi.org/10.1108/13620430410570329

Hill, C. W. L. (2023). International business: Competing in the global marketplace (14th ed.). McGraw-Hill Education.

Huff, C. (2022, November 1). Media overload is hurting our mental health. *Monitor on Psychology, 53*(8). https://www.apa.org/monitor/2022/11/media-overload-mental-health

Kisely, S., Warren, N., McMahon, L., Dalais, C., Henry, I., & Siskind, D. (2020). Occurrence, prevention, and management of the psychological effects of emerging virus outbreaks on healthcare workers: *Rapid review and meta-analysis. BMJ, 369*, m1642. https://doi.org/10.1136/bmj.m1642

Koveshnikov, A., & Lehtonen, M. J. (2024). Stuck in a moment you can't get out of: The psychological effects of expatriates' coping with a crisis situation. *Journal of Global Mobility*, ahead-of-print. https://doi.org/10.1108/JGM-11-2023-0082

Koveshnikov, A., Lehtonen, M. J., & Wechtler, H. (2022). Expatriates on the run: The psychological effects of the COVID-19 pandemic on expatriates' host country withdrawal intentions. *International Business Review, 31*, 102009. https://doi.org/10.1016/j.ibusrev.2022.102009

Lauring, J., Selmer, J., & Kubovcikova, A. (2016). Expatriate academics: Job factors and work outcomes. International Journal of Human Resource Management, 27(9), 1023-1039.

Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. Springer publishing company.

Lerbinger, O. (2012). The crisis manager: Facing disasters, conflicts, and failures. Routledge.

Mayrhofer, W., Reichel, A., & Sparrow, P. (2012). Alternative Forms of International Working. *Handbook of Research in International Human Resource Management, Second Edition*. https://doi.org/10.4337/9781849809191.0002

McNulty, Y., Lauring, J., Jonasson, C., & Selmer, J. (2019). Highway to hell? Managing expatriates in crisis. *Journal of Global Mobility, 7*(2), 157-180. https://doi.org/10.1108/JGM-10-2018-0054

McNulty, Y., & Moeller, M. (2018). A typology of dual-career expatriate (trailing) spouses: The 'R' profile. In M. Dickmann, V. Suutari, & O. Wurtz (Eds.), The management of global careers (pp. [page range]). Palgrave Macmillan. https://doi.org/10.1007/978-3-319-76529-7_10

Mehreen, H., Rammal, H. G., Schulenkorf, N., & Hassanli, N. (2024). "Homeward bound": A systematic review of the repatriation literature. *International Studies of Management & Organization*, 1-24. https://doi.org/10.1080/00208825.2024.2390789

Meyers, L. S., Gamst, G., & Guarino, A. J. (2013). *Applied multivariate research: Design and interpretation* (2nd ed.). SAGE Publications.

Monroe, S. M., & Slavich, G. M. (2016). Psychological Stressors. Stress: Concepts, Cognition, Emotion, and Behavior, 109-115. https://doi.org/10.1016/b978-0-12-800951-2.00013-3

Morin, G., & Talbot, D. (2023). Cultural intelligence of expatriate workers: A systematic review. *Management Review Quarterly, 73*(3), 413–454. https://doi.org/10.1007/s11301-021-00245-6

Nguyen, A., & Andresen, M. (2023). Expatriates' Quality of Life During the Pandemic: Two Sides of the Same Coin. In: Mockaitis, A.I. (eds) The Palgrave Handbook of Global Migration in International Business. Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-031-38886-6_23

Rhoades, L., & Eisenberger, R. (2002). Perceived organizational support: A review of the literature. *Journal of Applied Psychology, 87*(4), 698-714. https://doi.org/10.1037//0021-9010.87.4.698

Ryff, C. D. (1989). Happiness is everything, or is it? Explorations on the meaning of psychological well-being. *Journal of Personality and Social Psychology, 57*(6), 1069–1081. https://doi.org/10.1037/0022-3514.57.6.1069

Ryff, C. D., & Keyes, C. L. M. (1995). The structure of psychological well-being revisited. *Journal of Personality and Social Psychology, 69*(4), 719–727. https://doi.org/10.1037/0022-3514.69.4.719

Tripathi, C. M., & Singh, T. (2022). Sailing through the COVID-19 pandemic: managing expatriates' psychological well-being and performance during natural crises. *Journal of Global Mobility: The Home of Expatriate Management Research, 10*(2), 192-208. https://doi.org/10.1108/jgm-03-2021-0034

Tripathi, R., Thite, M., Varma, A., & Mahapatra, G. (2021). Appraising the revamped performance management system in Indian IT multinational enterprises: The employees' perspective. *Human Resource Management, 60*(5), 825-838.

Vazquez, L. M., & McGaughey, S. L. (2016). Non-traditional international assignments, knowledge and innovation: An exploratory study of women's experiences. Prometheus. http://dx.doi.org/10.1080/08109028.2015.1122952

Vegh, J., Jenkins, J., & Claes, M.-T. (2023). "Should I stay or should I go?"—Why the future of global work may be less binary: Lessons on approaches to global crises from the experiences of expatriates during the COVID-19 pandemic. *Thunderbird International Business Review, 65*(1), 21-37. https://doi.org/10.1002/tie.22309

Wild, J. J., & Wild, K. L. (2023). International business. The challenges of globalization (10th ed.). Pearson.

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Relevance of Generation z's Entry Into the Labour Market in the Context of Economic Performance

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Romania;
Finland

Abstract: *Skills, knowledge, and abilities represent attributes of the workforce that influence its performance. With ongoing intergenerational exchange, many questions arise that need answers. The most debated question concerns the integration of Generation Z into the labour market. Given the unfavorable demographic trend in Slovakia, where the workforce's growth rate is significantly declining, the sustainability of the economy becomes a pressing issue. The present study aims to analyse the links between the entry of Generation Z into the labour market and the performance of the economy and, based on the findings, to formulate recommendations for the needs of the labour market. Additionally, a comparison of selected data from four EU states—Czech Republic, Romania, Slovakia, and Finland—was conducted. Observing selected indicators allows for better determination of recommendations for the needs of the Slovak labour market. Generation Z is highly educated and motivated, has strong digital skills and is open to new challenges. These characteristics enable them to adapt to changes in the labour market and contribute to its development. To harness and fulfill this potential, it is necessary to create suitable conditions that allow for fully utilizing the abilities of this generational cohort. In the conditions of the Slovak Republic, the population size of this generation, technological changes, changes in preparation for entering the labour market, and legislative changes related to migration policy are all acute issues.This study applies their framework to expatriates in Albania and Montenegro during the pandemic, using a survey to: a) assess the relevance of psychological and situational stressors; b) evaluate the relevance of perceived organizational, family, and social network support as support factors; and c) analyze relationships between stressors, support factors, and expatriates' psychological well-being. The findings enhance understanding of expatriates' experiences during natural crises and inform improved support mechanisms.*

1. INTRODUCTION

Generation Z currently represents 30% of the world's population, and it is estimated to constitute 27% of the workforce by 2025 (Noor, 2023). Their entry into the workforce has already started exerting pressure for changes in the human values orientation toward the social responsibility of organizations and companies. In 2030, it is expected to be the largest group in the labour market with a 30 percent share (Berger, 2022). According to McCrindle Research, they are projected to work in 18 places and live in 15 houses during their lifetime (McCridle, 2023). Overall, they are anticipated to reshape the world of work, particularly in terms of work organization, as they prefer alternative modes of work engagement. The overall economic growth will depend significantly on the economic activation of this generation. However, the global labour market is highly segmented (ILO, 2023), and

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individual segments exhibit different trends. From a scientific research perspective, understanding the development in each segment is crucial to comprehend the processes and phenomena associated with it. In our presented study, we will focus on the impact of Generation Z's entry into the Slovak labour market compared to the labour markets of selected European Union member states. The Slovak labour market does not correspond with the global rise of Generation Z due to unfavorable demographic developments, much like a considerable portion of EU member states. According to selected findings from the Eurostat labour force survey, which published results for the previous year 2022, there are 165,000 young people aged 15 to 29 in the Slovak labour market who are working or seeking employment, which is fewer than 10 years ago (Eurostat, 2023). The capacity of the young labour force remaining in the job market is not adequately utilized. This capacity could play a significant role in the competitiveness of the Slovak economy.

2. LITERATURE REVIEW

Factors such as rapidly advancing technologies, the global economy, significant variations in product and service demand, changing market conditions, demographic shifts, workforce composition, and population aging create the need for modifications in work processes (Ciarniene & Vienazindiene, 2018). Current literature suggests that due to demographic changes, including declining birth and mortality rates, an increasing dependency ratio, and a decrease in the working-age population, labour productivity is affected, along with the size of the workforce (Bawazir et al., 2020; Maestas et al., 2016). Changes in the demographic structure of the population lead to increased intergenerational diversity within the workforce and workplaces, affecting interactions among employees. Positive interactions may contribute to higher morale and improved work productivity, while negative interactions can cause confusion, tension, or uncertainty, leading to lower employee productivity (Harnphattananusorn & Puttitanun, 2022). Looking at the aspect of an aging population, Japan serves as a perfect example of a country that has shown significant socio-economic progress over the years. However, the country is currently facing population aging. Concerned about population aging, the Japanese government explored new options for economic development, including changes in immigration and refugee recognition laws, aiming to attract more immigrants to enhance economic performance. Interestingly, this was once strictly opposed in Japan. Under Prime Minister Abe's administration, new policies were developed to enhance the performance of Japanese workers and increase their economic contributions (Government of Japan, 2019). The impact of aging on various economic areas, such as GDP or growth rate, has been the subject of scientific research. Studies have also examined the influence of aging on labour supply, consumption, savings, housing expenses, healthcare, and the roles of public and private transfers in the context of an aging society. Researchers generally point to various negative economic impacts of population aging (Bloom & Luca, 2016; Börsch-Supan et al., 2016; Kaschützke & Maurer, 2016; Lee & Mason, 2011; United Nations, 2016). The concept of intergenerational diversity has been used for example to assess the impact of age on the demand for products and services. Several studies have distinguished generational cohorts in the context of different countries, attributing these differences to specific external events in each country. Stirpe and Zarraga-Oberty (2017) note that employees from different generations and genders have different expectations and priorities at work - this has been explored by various authors over the years (Buonocore et al., 2015; Fry, 2015; Lub et al., 2016). Generation Z represents a cohort that is part of the education system and the labour market. Defined as the "connected" generation, they are familiar with modern technologies. Generation Z is open to cultural diversity, values constant contact with peers and others, and actively engages with online content, creating and influencing it (Gentina, 2020; Hinduan et al., 2020; Seemiller & Grace, 2017). This generation is described as independent, goal-oriented, intuitively innovative, highly productive and realistic. There is a contradiction in whether they exhibit entrepreneurial tendencies (Chillakuri, 2020; Merriman, 2015)

or have the lowest entrepreneurial inclinations (Katekhaye et al., 2019). Factors such as rising youth unemployment and concerns about economic, local, regional, and national development have led countries' authorities to proactively support entrepreneurship among students. Many tertiary education institutions have established entrepreneurial centers to help students identify and leverage business opportunities. For instance, Romania has witnessed the creation of student entrepreneurial societies within higher education institutions, fostering entrepreneurial skills and changing students' perspectives on business. The ultimate goal is to achieve a balance between supply and demand in the labour market, reducing the number of job seekers in favor of students who, based on viable business ideas, can create jobs (Rusu et al., 2022). Research indicates that people aged 18 to 24 have the lowest entrepreneurial inclinations, emphasizing the importance of stimulating entrepreneurial activities for students (Katekhaye et al., 2019). It is on this basis that the stimulation of entrepreneurial activities for students is of critical importance, which becomes a public responsibility that is assigned to both policymakers and educational settings (Rusu et al., 2022). Education, especially tertiary education, is considered a crucial factor in reducing inequalities in development and competitiveness. Education provides the best qualifications for competing in the global economy, responding to continuous technological changes, achieving higher productivity, and income, and reducing unemployment (Agasisti & Bertoletti, 2022; Buser et al., 2021; Habibi & Zabardast, 2020; Kopycka, 2021; Mikulec, 2018). Higher education improves the quality of human capital, and universities are crucial in knowledge creation (Bugallo-Rodriguez & Vega-Marcote, 2020; Schneider, 2020). It is also on this basis that differences between countries are explained by how literate adults are, the proportion of people with higher education or access to education, without taking into account aspects such as science, material base, or technology (Gapsalamov et al., 2020).

3. METHODOLOGY

From a global perspective, a positive contribution to the world economy is expected from Generation Z; however, due to significant developmental differences in various indicators within individual countries, these impacts may vary. For these reasons, the present study aims to analyse the links between the entry of Generation Z into the labour market and the performance of the economy and, based on the findings, to formulate recommendations for the needs of the labour market. We have formulated the following research questions:

RQ 1: What are the macroeconomic impacts of Generation Z entering the labour market?

RQ 2: What are the differences in the macroeconomic impacts of Generation Z entering the labour market in different countries?

To achieve the goal and address the research questions, we first mapped the available literature on the macroeconomic impacts of Generation Z entering the workforce. This allowed us to acquire basic information on the topic and delineate our research space. We then proceeded to the empirical analysis of selected macroeconomic indicators. We used quantitative methods such as correlation analysis, descriptive statistical methods and time series analysis to analyse the macroeconomic data. These methods enabled us to determine whether there is a statistically significant relationship between the entry of Generation Z into the labour market and macroeconomic indicators. Lastly, based on the acquired knowledge, we developed two prediction models. The first model focuses on the employment trends of Generation Z and the Gross Domestic Product (GDP). In the second model, we examined the trends of young people in individual countries who are neither employed nor part of the education system. Conclusions drawn from these data are presented in the findings and in the conclusion.

4. FINDINGS

To answer the RQ1 and RQ2 we can say that Finland stands out with its dynamics, showing fluctuations over the years in terms of the GDP. This variability in Finland highlights the need for a deeper reflection on the specific economic factors shaping the labour market for the younger generation. The corresponding trajectory of GDP trends offers a complete contrast. The Czech Republic, Romania, and Slovakia share a common theme of sustained economic growth evident in their upward GDP trends. In contrast, Finland's GDP path exhibits fluctuations, but the overall direction remains positive in the context of economic development. The gap between the decline in Generation Z employment and resilient GDP growth in these countries highlights an issue within workforce engagement and broader economic indicators. To explore the relationship between Generation Z and GDP, we conducted a correlation analysis. The correlation coefficient of 0.33 between the Generation Z population and GDP values indicates a positive but only moderately strong relationship between the two variables. In the context of our analysis, this means that on average there is a tendency for GDP values to increase as the number of Generation Z employees increases across the selected countries and years. However, it is important to note that the strength of this relationship is not very high, which means that factors other than Generation Z employment are likely to contribute significantly to variations in GDP. This moderately positive correlation could imply that demographic factors associated with the Generation Z population may be influencing general economic growth to some extent.

Regarding the dependency between Generation Z employment and GDP development, we created a prediction model for Slovakia (Figure 1).

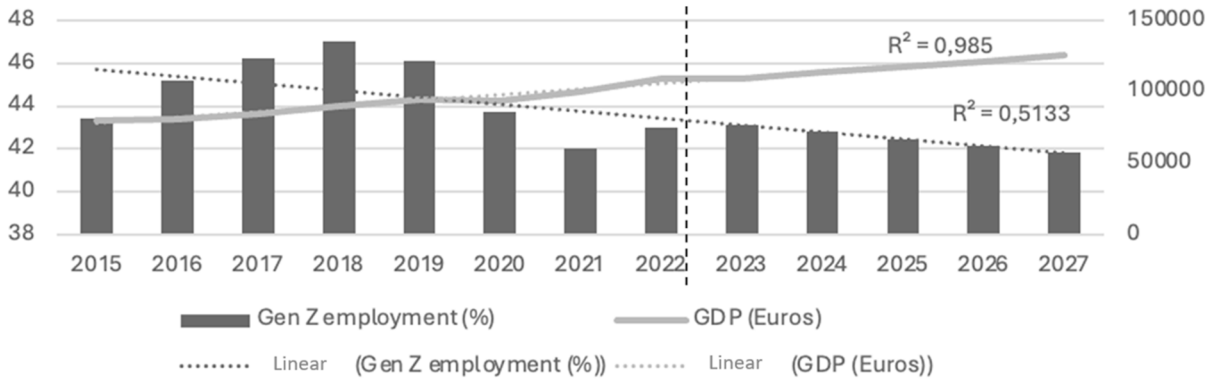

Figure 1. Prediction model of Generation Z employment and GDP development in the context of Slovakia

Source: Own processing

This prediction model, as evidenced by the R values, provides valuable insights into the expected trends in Generation Z employment and gross domestic product (GDP) in the forecasted period. Analysing the figure, it is possible to observe a trend in Generation Z employment, which is expected to decline gradually, with an initial value of 43.1% in 2023 to 41.8% in 2027. This declining trend indicates a potential decrease in the labour force participation rate of individuals from Generation Z in the forecasted years. Simultaneously, the estimated GDP values reveal a consistent upward trend. Starting at 109,524.4 billion EUR in 2023, GDP is expected to grow steadily, reaching 125,356.1 billion EUR by 2027. This positive trend aligns with the anticipation of economic growth in the forecasted period. The interplay between Generation Z employment and GDP is a dynamic aspect of our analysis. Despite the expected decline in Generation Z employment, GDP is expected to show strong growth.

This difference suggests that economic growth may not exclusively depend on the active labour market participation of Generation Z. Other factors, such as increased productivity or technological advancements, may significantly contribute to overall economic expansion in the forecasted period. Looking at the R values, they provide measures of explanatory power for our predictive model for each variable. The R value for Generation Z employment is 0.5133, indicating that approximately 51.33% of the observed variability in Generation Z employment is explained by the independent variable, which is time. Similarly, the R value for GDP is remarkably high at 0.985, meaning that almost 98.5% of the observed variability in GDP can be attributed to the chosen independent variable - time.

For a better understanding of the dependence between graduates of tertiary education and the employment of Generation Z, we decided to use correlation analysis. The correlation coefficient of 0.98 obtained from the analysis indicates an extremely strong positive linear relationship between the number of Generation Z tertiary education graduates and the number of employed individuals from Generation Z. This high correlation implies that as the number of Generation Z tertiary education graduates' increases, there is almost a perfect corresponding increase in the number of employed individuals from Generation Z. The positive correlation coefficient close to 1 suggests that the variables move in the same direction, with a consistent and strong linear association over the observed years and countries. In the context of the youngest Generation Z, we also created a prediction model that points to the potential development of the number of representatives of this cohort who neither work nor are part of the education system. This development in the context of the four selected countries is illustrated in Figure 2.

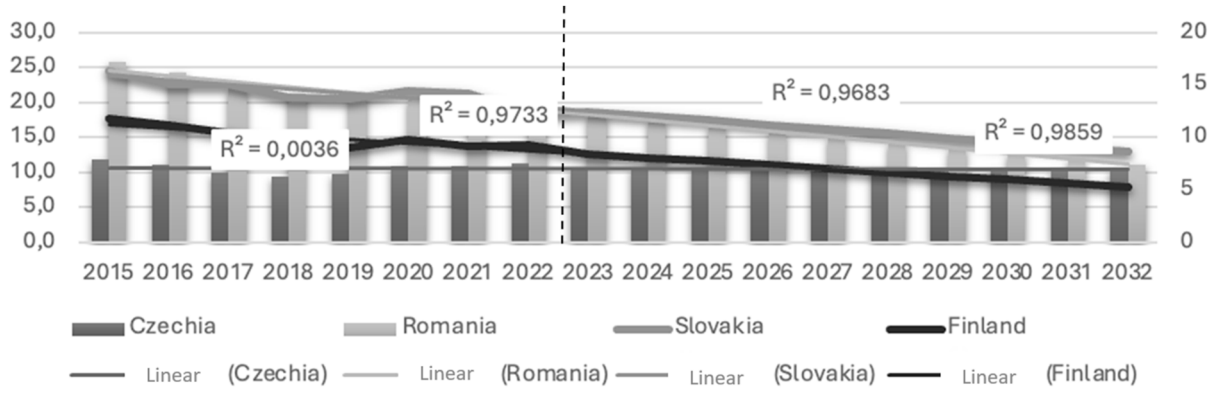

Figure 2. Prediction model of Generation Z that neither works nor studies

Source: Own processing

In the Czech Republic, the predicted unemployment and non-participation rates in education for Generation Z show slight fluctuations, ranging from the initial value of 10.66% in 2023 to stabilization of around 10.61% in 2032. This small decline indicates a relatively stable scenario, albeit with a slightly decreasing trend. The low coefficient value of R = 0.0036 suggests that the model has limited explanatory power, reflecting the complexity of accurately predicting this specific aspect of Generation Z behavior in the Czech Republic. Romania exhibits a more pronounced trend, with the predicted unemployment and non-participation rate for Generation Z decreasing from 18.30% in 2023 to 11.14% in 2032. This consistent decline suggests significant improvement in disconnecting Generation Z from the workforce and education. The high R coefficient value of 0.9859 underscores the robustness of the model in explaining observed changes, indicating a high level of reliability in forecasting expected trends in Romania. Slovakia shows a similar favorable trajectory, with the predicted unemployment and non-participation rate for Generation Z decreasing from 12.48% in 2023 to 8.69% in 2032. This declining trend signals a positive outlook for the involvement of Generation Z in society, related to

broader societal and economic factors. The R coefficient value of 0.9683 indicates a strong explanatory power of the model, reinforcing the reliability of the forecast for Slovakia. Finland demonstrates consistent and remarkable progress, with the predicted unemployment and non-participation rate for Generation Z decreasing from 8.45% in 2023 to 5.26% in 2032. This declining trend reflects a significant reduction in the disconnection of Generation Z from the workforce and educational systems in Finland. The R coefficient value of 0.9733 signifies a high level of forecast reliability, instilling confidence in the accuracy of projected trends in Finland. The predicted data indicate varying degrees of improvement in the disconnection of Generation Z from the workforce and education in these four countries. While the Czech Republic shows a more stable scenario with a small decline, Romania, Slovakia, and Finland present more significant and favorable trends. The high R coefficient values for Romania, Slovakia, and Finland underscore the reliability of predictive models in explaining and forecasting these developments, providing valuable insights for policymakers and researchers.

In this study, the focus was on the aspect of tertiary education in the context of Generation Z, examining the relationship between the number of Generation Z tertiary education graduates and employees of the same cohort. The findings revealed that as the number of Generation Z tertiary education graduates increases, there is an almost perfect corresponding increase in the number of employed individuals from Generation Z. This assertion is supported by a correlation analysis result of 0.98 between the variables in question. The second research question of this study aimed to analyze differences in the macroeconomic impacts of Generation Z entering the labour market in various countries. It was found that while the Czech Republic, Romania, and Slovakia experience a steady decline in Generation Z employment, Finland stands out with its dynamics showing fluctuations over the years. However, when comparing GDP, it can be noted that the Czech Republic, Romania, and Slovakia share a common theme of sustained economic growth, evident in their upward GDP trend. In contrast, Finland's GDP trajectory shows fluctuations, but the overall direction remains positive in the context of economic development. In the context of Generation Z employment and GDP levels in one of the studied countries (Slovakia), a predictive model was created until 2027, indicating that if current conditions do not change, employment for Generation Z is expected to gradually decline, from an initial value of 43.1% in 2023 to 41.8% in 2027. This declining trend suggests a potential decrease in the labour market participation rate for Generation Z individuals in the forecasted years. At the same time, estimated GDP values reveal a consistent upward trend. Starting at 109,524.4 billion EUR in 2023, GDP is expected to gradually increase, reaching a value of 125,356.1 billion EUR by 2027. This difference suggests that economic growth may not be exclusively dependent on the active labour market participation of Generation Z. Other factors, such as increased productivity and technological progress, may significantly contribute to overall economic expansion in the predicted period. Differences between the countries were also examined in our study regarding tertiary education graduates. Our results in the context of four countries indicate diverse dynamics in the development of graduates compared to Thailand. The Czech Republic recorded a decline in graduates from 69,026 in 2016 to 54,111 in 2021. Romania experienced fluctuations in the number of graduates, reaching a peak of 103,155 in 2020. Slovakia showed a constant decline in the number of graduates from 46,332 in 2016 to 32,278 in 2020, with a slight increase to 32,787 in 2021. Finland maintained stability in the number of graduates, ranging from 36,731 to 37,305. Another predictive model focused on the number of Generation Z members who are neither employed nor part of the education system in the context of all the studied countries. Similarly, this model is created until 2032, where in the Czech Republic, the predicted unemployment rate and non-participation in education for Generation Z show slight fluctuations, from an initial value of 10.66% in 2023 to a stabilization of around 10.61% in 2032. Romania shows a more pronounced trend, with the predicted unemployment and non-participation rate in education for Generation Z decreasing from 18.30% in 2023 to 11.14% in 2032. Slovakia exhibits a similar favorable trajectory, with the predicted unemployment

and non-participation rate in education for Generation Z decreasing from 12.48% in 2023 to 8.69% in 2032. Finland demonstrates consistent and remarkable progress, with the predicted unemployment and non-participation rate in education for Generation Z decreasing from 8.45% in 2023 to 5.26% in 2032. The predicted data indicate varying degrees of improvement in the disconnection of Generation Z from the labour force and education in the four countries. While the Czech Republic shows a more stable scenario with a small decline, Romania, Slovakia, and Finland represent more significant and favorable trends. In light of the findings regarding the entry of Generation Z into the labour market and their impact on macroeconomic indicators, it is evident that adapting to the unique characteristics of this generation is essential for sustainable economic development. For the Czech Republic, Romania, Slovakia, and Finland, the following recommendations are proposed: (1) given the challenges highlighted in accommodating Generation Z in the workforce, employers in all countries should invest in programs that enhance the skills and adaptability of their workforce. This includes fostering a workplace culture that aligns with the preferences and expectations of Generation Z employees; (2) universities and educational institutions should consider adopting adaptive teaching methods to cater to the learning preferences of Generation Z; (3) building on the findings of the study, it is noteworthy that Finland has maintained stability in the number of tertiary education graduates, showcasing a unique educational approach. The Finnish education system is renowned for its emphasis on holistic development, minimal standardized testing, and a focus on student well-being. Considering the consistent positive trajectory in Finland's economic development, it is recommended that the Czech Republic, Romania, and Slovakia explore adopting elements of the Finnish education model.

5. FUTURE RESEARCH DIRECTIONS

Future research on Generation Z should prioritize the examination of the educational experiences of this cohort to evaluate the efficacy of current educational systems in preparing young people for the demands of the labor market. Concurrently, it is crucial to investigate the value orientations of this generational cohort, which have a profound influence on employee loyalty to their employers and the types of employers that this generation finds appealing, particularly in the context of corporate culture.

6. CONCLUSION

The present study aims to analyse the links between the entry of Generation Z into the labour market and the performance of the economy and, based on the findings, to formulate recommendations for the needs of the labour market. We analyzed the relationships between Generation Z employment in selected countries and the GDP level, as well as tertiary education graduates of this cohort. We focused on areas such as employment dynamics, GDP development, the number of tertiary education graduates, and, last but not least, the unemployment rate and simultaneously the non-participation in the education system. The results highlight diverse dynamics of macroeconomic performance depending on individual countries and in relation to the integration of Generation Z into the workforce. It was found that there is a dependency between the number of Generation Z employees and GDP values, although it is necessary to state that the strength of this relationship is not strong. This indicates that there are other factors influencing economic growth. At the same time, an increased employment trend of Generation Z was identified as the number of tertiary education graduates increased. Focusing on the employment of this generational cohort, it was found that while the Czech Republic, Romania, and Slovakia experienced a decline in Generation Z employment, Finland exhibited a development dynamic with a favorable direction. The predictive model in the context of the Slovak Republic pointed to possible future

trends, where a decrease in Generation Z employment could be discussed in terms of employment. The tertiary education sector also differs depending on which of the subject countries is the focus of our attention. The conclusion of the study forms the second predictive model, which speaks to the development of Generation Z members who are neither employed nor part of the education process. Under unchanged current conditions, the relative stability of the current value of this indicator can be expected in the Czech Republic, but other states show more significant declines, which is a positive signal. We can conclude that the entry of Generation Z into the workforce has clear macroeconomic consequences. This study contributes to understanding the complex interactions between Generation Z and the economies of the respective countries. The findings may be valuable for policymakers or businesses in shaping future strategies targeted at Generation Z.

References

Agasisti, T., & Bertoletti, A. (2022). Higher education and economic growth: A longitudinal study of European regions 2000–2017. *Socio-Economic Planning Sciences*, *81*, 100940. https://doi.org/10.1016/j.seps.2020.100940

Bawazir, A. A. A., Aslam, M., & Osman, A. F. B. (2020). Demographic change and economic growth: Empirical evidence from the Middle East. *Economic Change and Restructuring*, 53(3), 429–450. https://doi.org/10.1007/s10644-019-09254-8

Berger, C. (2022). Gen Z workers will be 30% of the workforce by 2030—Here's what they want from their employers. *Yahoo Finance*. https://finance.yahoo.com/news/gen-z-workers-30-workforce-123000932.html

Bloom, D. E., & Luca, D. L. (2016). The Global Demography of Aging: Facts, Explanations, Future. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2834213

Börsch-Supan, A., Härtl, K., & Leite, D. N. (2016). Social Security and Public Insurance. *Handbook of the Economics of Population Aging,* 781-863. https://doi.org/10.1016/bs.hespa.2016.09.002

Bugallo-Rodríguez, A., & Vega-Marcote, P. (2020). Circular economy, sustainability and teacher training in a higher education institution. *International Journal of Sustainability in Higher Education*, 21(7), 1351–1366. https://doi.org/10.1108/IJSHE-02-2020-0049

Buonocore, F., Russo, M., & Ferrara, M. (2015). Work–family conflict and job insecurity: Are workers from different generations experiencing true differences? *Community, Work & Family*, 18(3), 299–316. https://doi.org/10.1080/13668803.2014.981504

Buser, T., Niederle, M., & Oosterbeek, H. (2021). Can Competitiveness predict Education and Labor Market Outcomes? Evidence from Incentivized Choice and Survey Measures (w28916; p. w28916). *National Bureau of Economic Research*. https://doi.org/10.3386/w28916

Chillakuri, B. (2020). Understanding Generation Z expectations for effective onboarding. *Journal of Organizational Change Management, 33*(7), 1277-1296. https://doi.org/10.1108/jocm-02-2020-0058

Ciarniene, R., & Vienazindiene, M. (2018). Flexible Work Arrangements from Generation and Gender Perspectives: Evidence from Lithuania. *Engineering Economics*, *29*(1), 84–92. https://doi.org/10.5755/j01.ee.29.1.19247

Eurostat. (2023). *Employment and activity*. https://ec.europa.eu/eurostat/databrowser/view/lfsi_emp_a/default/table?lang=en

Fry, R. (2015). *Millennials Surpass Gen Xers as the Largest Generation in U.S. Labour Force*. Pew Research Centre.

Gapsalamov, A. R., Bochkareva, T. N., Vasilev, V. L., Akhmetshin, E. M., & Anisimova, T. I. (2020). Comparative analysis of education quality and the level of competitiveness of leader countries under digitalization conditions. *Journal of Social Studies Education Research*, *11*(2), 133–150.

Gentina, E. (2020). Generation Z in Asia: A Research Agenda. The New Generation Z in Asia: Dynamics, Differences, Digitalisation, 3-19. https://doi.org/10.1108/978-1-80043-220-820201002

Government of Japan. (2019). *For future growth, for future generations, and for a future Japan*. ABENOMICS.

Habibi, F., & Zabardast, M. A. (2020). Digitalization, education and economic growth: A comparative analysis of Middle East and OECD countries. *Technology in Society*, *63*, 101370. https://doi.org/10.1016/j.techsoc.2020.101370

Harnphattananusorn, S., & Puttitanun, T. (2022). Generation mix and GDP growth in OECD countries. *Heliyon*, *8*(9), e10508. https://doi.org/10.1016/j.heliyon.2022.e10508

Hinduan, Z. R., Anggraeni, A., & Agia, M. I. (2020). Generation Z in Indonesia: The Self-Driven Digital. *The New Generation Z in Asia: Dynamics, Differences, Digitalisatio*n, 121-134. https://doi.org/10.1108/978-1-80043-220-820201012

ILO. (2023). *Labour Market Segmentation*. https://www.ilo.org/global/topics/employment-security/labour-market-segmentation/lang--en/index.htm

Kaschützke, B., & Maurer, R. (2016). Investing and Portfolio Allocation for Retirement. *Handbook of the Economics of Population Aging,* 567-608. https://doi.org/10.1016/bs.hespa.2016.09.007

Katekhaye, D., Meyer, N., & Magda, R. (2019). Entrepreneurial Core Motivation as a Success Factor for Rural Entrepreneurship in Western India. *Polish Journal of Management Studies*, *19*(2), 218–230. https://doi.org/10.17512/pjms.2019.19.2.18

Kopycka, K. (2021). Higher education expansion, system transformation, and social inequality. Social origin effects on tertiary education attainment in Poland for birth cohorts 1960 to 1988. *Higher Education*, *81*(3), 643–664. https://doi.org/10.1007/s10734-020-00562-x

Lee, R. D., & Mason, A. (Eds.). (2011). *Population aging and the generational economy: A global perspective*. International Development Research Centre.

Lub, X. D., Bal, P. M., Blomme, R. J., & Schalk, R. (2016). One job, one deal…or not: Do generations respond differently to psychological contract fulfillment? *The International Journal of Human Resource Management*, *27*(6), 653–680. https://doi.org/10.1080/09585192.2015.1035304

Maestas, N., Mullen, K., & Powell, D. (2016). The Effect of Population Aging on Economic *Growth, the Labor Force and Productivity*. https://doi.org/10.7249/wr1063-1

McCridle. (2023). *Gen Z and Gen Alpha Infographic*. https://mccrindle.com.au/article/topic/generation-z/gen-z-and-gen-alpha-infographic-update/

Merriman, M. (2015). *What if the next big disruptor isn'ta what but a who.* Ernst & Young.

Mikulec, B. (2018). Normative presumptions of the European Union's adult education policy. *Studies in the Education of Adults*, *50*(2), 133–151. https://doi.org/10.1080/02660830.2018.1522942

Noor, A. (2023). 20+ Gen Z Statistics For Employers in 2023. *QUREOS*. https://www.qureos.com/hiring-guide/gen-z-statistics#top-generation-z-statistics-for-employers-in-2023

Rusu, V. D., Roman, A., & Tudose, M. B. (2022). Determinants of Entrepreneurial Intentions of Youth: The Role of Access to Finance. *Engineering Economics*, 33(1), 86–102. https://doi.org/10.5755/j01.ee.33.1.28716

Schneider, S. (2020). European Social Survey. www.europeansocialsurvey.org

Seemiller, C., & Grace, M. (2017). Generation Z: Educating and Engaging the Next Generation of Students. *About Campus: Enriching the Student Learning Experience, 22*(3), 21-26. https://doi.org/10.1002/abc.21293

Stirpe, L., & Zárraga-Oberty, C. (2017). Are High-Performance Work Systems always a valuable retention tool? The roles of workforce feminization and flexible work arrangements. *European Management Journal*, *35*(1), 128–136. https://doi.org/10.1016/j.emj.2016.04.002

United Nations. (2016). World Population Ageing 2015: Highlights. https://doi.org/10.18356/cba8beb6-en

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Lessons from the COVID-19 Pandemic: Consumer Behavior During Adverse Events

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Factors influencing consumer behavior;
Consumer age

Abstract: *The COVID-19 pandemic created unique conditions in societies with various implications for the future. A research study based on empirical research conducted on a sample of 1172 consumers explores the consumer behavior changes that occurred during the pandemic. It was discovered that the consumers in the age group 30 – 39 years old living alone to the greatest extent decreased the amount of products they bought during the pandemic. In 2021, the most significant impact of the shop availability factor was recorded, from the point of view of consumers aged 50 to 59. Consumers aged 40-49 were most likely to be influenced by expert information in their purchasing decisions and they were the ones who most trusted the official government information on pandemic development. Fear was an important factor that influenced consumer behavior during the pandemic. The fear of job loss manifested itself in higher savings among consumers in the 40-59 age group. On the contrary, lower age categories of consumers were more concerned about the health of their loved ones, which was mainly reflected in the tendency to shop in brick-and-mortar stores unaccompanied. Guidelines were formulated based on these findings in order to predict how the consumers will adapt their behavior during the next adverse event that may occur in the future. By explaining in detail what changes occurred and why they occurred it is possible to predict consumer behavior during adverse events in the near future.*

1. INTRODUCTION

The COVID-19 pandemic marked a significant crisis period in societies worldwide from its outbreak in 2020 up until its official conclusion in 2023. However, its impacts are still significant even after its conclusion. Any adverse event or time of crisis introduces significant changes in all aspects of life. Such changes provide both challenges and opportunities for the business environment. Enterprises need to face these challenges and introduce significant adjustments and even sometimes new strategies to not only survive but also thrive. Several major lessons can be derived from this experience. However, that depends on the organization's ability to learn.

The challenges that businesses face during the COVID-19 pandemic can be divided into two categories based on the sources from which they were introduced. The first group of challenges can be traced back to the government that its introduction of new policies and restrictions designed to stop the spread of the virus. As the reports show (Fletcher & Griffiths, 2020; Hean & Chairassamee, 2023; Iwuoha et al., 2021; Mahmud & Riley, 2022), these were the challenges that were very easy to overcome. However, it was the second category that created major problems for businesses worldwide. Since the pandemic introduced new changes in societies, people were forced to adapt. Therefore, this period also observed significant modifications in consumer behavior.

Consumer behavior on its own is already a very complex system of factors influencing how consumers decide to either buy or not purchase a certain product. However, during adverse events,

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this fragile system experiences major turmoil. Consumer behavior changes have been a significant focus of research throughout the pandemic and soon after its conclusion. Various researchers mapped the changes that occurred during the pandemic in all major aspects of consumer behavior as we understand it today (Bisaria, 2021; Cai et al., 2023; Ma et al., 2023).

However, all that is currently still missing from the pool of knowledge are the conclusions. The synthesis of all analyzed aspects of consumer behavior changes needs to be transformed into lessons for the near future. Predicting consumer behavior is very difficult, however, predicting its development during adverse events can become essential for businesses to overcome such challenges and to thrive. This research aims to provide several of these lessons and their implications for the business environment in the form of guidelines for companies to develop strategies in order to flexibly react to consumer behavior changes should another adverse event arise in the near future.

2. LITERATURE REVIEW

Consumer behavior can be perceived as a complex set of factors influencing behavior that results in either a purchase or not. The complexity of this issue has been known and explored by various researchers for many decades (Ma et al., 2023; Novotny & Duspiva, 2014). However, it was discovered that consumer behavior is a dynamic phenomenon that changes over time or under specific circumstances. The COVID-19 pandemic was such a significant adverse event that it impacted even the most basic processes in societies and created a whole new reality that people had to adjust to. As a result, consumer behavior changed drastically. Various research studies explored these changes.

The most significant and fundamental change in consumer behavior that many researchers explored since the start of the COVID-19 pandemic was the fluctuation in the quantity of products consumers were buying. Kumar and Pole (2024) provided evidence that the emergence of the pandemic and consequent governmental measures were a cause for an increase in the quantity of bought products. However, other research studies conducted in later pandemic years show that this increase did not last (Juhasz et al., 2022). There is a significant discrepancy between the findings of these studies that prove that consumers in different countries reacted differently to pandemic conditions.

Furthermore, differences were also observed in different types of products that were bought during the pandemic. Zuokas et al. (2022) provided evidence that it was daily consumption products that were bought during the pandemic in different quantities. However, leisure products also observed changes in their bought quantities, these changes were not as significant as it was observed in the previous category.

Research has also proven that any major adverse event is always accompanied by an increase in fear (Zhang et al., 2022). However, very few studies have explored how different types of fear affected consumers during the COVID-19 pandemic and what were the consequent consumer behavior changes. Belbag (2021) explored how the fear manifested in panic buying. However, this study covered only the first stage of the pandemic, not exploring how this phenomenon evolved in the later months and years of the COVID-19 pandemic.

Moreover, there are many studies focused on how the factors influencing consumer behavior evolved their influence during the pandemic (Ali Taha et al., 2021; Sostar & Ristanovic, 2023). Special attention was given to media, especially social networks (Mason et al., 2021). However, the results varied. Some authors provided evidence on positive examples of how media can instigate

a positive change in consumer behavior even during harsh conditions of an adverse event (Ng et al., 2022). Other research studies cite media as the main source of social discord and even a cause of panic in societies (Ali Taha et al., 2021; Belbag, 2021; Luc & Hoang, 2023). Based on these findings, it is clear that societies were very polarized during the pandemic and consumers reacted differently based on other factors.

These findings draw a clear picture of major consumer behavior changes that occurred during the COVID-19 pandemic. However, their connections remain not fully explored. Furthermore, some studies even focused on suggesting what these changes could mean for businesses (Khouja & Liu, 2021; Poon & Tung, 2022; Tao et al., 2022). However, such implications have not yet been fully covered, especially with the connection to post-pandemic consumer behavior or future adverse events. This research aims to contribute to filling this research gap by addressing this issue and by developing guidelines for businesses.

3. METHODOLOGY

The main aim of this research was to explore consumer behavior changes that occurred during the COVID-19 pandemic, to draw the lessons from this information and to develop guidelines for enterprises to be able to flexibly react to consumer behavior changes that may occur during an adverse event in the future. This research study was based on an empirical research. A sample of 1172 consumers in the Slovak Republic was used to collect data and to explore the consumer behavior changes that occurred during the pandemic to draw guidelines for the future. The representativeness of this sample file was verified according to the criterion of the consumer's age. The base file consisted of all Slovak citizens of legal age that is older than 18 years old. The chi-square test was used to calculate and consequently also confirm the representativeness of the sample file. The structure of the sample file according to the criterion of consumers' age is provided in Table 1.

Table 1. Sample file

Base file (population as of 1st July of researched year)				Sample file		
Age	**2023***	**2022**	**2021**	**2023**	**2022**	**2021**
18 - 29		856586	878419	72	206	26
30 - 39		815154	828026	82	135	26
40 - 49		879998	872853	37	125	32
50 - 59		705272	703452	62	118	18
60 - 69		683376	689923	39	99	22
70 and more		618244	599217	4	55	14
Total		**4558628**	**4571888**	**296**	**738**	**138**

* The data is not available at the time of processing

Source: Own processing

Moreover, other social and economic characteristics of consumers were collected and consequently used in the analysis of various phenomena related to consumer behavior changes during the pandemic. This sample file consisted of 68.61% of female consumers. The majority of consumers in the sample file were employed (61.09%) and 22.69 % of them were entrepreneurs. Up to 21.5% of consumers in the sample file lived alone during the time of the pandemic, 21.51% lived with their parents, 24.23% shared a household with a partner without children and the remaining 32.78% lived in a household with a partner with children.

4. RESULTS

The first change explored in this study was the extent of the quantity of products bought that varied during the pandemic years. It was discovered that even though consumers initially increased the quantity of products they bought at the time of the outbreak, only older consumers continued to buy more as the pandemic progressed. Consumers of all other age groups either returned to the amounts of products they had bought before the pandemic or some even decreased the quantity of products they bought. It was the consumers in the age group 30 – 39 years old living alone who to the greatest extent decreased the amount of products they bought during the pandemic. This result can signify an indication of the turn towards sustainable consumption as the lifestyle that has become popular among younger generations. Furthermore, it was discovered that daily consumption goods, not entertainment products observed the largest decline in their purchase amounts in 2022. This is a surprising finding indicating that consumers were more mindful during the pandemic of their expenses. This trend was observed to a higher extent among female consumers.

This research also focused on exploring factors that influenced the purchasing behavior of consumers during the COVID-19 pandemic. Several traditional factors such as family, friends, and media were considered. However, some new factors emerging during the COVID-19 pandemic were also included in the research. Figure 1 and Table 2 show the fluctuation in the influence of such factors structured according to the age of consumers and the year of the pandemic. The scale used to evaluate the influence of any factor was from 1 point (the lowest influence) to 5 points (the highest influence).

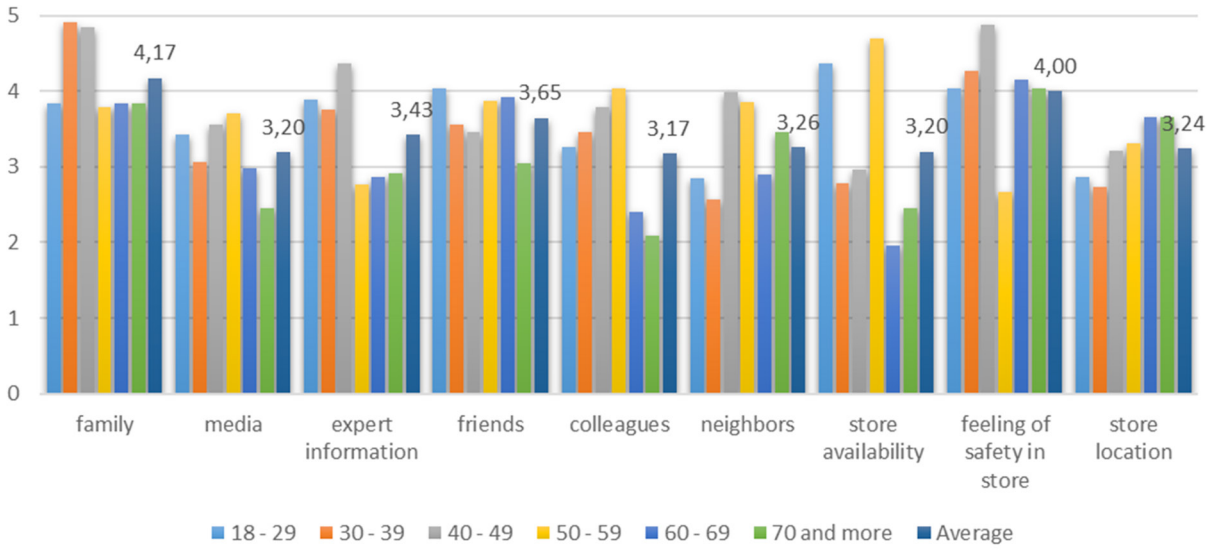

Figure 1. Influence of factors – based on age of consumers

Source: Own processing

It was discovered that in 2021, the significantly highest impact of the shop availability factor was recorded, especially in the age groups of consumers 50 to 59 years and 18 to 29 years old. However, this factor had only a moderate effect on the 60 - 69 age group. Furthermore, the influence of this factor significantly decreased in other years of the pandemic. A high impact of the factor of feeling safe in the store was recorded across all age categories, except for consumers aged 50 – 59. However, this high impact was recorded mostly in the later years of the pandemic. Furthermore, a significant increase in the influence of the family factor can be observed mainly among consumers aged between 30 and 49 years. However, this factor had a very steady influence on

all consumer segments. It was also discovered that consumers aged 40 - 49 were also most likely to be influenced by expert information in their purchasing decisions and they were the ones who most trusted the official government information on pandemic development.

Table 2. Changes in influence of factors – based on pandemic year

Factors	2021	Interannual change of		2022	Interannual change of		2023
	Level of influence			Level of influence			Level of influence
family	4,59	**-0,49**	**-10,68%**	4,10	**-0,12**	**-2,93%**	3,98
media	3,35	**-0,11**	**-3,28%**	3,24	**-0,12**	**-3,70%**	3,12
expert information	3,63	**0,15**	**4,13%**	3,78	**-0,82**	**-21,69%**	2,96
friends	3,41	**0,28**	**8,21%**	3,69	**0,08**	**2,17%**	3,77
colleagues	2,14	**1,51**	**70,56%**	3,65	**0,14**	**3,84%**	3,79
neighbors	3,26	**0,25**	**7,67%**	3,51	**-0,46**	**-13,11%**	3,05
store availability	4,96	**-2,49**	**-50,20%**	2,47	**-0,31**	**-12,55%**	2,16
feeling of safety in store	3,69	**0,60**	**16,26%**	4,29	**-0,28**	**-6,53%**	4,01
store location	3,02	**0,29**	**9,60%**	3,31	**0,09**	**2,72%**	3,40

Source: Own processing

As the current pool of knowledge shows, any major adverse event is always accompanied by the emergence of fear. Different aspects of fear and its influence on consumer behavior during the COVID-19 pandemic were also explored in this research (Figure 2). The significant stockpiling was observed in a very polarized way. The highest rate was expressed by the oldest consumers, but consumers in the age group 30 – 39 years old were stockpiling nearly as much. Furthermore, health concerns were very significant throughout the age spectrum. However, it was the fear for the health of loved ones that was more impactful on consumers' shopping tendencies, even over the concerns for their health except for the oldest consumers.

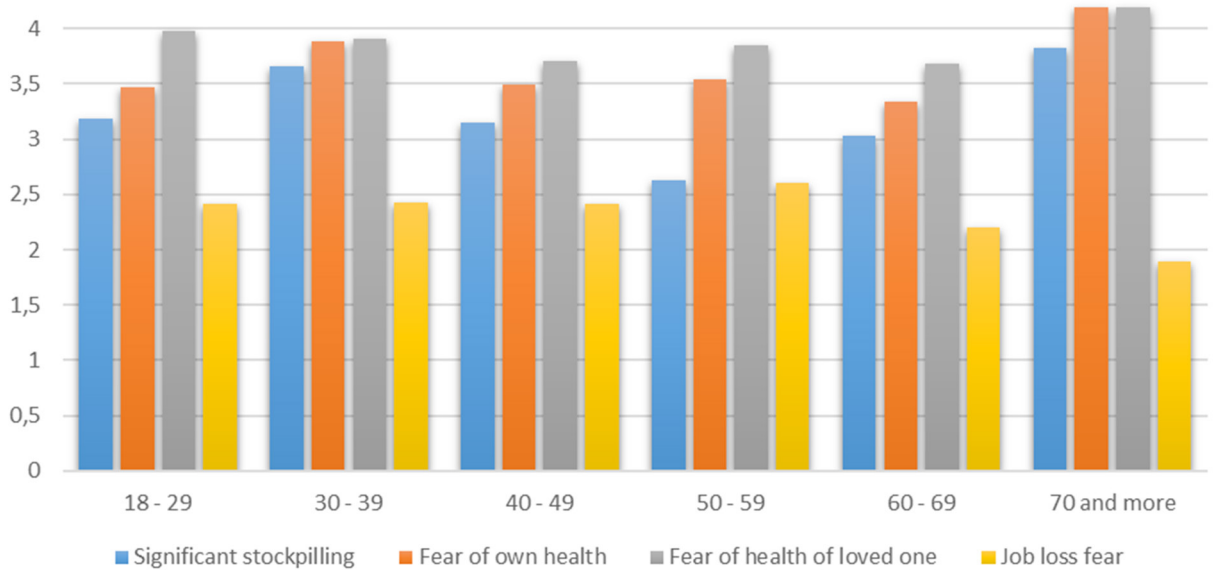

Figure 2. Influence of fear on consumer behavior

Source: Own processing

It was discovered that lower age categories of consumers were more concerned about the health of their loved ones, which was mainly reflected in their tendency to shop in brick-and-mortar stores unaccompanied. Furthermore, it was discovered that panic buying was not significantly present in the Slovak Republic. Very few consumers felt the need to significantly increase the number of daily consumption goods that they bought during the COVID-19 pandemic except for the first months of the pandemic.

The findings of this research also proved adverse events are always periods of increased fear. The consumer behavior theory suggests that consumers become more cautious during such times and spend less of their household income. However, the data collected in the Slovak Republic shows the opposite trend. The tendency to create savings decreased during the COVID-19 pandemic in this country. The only exception that was observed was when in 2022 the fear of job loss manifested itself in higher savings among consumers in the 40 - 59 age groups.

5. FUTURE RESEARCH DIRECTIONS

The findings of this research indicate various significant new trends that are emerging in the post-pandemic world. It is clear that societies have changed and therefore, consumers have also changed since they have adapted to these changes. Information and communication technologies have made access to news very fast and easy. Therefore, decisions related to purchase can also be made significantly quicker. Moreover, consumers now make well-informed decisions based on gained knowledge. Or so they would like to believe. Nowadays, consumers have many opportunities to gain information if they seek it correctly. However, not all consumers are prepared to properly apply critical thinking when processing the information. The Internet and especially social networks are the main sources of recommendations for many consumers. Friends and family members are the pillars of absolute truths. Therefore, consumers are more prone to believing information coming from such sources, even if it's contradictory to the official information provided by government offices. Herrero-Diz and Perez-Escolar (2022) described the consequences of disinformation and consumer behavior. Their research provided evidence of how fake health news could potentially be more harmful to consumer welfare than political hoaxes. Moreover, Di Domenico and Visentin (2020) explored how fake news and problematic information that has been rapidly contaminating the digital world could negatively impact consumers and marketing managers. Therefore, one direction for future research could be the exploration of the potential connection between fear that was present during the COVID-19 pandemic and fake information. Both these negative phenomena can have negative impacts on consumer behavior on their own, however, what is currently missing from the pool of knowledge are the potential combined influences of both these factors.

Furthermore, this research proved that the influence of media and family remains steady even during severe adverse events. Therefore, the focus of new marketing strategies should be on implementing measures that can combine these factors and exploit such influences. Future research on marketing strategies should focus on this topic to provide current information valid in the post-pandemic business environment.

Min et al. (2021) provided evidence on how generations differ in coping with a pandemic. Their research also proved what this research study explored in terms of the different reactions of consumers of different ages during the pandemic. However, this topic remains not fully understood, therefore further research into its implications should be conducted.

The findings of this research also focused on the link between fear and consumer behavior changes. Mamgain (2021) also provided evidence on labor market disruptions and job losses amidst COVID-19 that confirm the fact that job loss was a serious threat during the COVID-19 pandemic and therefore, this fear was not completely unfounded. Other authors reached similar conclusions (Andersen et al., 2023; Bisaria, 2021). The threat of job loss should have passed since the conclusion of the pandemic; however, the initial indications are that it may not be the case (Zheng et al., 2024). Therefore, further research is needed to explore this phenomenon in the post-pandemic world.

6. CONCLUSION

The COVID-19 pandemic brought on a major socioeconomic transformation that also impacted attitudes and beliefs. In order to understand a modern consumer a more pronounced thinking in a system context that focuses on both supply and demand side is needed. Guidelines were formulated based on the research findings in order to predict how the consumers will adapt their behavior during the next adverse event that may occur in the future.

The most important fact that all business managers need to be aware of is the nature of adverse events and their severity. Adverse events such as pandemics can impact societies in very significant ways. Therefore, the very fundamentals of marketing principles need to be adjusted. Orientation on the marketing mix is essential to successfully adapt to new conditions. The first area that needs to be considered is the very products the companies sell. This research study discovered that younger generations of consumers are more conscious of the sustainable principles of modern societies. Therefore, these generations are the segments of consumers that should be targeted by preparing new ways of producing more sustainable products.

Secondly, the price as another part of the marketing mix also needs to be considered during these adverse events. Data from the COVID-19 pandemic showed that many businesses adjusted their prices in order to compensate for the lack of revenues, especially during lockdowns. However, this proved to be counterproductive since consumers reacted negatively to such price adjustments. Therefore, the main recommendation in the area of prices is not to increase them significantly during such adverse events, since it could lead to a significant loss of customers. If prices need to be adjusted during a pandemic or other adverse events in the future the recommendation is to use other ways to make changes or implementation of other methods, for example, promotions or loyalty programs.

The marketing mix component that experienced the biggest changes during the pandemic was distribution. It quickly became obvious that the pre-pandemic models were not sufficient for such altered conditions. Therefore, businesses should strive to discover and implement new ways of product distribution that do not rely on face-to-face contact or on customers who need to come to the traditional brick-and-mortar store to see and purchase products. However, this poses a significant challenge for businesses that sell services instead of physical products. Diversification seems to be the only option for such businesses to prepare for situations when they would not be able to deliver their services to customers. The other option is to prepare their premises to accommodate governmental restrictions, for example, those on social distancing. Therefore, by creating conditions that enable the feeling of safety in stores or business premises can become beneficial when such negative conditions arise.

Overall, the implementation of new technologies should become an integral part of all business processes already on a strategic level of management. Innovations in information and communication

technologies will lead the way in progress and that way create new possibilities for businesses to adjust their processes in order to better accommodate the customers' needs and desires. If technologies are used correctly, they can become a good way to compensate for negative restrictions during adverse events and to gain a competitive advantage. Therefore, the biggest lesson from the COVID-19 pandemic for business should be the orientation on implementing innovations in this area to be better prepared for the future.

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References

Ali Taha, V., Pencarelli, T., Škerháková, V., Fedorko, R., & Košíková, M. (2021). The Use of Social Media and Its Impact on Shopping Behavior of Slovak and Italian Consumers during COVID-19 Pandemic. Sustainability, 13(4), 1710. https://doi.org/10.3390/su13041710

Andersen, A. L., Jensen, A. S., Johannesen, N., Kreiner, C. T., Leth-Petersen, S., & Sheridan, A. (2023). How Do Households Respond to Job Loss? Lessons from Multiple High-Frequency Datasetst. *American Economic Journal - Applied Economics, 15*(4), 1-29. https://doi.org/10.1257/app.20210206

Belbag, A. G. (2021). Impacts of Covid-19 pandemic on Consumer Behavior in Turkey: A qualitative study. *Journal of Consumer Affairs*, *56*(1), 339–358. https://doi.org/10.1111/joca.12423

Bisaria, C. (2021). Impact of COVID-19 on consumer behaviour. *Revista de investigaciones - Universidad del Quindio, 33*(2), 86-96. https://doi.org/10.33975/riuq.vol33n2.506

Cai, L., Yuen, K. F., Fang, M., & Wang, X. (2023). A literature review on the impact of the COVID-19 pandemic on consumer behaviour: implications for consumer-centric logistics. *Asia Pacific Journal of Marketing and Logistics, 35*(11), 2682-2703. https://doi.org/10.1108/apjml-08-2022-0731

Di Domenico, G., & Visentin, M. (2020). Fake news or true lies? Reflections about problematic contents in marketing. *International Journal of Market Research, 62*(4), 409-417. https://doi.org/10.1177/1470785320934719

Fletcher, G., & Griffiths, M. (2020). Digital transformation during a lockdown. *International Journal of Information Management*, *55*. https://doi.org/10.1016/j.ijinfomgt.2020.102185

Hean, O., & Chairassamee, N. (2023). The effects of the COVID-19 pandemic on U.S. entrepreneurship. *Letters in Spatial and Resource Sciences*, *16*(1). https://doi.org/10.1007/s12076-023-00327-x

Herrero-Diz, P., & Perez-Escolar, M. (2022). Analysis of Hoaxes about COVID-19 Debunked by Maldita and Colombiacheck: Effects of the Infodemic on the Behavior of Society. *Palabra Clave, 25*(1). https://doi.org/10.5294/pacla.2022.25.1.7

Iwuoha, V. C., Aniche, E. T., Ezirim, G. E., Alumona, I. M., & Obiorji, J. N. (2021). Impact of COVID-19 lockdown and social distancing policies on small businesses in south-eastern Nigeria: whither the stimulus packages? *Journal of Poverty and Social Justice, 29*(2), 231-239. https://doi.org/10.1332/175982721x16124992938824

Juhász, T., Huszka, P., & Karácsony, P. (2022). Impact of the crisis caused by the coronavirus on Hungarian consumer behavior related to food purchases. *Ukrainian Food Journal*, *11*(2), 315–330. https://doi.org/10.24263/2304-974x-2022-11-2-11

Khouja, M., & Liu, X. (2021). A price adjustment policy for maximizing revenue and Countering Strategic Consumer Behavior. *International Journal of Production Economics*, *236*. https://doi.org/10.1016/j.ijpe.2021.108116

Kumar, A., & Pole, A. (2024). Grocery shopping and food preferences: The Long and Winding Road of the COVID-19 pandemic. *Journal of International Food & Agribusiness Marketing*, 1–29. https://doi.org/10.1080/08974438.2024.2355091

Luc, P. T., & Hoang, T.-H. (2023). Social Media and panic buying during the COVID-19 pandemic in Vietnam: Preliminary analysis. *Journal of Human Behavior in the Social Environment*, 1–13. https://doi.org/10.1080/10911359.2023.2275623

Ma, Z., Guo, G., & Jing, L. (2023). Consumer behavior research in the 21st century: Clusters, themes, and future research agenda. *International Journal of Consumer Studies*, *48*(1). https://doi.org/10.1111/ijcs.12980

Mahmud, M., & Riley, E. (2022). Adapting to an aggregate shock: The impact of the COVID-19 crisis on rural households. *Review of Economics of the Household*, *21*(1), 19–36. https://doi.org/10.1007/s11150-022-09625-7

Mamgain, R. P. (2021). Understanding labour market disruptions and job losses amidst COVID-19. *Journal of Social and Economic Development, 23*(2), 301-319. https://doi.org/10.1007/s40847-020-00125-x

Mason, A. N., Brown, M., Mason, K., & Narcum, J. (2021). Pandemic effects on social media marketing behaviors in India. *Cogent Business & Management, 8*(1). https://doi.org/10.1080/23311975.2021.1943243

Min, J., Kim, J., & Yang, K. (2021). How generations differ in coping with a pandemic: The case of restaurant industry. *Journal of Hospitality and Tourism Management, 48*, 280-288. https://doi.org/10.1016/j.jhtm.2021.06.017

Ng, P., Quach, X., Fares, O. H., Mohan, M., & Lee, S. H. M. (2022). Essential item purchases during COVID-19: A cluster analysis of psychographic traits. *Journal of Global Scholars of Marketing Science, 32*(4), 579-600. https://doi.org/10.1080/21639159.2022.2033132

Novotný, J., & Duspiva, P. (2014). Factors influencing consumers' buying behavior and their importance for enterprises. *E+M Ekonomie a Management, 17*(1). https://doi.org/10.15240/tul/001/2014-1-012

Poon, W. C., & Tung, S. E. (2022). The rise of online food delivery culture during the COVID-19 pandemic: An analysis of intention and its associated risk. *European Journal of Management and Business Economics*, *33*(1), 54–73. https://doi.org/10.1108/ejmbe-04-2021-0128

Sostar, M., & Ristanovic, V. (2023). An assessment of the impact of the COVID-19 pandemic on consumer behavior using the analytic hierarchy process model. *Sustainability*, *15(*20). https://doi.org/10.3390/su152015104

Tao, H., Sun, X., Liu, X., Tian, J., & Zhang, D. (2022). The Impact of Consumer Purchase Behavior Changes on the Business Model Design of Consumer Services Companies Over the Course of COVID-19. *Frontiers in Psychology, 13*. https://doi.org/10.3389/fpsyg.2022.818845

Zhang, H., Li, P., Zhang, Z., Li, W., Chen, J., Song, X., Shibasaki, R., & Yan, J. (2022). Epidemic versus economic performances of the COVID-19 lockdown: A big data driven analysis. *Cities, 120,* 103502. https://doi.org/10.1016/j.cities.2021.103502

Zheng, H. T., Roll, S., & Despard, M. (2024). Job loss during COVID-19 on early retirement withdrawals: A moderated-mediation analysis. *Journal of Consumer Affairs*. https://doi.org/10.1111/joca.12598

Zuokas, D., Gul, E., & Lim, A. (2022). How did covid-19 change what people buy: Evidence from a supermarket chain. *Journal of Retailing and Consumer Services*, *68*. https://doi.org/10.1016/j.jretconser.2022.103010

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Exploring Spectators' Satisfaction and Behavioral Intentions: The Case of World Rally Championship Croatia

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WRC Croatia Rally;
Spectators' satisfaction;
Mega event

Abstract: *This study focuses on the WRC Croatia Rally, currently the largest sporting event in Croatia. The purpose of this research was to assess spectators' satisfaction with the event and their intention to revisit the event in the future. A total of 727 respondents participated in an online survey conducted in April 2024. The findings indicate that respondents were highly satisfied with the general appearance of the event, while the lowest-rated aspects were related to the sanitary facilities and the entertainment in the area. When evaluating the destination, respondents were satisfied with the friendliness of the hosts and the climate, while the main area of dissatisfaction was the price level. Importantly, most respondents expressed a strong intention to re-visit the event in the future. Overall, the research shows that visitor satisfaction is relatively high, though some areas could be improved to enhance the spectator's overall experience.*

1. INTRODUCTION

International mega-sport events, like the World Rally Championship (WRC), are efficient and powerful tools for attracting various groups of participants to a destination, such as competitors and their supporting teams, event organizers, technical staff, volunteers, official representatives of international sports organizations, media representatives as well as massive numbers of spectators from all over the world. For that reason, such large events are recognized as an important source of demand for inbound tourism and a large income generator for the local economy.

One of the main aspects of successful event organization is to achieve and maintain a high level of visitor' satisfaction, which boosts the local economy and stimulates repeat visits to the event, but also to the hosting destination itself (regardless of the purpose of repeat visits). Although the level of visitors' satisfaction is one of the key determinants of the positive economic impacts of the event on the host destination, research efforts focused on spectators' satisfaction with large sports events are still scarce (Van Leeuwen et al., 2002, p. 99), especially in motorsport mega events like the WRC.

Since 1973, the WRC has been an international rallying series owned and governed by the Fédération Internationale de l'Automobile (FIA) (World Rally Championship, 2024). The 2024 edition of the WRC was spread across four continents and 13 countries, including Croatia. The WRC Croatia Rally took place in April 2024 (for the fourth time in a row) gathering around 450,000 spectators, 68 competing crews and their supporting teams, the Organizing team of more than 2,000 people consisting of the core staff, technicians, scrutineers, judges and volunteers, including also journalists, invited guests, business partners, professional service providers, etc. (WRC Croatia Rally, 2024).

The target population in this research were the spectators and the focus was on their level of satisfaction with the event as well as the destination hosting the WRC Croatia Rally. Apart from the visitors'

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satisfaction, the survey was also aimed at discovering their intention to re-visit the WRC Croatia Rally and the destination in the future. A secondary purpose of this research was to examine the strengths and weaknesses of the Croatian edition of the WRC in the eyes of a spectator so that the organizers and tourism destination management can get a clearer picture of how visitors experience and what they expect from this sports event.

2. THEORETICAL BACKGROUND

Achieving a high level of spectators' satisfaction is essential for the success of events, but also an increasingly difficult task for the organizers. This is due to the increasingly demanding visitors as well as growing competition among large events. In general, spectators will be satisfied if the service performance is above expectations (Alguacil et al., 2018). Accordingly, models are being developed that can be used to measure customer (spectator or visitor) satisfaction. Customer satisfaction can be defined as a "post-purchase psychological status representing the evaluation of the usage experience of a product/service which depends on several elements: expectations (standards), performance, and disconfirmation" (Guido, 2015, p. 1). Based on these three elements, the Disconfirmation of Expectations Model (DEM) has been developed and has been successfully used to explain customer satisfaction for different goods and services, but, due to the complexity of sports events, its ability to measure the spectators' satisfaction is questionable (Van Leeuwen et al., 2002, p. 102). For that reason, Van Leeuwen, Quick and Daniel adjusted the existing model and created the Sport Spectator Satisfaction Model (SSSM) by adding club identification and win/lose phenomenon as well as consideration of both the core and peripheral dimensions of the spectator service. This model was used a lot in later research, but very often it was expanded by adding other variables (Koo, 2009; Pahrudin et al., 2024). Also, variables related to visitor satisfaction are often put in relation to behavioral intentions in research (Armbrecht, 2021; Duan & Liu, 2021; Plunkett & Brooks, 2018; Tzetzis et al., 2014), because, as stated by Oh and Kim (2017), satisfaction and behavioral intention are the most paramount dependent variables. Behavioral intention can be defined as "the degree to which a person has formulated conscious plans to perform or not perform some specified future behavior" (Warshaw & Davis, 1985, p. 214). Behavioral intention, which can be attributed to the intention to visit the event, the intention to re-visit the event, or the intention to visit the destination for some other purpose. In behavioral intention research, besides variables connected with the event, there are often destination attributes like destination image, attractions, accommodation, traffic, shopping opportunities, etc. (Newland & Yoo, 2020; Vassiliadis et al., 2021; Vegara-Ferri et al., 2020). For example, Newland and Yoo (2020) investigated how the characteristics of sports events (reputation, history, challenge, cost, scenery, level of competition) and destinations (shopping, nightlife, entertainment, tours, culture & art, different cultures) influence the intention of returning to the event and the destination in another role.

When it comes to motorsport, particularly the WRC, there are several scientific research papers and studies (Borges et al., 2020; Hassan & Connor, 2009; Pischedda et al., 2020; Rasku & Turco, 2017a, 2017b) that are focused on investigating spectators' satisfaction and behavioral intention. Several other studies related to the WRC are focused on measuring the economic and socio-cultural impacts of the event on hosting destinations (Hassan & McCulloch, 2007; Mackellar, 2013; Naess & Tickell, 2019; O'Connor, 2005; Perna & Custodio, 2019).

3. RESEARCH METHODOLOGY

To achieve the objectives of this research, the authors conducted a survey that shed light on the WRC Croatia Rally 2024 spectators' profile, and their satisfaction with the event and the destination visited. The primary research was conducted using a quantitative approach and convenience

sample. The research instrument was a structured online questionnaire distributed via the official social media networks of the WRC Croatia Rally organizers. The questionnaire included questions on spectators' demographic characteristics, previous experience with WRC competitions, and spectators' satisfaction with the event and the destination.

The data was collected during the four days of the WRC Croatia Rally 2024 and shortly after the event in April 2024. The target population consisted of on-site spectators from Croatia and abroad attending the WRC Croatia Rally 2024. Participation in the survey was voluntary and anonymous. The study is based on a convenience sample, with 727 collected questionnaires being valid and used for further analysis. The collected data was analyzed and presented using descriptive statistics.

4. RESEARCH RESULTS

From a total of 727 respondents, 27.5% were temporary visitors, while 72.5% were residents of the region where the WRC Croatia Rally 2024 took place. Additionally, 88.3% of respondents attended at least one of the previous WRC Croatia Rally events, showing that respondents are familiar with the event and remain loyal to it.

Table 1. Socio-demographic characteristics of spectators

Gender	**n**	**%**
Male	578	79.5%
Female	149	20.5%
Age group	**n**	**%**
18-24	164	22.6%
25-34	222	30.5%
35-44	167	23%
45-54	128	17.6%
55-64	40	5.5%
Over 65	6	0.8%
Level of education	**n**	**%**
Primary school	7	1%
Secondary school	376	51.7%
College	116	16%
University	187	25.7%
Master's or Doctor's degree	41	5.6%
Professional status	**n**	**%**
Student	104	14.3%
Self-employed entrepreneur	89	12.2%
Employee	507	69.7%
Unemployed	12	1.7%
Retired	15	2.1%
Civil status	**n**	**%**
Single	226	31.1%
In a relationship	203	27.9%
Married	274	37.7%
Divorced	23	3.2%
Widowed	1	0.1%

Source: Own research

An overview of the socio-demographic characteristics of the spectators can be found in Table 1. When analyzing the characteristics of the spectators, it is evident that the male audience predominates, considering that 79.5% of the audience was male and the rest female. This was to be expected given that

this is a motor sports competition. Spectators were mainly from younger age groups as more than 50% of them were in the age groups of 18-24 years (22.6%) and 25-34 years (30.5%). More than half of the respondents (51.7%) have completed a secondary school as their highest level of education, while the other half (47.3%) graduated from either college or university. From the above data, it can be concluded that secondary education is predominant, which could be because the majority of respondents belong to younger age groups. When analyzing the professional status of spectators, it is noticeable that the vast majority of them work as employees and more than 14% of them declared themselves as students. From the marital status point of view, more than a third of respondents (37.7%) were married, 27.9% were in a relationship, and a slightly larger percentage of them (31.1%) were single.

The focus of the research was to examine spectators' satisfaction with the event and the destination, and consequently, their intentions to re-visit future editions of the WRC Croatia Rally. Therefore, 15 variables (aspects of satisfaction) were created to examine spectators' satisfaction with the event and 10 variables were created to examine spectators' satisfaction with destination. Participants were asked to rate their satisfaction with each variable on a 5-point Likert-type scale, from 5 - "very satisfied" to 1 - "very dissatisfied" or 0 if they could not provide a rating. Therefore, the responses that were rated 0 were excluded from further analysis.

Table 2. Descriptive statistics for spectators' satisfaction with the event

	n	Mean	Median	Mod	Std. deviation
Price level	674	3,29	4	4	0,978
Atmosphere at the event	712	3,77	4	4	0,735
General appearance of the event	715	3,77	4	4	0,729
Safety of the event	705	3,74	4	4	0,742
Entry to the area	702	3,54	4	4	0,892
Moving around in the area	706	3,54	4	4	0,873
Spectator direction in the area	700	3,60	4	4	0,869
Availability of food and drinks in the area	674	3,38	4	4	0,921
Selection of food and drinks in the area	671	3,33	4	4	0,943
Entertainment in the area	662	3,28	4	4	0,995
Quality of entertainment in the area	660	3,31	4	4	0,987
Number of toilets in the area	646	3,13	4	4	1,062
Cleanliness of toilets in the area	626	3,16	3	4	1,017
Waste management	669	3,29	4	4	1,020
Overall satisfaction with the event	712	3,74	4	4	0,756

Source: Own research

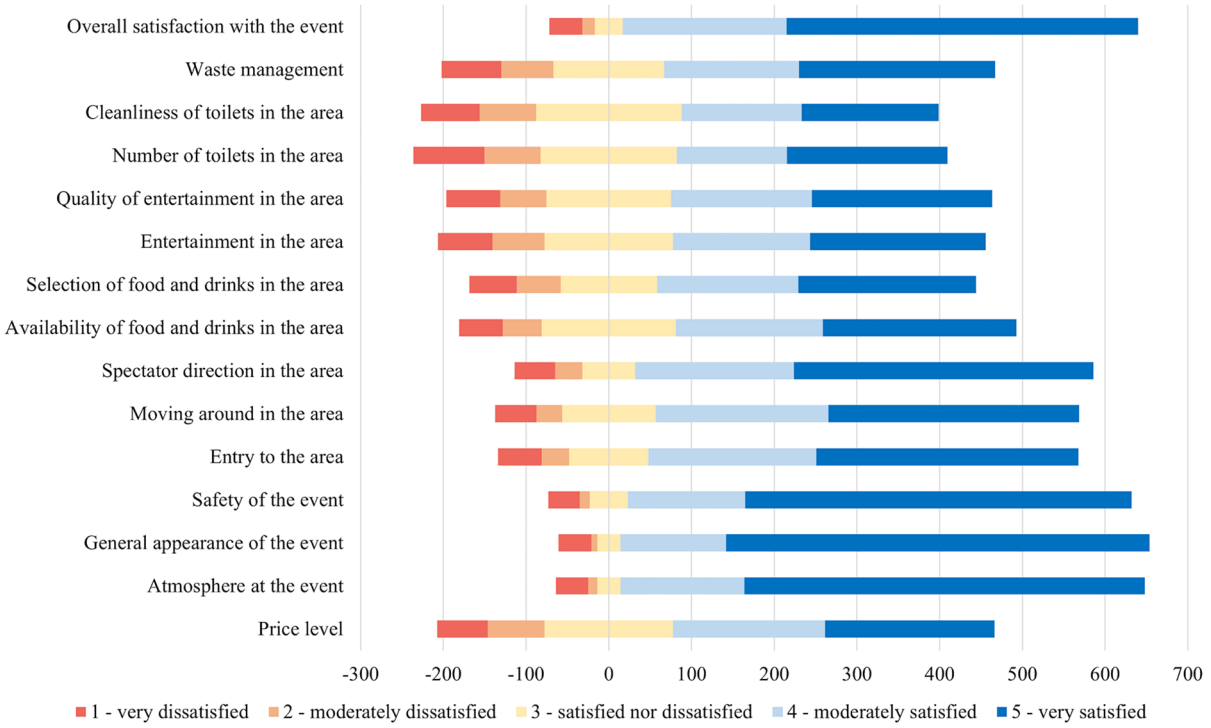
Table 3. Descriptive statistics for spectators' satisfaction with the destination

	n	Mean	Median	Mod	Std. deviation
Transport accessibility	694	3,51	4	4	0,921
Choice of accommodation	597	3,48	4	4	0,896
Quality of accommodation	601	3,47	4	4	0,896
Cultural offer	642	3,51	4	4	0,885
Shopping offer	659	3,47	4	4	0,896
Entertainment offer	656	3,38	4	4	0,956
Price level	676	3,23	4	4	1,006
Tourist information accessibility	641	3,40	4	4	0,965
Kindness of the host	689	3,64	4	4	0,844
Climate	693	3,65	4	4	0,817

Source: Own research

Descriptive statistics for spectators' satisfaction with the event are shown in Table 2. The measurement items of spectators' satisfaction with the event ranged from 3.13 to 3.77, which suggests that all mean scores were above 3.0, with a mean score of 3.46. When examining spectators' satisfaction with the event, the variables - general appearance of the event (M=3.77) and atmosphere at the event (M=3.77) had the highest and equal mean scores. The most frequently given rating is 4 - indicating moderate satisfaction. A closer look at these highly rated variables reveals that over 70% of respondents (71.6%) were very satisfied and 17.9% were moderately satisfied with the general appearance of the event, with only 5.6% expressing strong dissatisfaction. Similarly, the atmosphere at the event was rated positively by 68% of respondents as very satisfied and 21.1% as moderately satisfied. A further 3.9% were neutral and 5.5% were very dissatisfied. These results highlight the event's strong appeal in terms of its visual presentation and overall ambiance. The third highest-rated aspect was the safety of the event with 66.2% of very satisfied respondents and only 5.4% of them expressing strong dissatisfaction. In addition to ensuring road safety during the competition, particularly protecting spectators from potential hazards, such as cars leaving the track, safety is a crucial consideration for events of this nature. Finally, it is worth highlighting that overall satisfaction with the event was notably high (M = 3.74), with 87.5% of respondents reporting being either very or moderately satisfied, which underscores the strong positive perception of the event.

The greatest areas of dissatisfaction among respondents were the number of toilets in the area (M=3.13), the cleanliness of the toilets (M=3.16) and the entertainment in the area (M=3.28). These factors are critical to address, as they directly impact the overall image of the event. Satisfaction with the price level and waste management was also notably low (M=3.29), both of which are key aspects of economic and environmental sustainability. Around a fifth of spectators expressed dissatisfaction with the price level, more specifically 9.1% were very dissatisfied, while 30.4% were very satisfied. Similarly, 10.8% of respondents were very dissatisfied with waste management, while 35.4% were very satisfied.

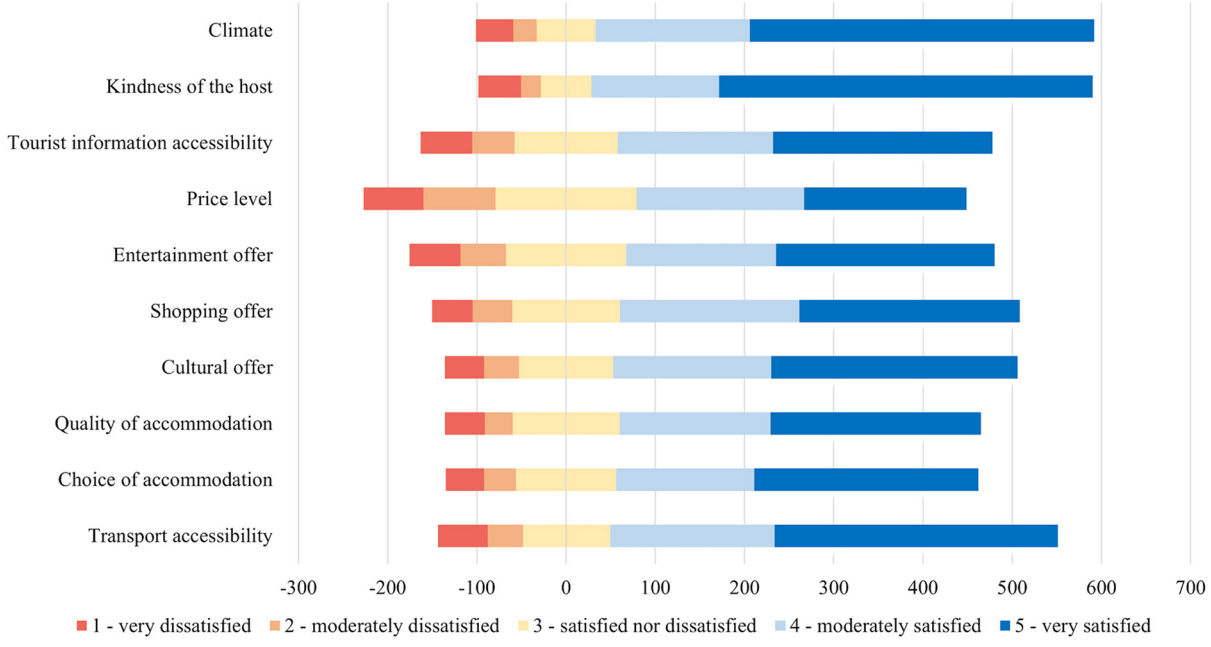


Graph 1. Spectators' satisfaction with the event

Source: Own research

Descriptive statistics for spectators' satisfaction with the destination are presented in Table 3. The measurement items of spectators' satisfaction with the destination ranged from 3.23 to 3.65 with a mean score of 3.47. All items had mean scores above the neutral midpoint of 3.0, suggesting a generally positive evaluation. The most frequently given rating was 4, indicating moderate satisfaction. The highest rated aspects included the climate conditions (M=3.65), the kindness of the hosts (M=3.64), accessibility of transportation and cultural offer (M=3.51), while the lowest rated aspects were price level (M=3.23), entertainment offer (M=3.38) and tourist information accessibility (M=3.40). Most spectators (60.8%) were very satisfied with the kindness of the hosts, while 20.8% of respondents were moderately satisfied, indicating over 80% of spectators as mostly satisfied. Furthermore, climate conditions were undoubtedly the highest-rated aspect with more than half of respondents (55.7%) being very satisfied, while only 6.1% were very dissatisfied. Transport accessibility, another crucial factor for reaching and navigating the destination, also received positive feedback, as 45.8% were very satisfied, and 26.5% were moderately satisfied, and just 8.1% were very dissatisfied. Aspects such as cultural offers also appeared to be well received by the spectators, as 43% of respondents were very satisfied and 27.6% moderately satisfied.

The aspect with the lowest satisfaction ratings, on the other hand, was the price level, with which 9.9% of respondents were very dissatisfied and 12% moderately dissatisfied. This clearly shows that prices of products and services at the destination were higher than expected, leading to dissatisfaction among visitors. Furthermore, it can lead to negative reviews of the destination and perhaps even a decline in tourist consumption due to boycotts of the purchase of overpriced products. Spectators were also unimpressed with the entertainment offer. Only 37.3% were very satisfied and 25.6% were moderately satisfied, while more than a fifth of them (20.6%) were neutral on this question. In addition to the entertainment offer, visitors also expressed dissatisfaction with the availability of tourist information, which can be a very limiting factor when considering tourist consumption. More specifically, 16.3% of respondents were either very or moderately dissatisfied.



Graph 2. Spectators' satisfaction with destination

Source: Own research

The second part of the survey covered behavioral intentions to attend the WRC Croatia Rally in subsequent years and to recommend it to others, which is shown in more detail in Table 4 and Table 5. Thus, 83.5% of respondents stated that they definitely intend to re-visit the WRC Croatia Rally, while 13.6% are likely to come back sometime in the upcoming years. Only 2.3% of respondents are not sure if they will attend the event again, while less than 1% of respondents (0.3%) do not plan to attend the event again.

About 88.4% of respondents would strongly recommend the WRC Croatia Rally to the others, 9.2% would probably recommend it and 1.7% are neutral, which is a good indicator for promoting future editions of the event, especially through positive online reviews, but also by using a still quite powerful tool - word of mouth. Only 0.1% have no intention of recommending the WRC Croatia Rally to others.

Table 4. Spectators' intention to re-visit the WRC Croatia Rally

Intention to re-visit the WRC Croatia Rally	Yes, for sure	Probably yes	Not sure	Probably not	For sure not
n	607	99	17	2	2
%	83.5%	13.6%	2.3%	0.3%	0.3%

Source: Own research

Table 5. Spectators' intention to recommend WRC Croatia Rally to others

Intention to recommend WRC Croatia Rally to others	Yes, for sure	Probably yes	Not sure	Probably not	For sure not
n	643	67	12	4	1
%	88.4%	9.2%	1.7%	0.6%	0.1%

Source: Own research

5. RESEARCH LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

Although this research was designed to cover all key aspects of WRC Croatia Rally spectators' satisfaction, the study has three limitations one should consider when interpreting the results: 1) Although the findings of this research are based on a relatively large sample of respondents (727), the size of overall population of spectators (450,000) makes the sample rather small; 2) Most of the respondents in the analyzed sample were domestic spectators (72.5%), which somewhat distorts the picture of the satisfaction of all visitors since residents are more familiar with a destination and related offer; 3) Older generations of spectators, which are not active on online social media used for the distribution of questionnaire, were not able to participate in this research.

Further studies should consider developing new approaches and variables for measuring spectators' satisfaction specifically designed for large international rally championships. To gain a clearer insight into the understanding of the satisfaction of certain groups of spectators, additional independent variables such as the country of origin of the spectators, the participation of competing team(s) from the same country and their final ranking can be included. Despite the mentioned limitations, the results of this research can still be of great value to the organizers of major sports events and the management of tourist destinations for improving the elements of the offer that will enable the improvement of the overall experience of the spectators.

6. CONCLUSION

The level of spectators' satisfaction is considered one of the key measures of success in managing major sports events, such as the World Rally Championship. Based on the survey conducted during the 2024 edition of the WRC Croatia Rally, this research revealed spectators' profiles, levels of satisfaction, and respective behavioral intentions. The results of this study showed that WRC spectators are predominantly young adult males, employed and in a relationship who travel in small groups and at relatively short distances. Regarding their satisfaction with the event or with a hosting destination, spectators expressed their high levels of satisfaction with the majority of analyzed aspects. Related to that, most respondents expressed their strong intention to revisit the event and the destination in the future, regardless of the purpose of the visit. Apart from the positive feedback from the spectators, this research also revealed some weaknesses of the event and hosting destination offer that could be improved to enhance the spectator's experience in the coming years.

References

Alguacil, M., Pérez-Campos, C., & González-Serrano, M. H. (2018). Study of spectator satisfaction at a major athletics event. *Journal of Physical Education and Sport, 18*(3), 1256-1264. https://doi:10.7752/JPES.2018.S3187

Armbrecht, J. (2021). Event quality, perceived value, satisfaction and behavioural intentions in an event context. *Scandinavian Journal of Hospitality and Tourism*, *21*(2), 169–191. https://doi:10.1080/15022250.2021.1877191

Borges, A. P., Vieira, B. M., & Vieira, E. (2020). Porto street stage at Rally Portugal: the determinants of the length of stay. *Journal of Sport & Tourism*, *24*(1), 1-17. https://doi.org/10.1080/14775085.2020.1748097

Duan, Y., & Liu, B. (2021). Spectator satisfaction model for mass participant sport events: antecedents and consequences. *International Journal of Sports Marketing and Sponsorship*, *22*(2), 385-406. https://doi:10.1108/IJSMS-09-2019-0104

Guido, G. (2015). Customer Satisfaction. *Wiley Encyclopedia of Management*, 1–8. https://doi:10.1002/9781118785317.weom090287

Hassan, D., & Connor, S. O. (2009). The socio-economic impact of the FIA World Rally Championship 2007. *Sport in Society*, *12*(6), 709-724. https://doi.org/10.1080/17430430902944134

Hassan, D., & McCulloch, D. (2007). A Report Examining the Socio-Economic Impact of the World Rally Championship 2007, University of Ulster, UK. Retrieved from https://pure.ulster.ac.uk/en/publications/a-report-examining-the-socio-economic-impact-of-the-world-rally-c-3

Koo, G.-Y. (2009). Examination of the causal effects between the dimensions of service quality and spectator satisfaction in minor league baseball. *International Journal of Sports Marketing and Sponsorship*, *11*(1), 41–54. https://doi:10.1108/ijsms-11-01-2009-b004

Mackellar, J. (2013). World Rally Championship 2009: Assessing the community impacts on a rural town in Australia. *Sport in Society*, *16*(9), 1149-1163. https://doi.org/10.1080/17430437.2013.790893

Naess, H. E., & Tickell, S. (2019). Fan engagement in motorsports: A case of the FIA world rally championship. *The Journal of Media Innovations*, *5*(1), 31-44. https://doi.org/10.5617/jomi.6289

Newland, B. L., & Yoo, J. J.-E. (2020). Active sport event participants' behavioural intentions: Leveraging outcomes for future attendance and visitation. *Journal of Vacation Marketing*, *27*(1), 32–44. https://doi:10.1177/1356766720948249

O'Connor, S. O. (2005). The marketing strategy for the World Rally Championship. *International Journal of Sports Marketing and Sponsorship*, *6*(4), 63-68. https://doi.org/10.1108/IJSMS-06-04-2005-B007

Oh, H., & Kim, K. (2017). Customer satisfaction, service quality, and customer value: Years 2000-2015. *International Journal of Contemporary Hospitality Management*, *29*(1), 2–29. https://doi.org/10.1108/IJCHM-10-2015-0594

Pahrudin, P., Wang, C. C., Liu, L. W., Lu, C., & Hak, M. B. (2024). Do Satisfied Visitors Intend to Revisit a Large Sports Event? A Case Study of a Large Sports Event in Indonesia. *Physical Culture and Sport. Studies and Research*, *105*(1), 24-41. https://doi.org/10.2478/pcssr-2024-0022

Perna, F., & Custodio, M. J. (2019). Study of WRC Vodafone Rally of Portugal Impact in Destination Image, Tourism Economics and Environmental Performance: Portugal - 2019 Edition, University of Algarve, Portugal.

Pischedda, G., Marinò, L., & Del Chiappa, G. (2020). Expenditure Behaviour and Satisfaction in Motor Sport Events: Insights from the FIA World Rally Championship in Sardinia. In *Principles and Practices of Small-Scale Sport Event Management* (pp. 233-248). IGI Global. https://doi.org/10.4018/978-1-7998-4757-1.ch012

Plunkett, D., & Brooks, T. J. (2018). Examining the relationship between satisfaction, intentions, and post-trip communication behaviour of active event sport tourists. *Journal of Sport & Tourism*, *22*(4), 303–313. https://doi.org/10.1080/14775085.2018.1532806

Rasku, R., & Turco, D. M. (2017a). Sport business intelligence and the WRC event. In *Routledge Handbook of International Sport Business* (pp. 15-25). Routledge. https://doi.org/10.4324/9781315709635

Rasku, R., & Turco, D. M. (2017b). The Personal Value Structures of Rally Spectators and Rally Team Members. In *Creating Marketing Magic and Innovative Future Marketing Trends: Proceedings of the 2016 Academy of Marketing Science (AMS) Annual Conference* (pp. 1035-1048). Springer International Publishing. https://doi.org/10.1007/978-3-319-45596-9_192

Tzetzis, G., Alexandris, K., & Kapsampeli, S. (2014). Predicting visitors' satisfaction and behavioral intentions from service quality in the context of a small-scale outdoor sport event. *International Journal of Event and Festival Management*, *5*(1), 4-21. https://doi.org/10.1108/IJEFM-04-2013-0006

Van Leeuwen, L., Quick, S., & Daniel, K. (2002). The Sport Spectator Satisfaction Model: A Conceptual Framework for Understanding the Satisfaction of Spectators. *Sport Management Review*, *5*(2), 99–128. https://doi.org/10.1016/S1441-3523(02)70063-6

Vassiliadis, C. A., Mombeuil, C., & Fotiadis, A. K. (2021). Identifying service product features associated with visitor satisfaction and revisit intention: A focus on sports events. *Journal of Destination Marketing & Management*, *19*, https://doi.org/10.1016/j.jdmm.2021.100558

Vegara-Ferri, J. M., López-Gullón, J. M., Valantine, I., Suárez, A. D., & Angosto, S. (2020). Factors influencing the tourist's future intentions in small-scale sports events. *Sustainability*, *12*(19). https://doi.org/10.3390/su12198103

Warshaw, P. R., & Davis, F. D. (1985). Disentangling behavioral intention and behavioral expectation. *Journal of Experimental Social Psychology*, *21*, 213-228. https://doi.org/10.1016/0022-1031(85)90017-4

World Rally Championship. (2024). About WRC. Retrieved from https://www.wrc.com/more/information/about-wrc

WRC Croatia Rally. (2024). Interview with Daniel Šaškin, president of the Organizing Committee after Croatia Rally 2024. Retrieved from https://rally-croatia.com/hr/novosti/intervju-daniel-saskin-predsjednik-organizacijskog-odbora-nakon-croatia-rallyja-2024

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Enhancing Customer Experience in Electronic Commerce: Role of Artificial Intelligence in Personalization and its Ethical Implications

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Ethics

Abstract: *The rise of artificial intelligence (AI) has transformed electronic commerce (e-commerce), with AI-powered personalization becoming essential for enhancing customer experiences. This paper explores the impact of AI-driven personalization on e-commerce, enhancing customer experience and the ethical implications. Using a mixed-methods approach, data from 78 participants show that personalized recommendations significantly boost shopping efficiency and brand loyalty, with 97.4% of respondents noticing personalization and 56.4% finding it highly useful. However, 51% expressed concerns about data privacy. The findings highlight the need for transparency and strong data protection to maintain consumer trust. In conclusion, the study emphasizes the need for a balanced approach to AI personalization, where e-commerce platforms can leverage AI's benefits while addressing ethical concerns and privacy issues. The research offers valuable insights for both academic and industry professionals seeking to improve customer experience through responsible AI use.*

1. INTRODUCTION

The integration of artificial intelligence (AI) into e-commerce platforms has transformed the shopping experience for consumers. AI-powered systems allow businesses to analyze large amounts of customer data and provide highly personalized recommendations, making the shopping experience more efficient and enjoyable. Recent studies confirm that AI contributes significantly to enhancing customer experience across various stages of the e-commerce journey (Anderson & Johnson, 2024).

Personalization in e-commerce has been shown to improve user engagement and loyalty by offering tailored shopping experiences that align with individual preferences. However, as personalization relies heavily on data collection and analysis, significant ethical concerns regarding privacy and data security have emerged. Consumers are becoming more aware of how their personal data is used, raising concerns about transparency and control over their information. This paper investigates the impact of AI-driven personalization on electronic commerce, focusing on how these advanced systems enhance customer experience and their ethical implications.

2. LITERATURE REVIEW

Artificial intelligence (AI) is significantly reshaping e-commerce by enhancing operational efficiency and digitizing traditional business processes (Bughin et al., 2017). As digitalization accelerates,

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AI plays a crucial role in addressing the varied preferences of online consumers (Gupta et al., 2019). Through data analysis and trend identification, AI facilitates personalized marketing and improves customer satisfaction by anticipating purchasing behavior.

Artificial intelligence (AI) personalization in e-commerce involves tailoring the shopping experience to individual customers based on their preferences, behaviors, and past interactions. By analyzing vast amounts of customer data, AI systems can deliver personalized content, product recommendations, and marketing messages (Nimbalkar & Berad, 2022). This not only increases sales and customer loyalty but also improves the consumer experience. Gupta et al. (2024) emphasize that AI significantly transforms e-commerce by enhancing customer service, enabling advanced personalization techniques, and supporting data-driven marketing strategies.

AI technologies such as machine learning and natural language processing are being used in recommendation engines that predict customer behavior. According to Song et al. (2019), intelligent recommendation systems take personalization a step further by using AI algorithms to suggest products that align with the customer's tastes and preferences. These systems analyze user behavior, purchase history, and browsing patterns to suggest products that customers are likely to buy. Such intelligent recommendation systems, widely adopted by platforms like Amazon and Netflix, use collaborative and content-based filtering to improve accuracy and increase engagement (Kumar et al., 2022; Pallathadka et al., 2023; Song et al., 2019). When e-commerce platforms use data-driven insights to recommend products and services that align with a customer's past behaviors and interests, it creates a more engaging and relevant shopping experience (Khyat & Kumre, 2023).

Collaborative filtering, content-based filtering, and hybrid models are among the main approaches used to deliver personalized content (Ramesh & Vijayalakshmi, 2022). Recommendation systems employ a technique called collaborative filtering to forecast consumer preferences and interests based on data and patterns from numerous users (Kouayep et al., 2024). The fundamental premise is that individuals with similar preferences for one product are likely to share preferences for others. There are two primary types: memory-based collaborative filtering, which uses neighborhood computation, and model-based collaborative filtering, which relies on data mining methods such as clustering, semantic analysis, and Bayesian networks (Kouayep et al., 2024). Content-based recommenders can be extensively customized to the user's preferences, including recommendations for specific items. When a company needs to generate suggestions based on a range of features and has a large product library, content-based filtering is particularly effective. Deep learning algorithms are used in e-commerce to forecast client preferences and behavior by analyzing customer data such as browsing history, previous purchases, and product interactions (Wang et al., 2020). This makes it possible for companies to provide extremely personalized recommendations, enhancing the buying experience and raising conversion rates.

To boost operational efficiency and improve service quality, e-commerce platforms and companies are continuously seeking innovative ways to meet consumer demands (Sinha & Rakhra, 2023). AI has emerged as a powerful tool in this context, simplifying the shopping experience and making it more accessible, even for less experienced or less privileged customers (Bughin et al., 2017). AI also supports inventory management by predicting demand and automating reordering processes, helping businesses minimize stockouts and reduce costs (Kumar et al., 2022). AI adoption also plays a critical role in the broader development of e-commerce infrastructure, contributing to innovation, competitiveness, and scalability (Areiqat et al., 2021).

AI-powered chatbots also play a crucial role in improving customer service by providing real-time support using natural language processing, which reduces the need for human intervention (Kumar et al., 2022; Pallathadka et al., 2023; Song et al., 2019). Adomavicius and Tuzhilin (2006) explain that personalization helps streamline the decision-making process by presenting customers with options that are tailored to their individual needs and preferences. When a customer receives personalized recommendations for products similar to those they've previously expressed interest in, they are more likely to make confident purchase decisions. Supporting this, McKinsey & Company (2021) found that 76% of consumers become irritated when their personalization expectations aren't met, and Mohamed (2024) found that 60.9% of participants in a Finnish study had made purchases based on AI-generated recommendations. These findings reinforce the positive psychological and behavioral impact of personalization in e-commerce environments. In addition, AI enables voice and visual search functionalities, helping users locate products through spoken queries or images, further streamlining the shopping experience (Pallathadka et al., 2023).

Netflix's recommendation engine employs collaborative filtering and content-based filtering to create a tailored viewing experience. By understanding individual user preferences and predicting their future behaviors, Netflix can suggest content that users are likely to enjoy, thereby reducing the time spent searching for something to watch and increasing overall satisfaction. According to Gomez-Uribe and Hunt (2016), Netflix meticulously tracks user activity—such as watch history, session duration, and ratings—to refine its suggestions and enhance user experience. Retailers like Sephora have successfully implemented AI to create highly personalized digital experiences, using data to adapt offers, communication, and product displays to each customer's profile (Alburger, 2020).

Psychological theories further explain the power of personalization. The Elaboration Likelihood Model (ELM) offers insights into how personalization influences consumer decision-making in e-commerce. When consumers are highly involved, they process information through the central route, and personalization can enhance this by delivering detailed information that meets the consumer's specific interests (Babatunde et al., 2024). Conversely, for low-involvement consumers, personalized emotional content can be influenced through the peripheral route (Shao et al., 2023). Moreover, AI plays a preventive role in fraud detection by monitoring transactions in real time and identifying anomalies using machine learning algorithms (Pallathadka et al., 2023). Despite its benefits, AI personalization faces ethical challenges. According to Riegger et al. (2022), personalization has a dual effect on customers—while it may lead to positive reactions such as gratitude and satisfaction, it can also increase privacy concerns and risk perceptions. These concerns highlight the ongoing privacy-personalization paradox, where users appreciate personalization but remain wary of data collection.

As Raji et al. (2024) note, the collection and use of personal data by AI systems raise serious concerns about privacy and transparency. Consumers are increasingly aware of how their data is being used, and when companies fail to communicate this clearly or obtain informed consent, it undermines trust in A1 systems. Raji et al. (2024) further explain that when AI systems are trained on biased data, they may unintentionally reinforce those biases, resulting in unfair or discriminatory outcomes. E-commerce platforms must proactively detect and mitigate algorithmic bias to ensure fair personalization.

In conclusion, while AI personalization offers substantial benefits to e-commerce, including enhanced customer experiences and increased loyalty, it also presents ethical and practical challenges that must be addressed. Emerging trends in AI, such as augmented reality (AR) and virtual reality (VR), promise to further personalize the e-commerce experience, but they must be implemented with care to address ongoing concerns about privacy and trust.

3. METHODOLOGY

This research employs a mixed-methods approach to explore the role of AI-powered personalization in enhancing customer experiences in e-commerce, while also addressing ethical implications. The study combines quantitative data collected through structured questionnaires with qualitative insights from open-ended responses to provide a comprehensive understanding of consumer attitudes toward AI-driven personalization. The survey was distributed to 78 participants, who are regular users of e-commerce platforms, to gather feedback on their experiences with AI-powered personalization.

3.1. Research Design

Primary data was collected through a structured online questionnaire. The survey was designed to assess consumer attitudes toward AI-powered personalization, particularly regarding customer satisfaction, trust, and privacy concerns. The questions were formulated using a Likert scale, allowing participants to express the extent to which they agreed or disagreed with statements about their experiences. The qualitative data was gathered from open-ended questions, providing additional insights into individual consumer experiences and concerns.

3.2. Data Analysis

The quantitative data was analyzed using descriptive statistics, correlation analysis, and reliability tests, while the qualitative responses were reviewed to identify common themes and patterns. Descriptive statistics provided an overview of participants' experiences with AI-powered personalization, while correlation analysis was used to examine the relationships between key variables, such as customer satisfaction, privacy concerns, and trust in AI systems.

3.3. Sample

This section presents the findings from the quantitative research conducted on the impact of AI-powered personalization on customer satisfaction in e-commerce, along with concerns regarding privacy, transparency, and trust in AI systems. The results are based on survey responses from 78 participants and have been analyzed using descriptive statistics and correlation analysis. The primary data collection was conducted in North Macedonia in the period from June 27th until July 11th, 2024, using a structured online questionnaire.

3.3.1. Quantitative Research Sample

Table 1. Demographic Characteristics of the Research Sample

Characteristic	Categories	Percentage (%)
Age	18-24	50%
	25-34	34.6%
	35-44	9%
	45+	6.4%
Gender	Male	43.6%
	Female	56.4%
Level of Education	High School	12.8%
	Some College/Further Education	28.2%
	Bachelors	41%
	Masters	17.9%

Source: Own research

The research sample consisted of 78 participants who regularly engage in e-commerce activities. The demographic analysis showed that the majority of respondents were between the ages of 18 and 24 (50%), followed by participants aged 25-34 (34.6%), 35-44 (9%), and those over 45 (6.4%). In terms of gender distribution, 56.4% of the respondents were female, and 43.6% were male. 41% of respondents have a Bachelor's degree, making it the most common level of education. 17.9% of respondents have a Master's degree, 28.2% have completed some college or further education, without earning a bachelor's degree and 12.8% of respondents have only a high school education.

3.3.2. Qualitative Research Sample

A more comprehensive qualitative approach, such as in-depth interviews or focus groups, was conducted to provide richer data on the nuances of customer experiences and the specific factors influencing their perceptions of AI personalization. 27 participants contributed to the qualitative research study, providing valuable insights and perspectives.

4. RESEARCH RESULTS

4.1. Quantitative Research Results

The survey results revealed key insights into how participants interact with and perceive AI-powered personalization in e-commerce. A vast majority (97.4%) of respondents acknowledged noticing personalized product recommendations based on their previous browsing or purchase history. When asked if they found these recommendations useful, 56.4% responded positively, while 37.2% said "sometimes.". In terms of relevance, 20.5% reported they were always relevant, 34.6% of participants reported that the recommendations they received were often relevant, and 37.2% noted that the recommendations were sometimes relevant. Only 6.4% found them rarely or never relevant. When it comes to purchasing decisions, 16.7% of respondents indicated that they were very likely to purchase a product recommended by an online store, 19.2% were likely, 42.3% remained neutral, and 17.9% were very unlikely to do so. Additionally, 35.9% stated that personalized recommendations somewhat influenced their purchasing decisions, while 24.4% said the recommendations had a very strong influence. A significant 97.4% of respondents noticed that after browsing or purchasing products, they were targeted with ads related to those items or the store. In terms of whether AI can improve the e-commerce experience through personalization, 48.7% agreed, while 24.4% strongly agreed. Regarding shopping efficiency, over half (52.6%) of participants believed that personalization somewhat improves the process, helping them find products faster and reducing irrelevant results and 32.1% said it greatly improves efficiency. Furthermore, 19.2% of respondents were very satisfied with the level of personalization provided by e-commerce platforms, while 41% were satisfied. Finally, when asked if personalized recommendations make them feel more valued as a customer, opinions were distributed across the scale, with 28.2% strongly agreeing and 34.6% agreeing.

The survey explored participants' concerns regarding data privacy and transparency in e-commerce personalization. When asked about their level of concern regarding the privacy of their data used for personalized recommendations, 32.1% of respondents reported being concerned, while 19.2% were very concerned. On the other hand, 26.9% were slightly concerned, and 10.3% were not concerned at all. Over half of the participants (52.6%) admitted to having opted out of personalized recommendations due to privacy concerns, while 47.4% indicated they had not. In terms of transparency, 50% of respondents disagreed that e-commerce websites are transparent about how they use personal data for personalization. An additional 23.1% strongly disagreed with the statement. Only 12.8% of respondents agreed, and a mere 2.6% strongly agreed that companies are transparent in their data practices.

Table 2. AI Personalization and Customer Satisfaction in E-commerce

Question	Response Options	Percentage (%)
Have you ever noticed that an online retailer suggests items for you to purchase based on what you've previously looked at or purchased?	Yes / No	97.4 / 2.6
Do you find it useful to receive product recommendations when shopping online based on items you've previously looked at or purchased?	Yes / No / Sometimes	56.4 / 37.2 / 6.4
Were the product recommendations you received relevant to you when shopping online?	Always / Often / Sometimes / Rarely / Never	20.5 / 34.6 / 37.2 / 6.4 / 1.3
If an online store suggests a product for you to buy, how likely are you to buy it?	Very Likely / Likely / Neutral / Unlikely / Very Unlikely	16.7 / 19.2 / 42.3 / 17.9 / 3.8
To what extent do personalized recommendations influence your purchasing decisions?	Very Much / Somewhat / Neutral / Little / Not at All	24.4 / 35.9 / 19.2 / 14.1 / 6.4
Have you ever noticed that after you buy or browse products on an online store, you are then targeted with ads related to those products or that e-store?	Yes / No	97.4 / 2.6
Do you think AI can help improve e-commerce by providing more personalized experiences and improved user experience?	Strongly Agree / Agree / Neutral / Disagree / Strongly Disagree	24.4 / 48.6 / 17.9 / 6.4 / 2.6
To what extent do you believe that personalization improves your shopping efficiency (e.g., finding products faster, fewer irrelevant results)?	Greatly / Somewhat / Neutral / Little / Not at All	52.6 / 32.1 / 7.7 / 2.6 / 5.1
Overall, how satisfied are you with the level of personalization provided by e-commerce websites?	Very Satisfied / Satisfied / Neutral / Dissatisfied / Very Dissatisfied	19.2 / 41 / 33.3 / 6.4 / 0
Do personalized recommendations make you feel more valued as a customer?	(strongly disagree) 1/2/3/4/5 (strongly agree)	7.7/12.8/34.6/16.7/28.2

Source: Own research

Table 3. Privacy Concerns, Transparency, and Opt-Out Behaviour

Question	Response Options	Percentage (%)
How concerned are you about the privacy of your data used for personalized recommendations?	Very Concerned/Concerned/ Neutral/Slightly Concerned/ Not Concerned	19.2 / 32.1/11.5/26.9/10.3
Have you ever opted out of personalized recommendations due to privacy concerns?	Yes / No	52.6 / 47.4
Do you believe e-commerce websites are transparent about how they use your data for personalization?	Strongly Agree / Agree / Neutral / Disagree / Strongly Disagree	2.6/ 12.8/ 11.5/ 50/ 23.1

Source: Own research

Table 4. Trust in Future AI Accuracy and Perceived Benefits in E-Commerce

Question	Response Options	Percentage (%)
How likely are you to trust AI recommendations if they become more advanced and accurate in the future?	(Very Unlikely) 1/2/3/4/5 (Very Likely)	6.4/14.1/33.3/19.2/26.9
What potential improvements do you think AI could bring to the personalization experience in ecommerce?	Better product matches/ Faster discovery of relevant products/ Improved customer service interactions/ More personalized marketing and promotions/Other	60.3/67.9/41/38.5/6.4

Source: Own research

The survey asked participants about their trust in AI recommendations becoming more advanced and accurate in the future. A total of 26.9% of respondents indicated that they would be very likely to trust future AI recommendations, while 19.2% said they would likely trust them. On the other end of the spectrum, 6.4% of respondents were very unlikely to trust AI in the future, with another 14.1% leaning toward distrust. Participants were also asked what potential improvements AI could bring to the personalization experience in e-commerce. The most frequently cited improvements included faster discovery of relevant products (67.9%) and better product matches (60.3%). Other notable potential benefits included more personalized marketing and promotions (38.5%) and improved customer service interactions (41%). A small percentage (6.4%) mentioned other improvements outside these categories.

4.2. Qualitative Research Results

Among the 27 respondents, many shared positive experiences with AI-driven personalization, highlighting how it improved decision-making and helped them find products more efficiently. Respondents appreciated the ease of locating specific items, such as niche products, and praised personalized recommendations for streamlining their shopping experience, much like having a personal shopping assistant. Platforms like Shein were noted for effectively using previous orders to inform current recommendations, saving time and enhancing convenience. However, privacy concerns were a common issue. Many respondents felt uncomfortable with the level of data collection and the invasive nature of targeted ads, which some described as "creepy" and intrusive. There were also frustrations with irrelevant recommendations that sometimes led to unnecessary purchases or failed to align with users' current needs. Looking ahead, respondents expressed a desire for more control over their personal data, including the ability to opt in or out of specific recommendations. They suggested features such as feedback mechanisms (e.g., thumbs up/down) to refine recommendations and called for a balance between familiar and new content to keep the experience engaging. Additionally, several participants mentioned the importance of AI supporting more mindful decision-making, helping users avoid overconsumption.

5. STATISTICAL ANALYSIS

The statistical analysis of the data collected from 78 participants provides key insights into how AI-powered personalization influences customer satisfaction and behavior. The analysis was conducted using descriptive statistics and correlation analysis to explore the relationships between key variables, such as customer satisfaction, privacy concerns, and trust in AI systems.

5.1. Descriptive Statistics

The descriptive statistics provide an overview of key variables related to AI-powered personalization in e-commerce. The analysis highlights the frequency and mean responses for each question, offering insights into customer behavior and attitudes toward personalization. Nearly all respondents (mean of 1.03) had noticed personalized recommendations while shopping online. In terms of usefulness, the mean response for finding product recommendations helpful was 1.81, and the relevance of these recommendations was rated at 2.33. On the likelihood of purchasing items based on personalized suggestions, the mean was 2.73, demonstrating a relatively positive impact of AI on consumer decision-making. Participants also indicated a moderate influence of personalized recommendations on their purchasing decisions, with a mean of 2.41. Additionally, the perceived usefulness of chatbots or virtual assistants received a mean score of 2.63. Privacy concerns were evident, with a mean of 2.77, reflecting moderate to high levels of concern regarding the use of

personal data for AI-driven recommendations. Transparency, however, was rated poorly, with a mean of 4.05, indicating that participants largely disagreed that e-commerce platforms are transparent about data usage. Trust in future AI accuracy was moderately high, with a mean of 3.46.

5.2. Correlation Analysis

The correlation analysis revealed several important relationships between the variables studied. Notably, there is a strong positive correlation (r=0.851) between the perceived usefulness of personalized recommendations and overall satisfaction with personalization. This suggests that when customers find recommendations useful, their satisfaction with the e-commerce experience increases. The influence of recommendations on purchasing decisions (r=0.941) shows that effective personalization, which drives purchasing behavior, is crucial for customer satisfaction. There is a strong positive correlation (r=0.848) between customers' concerns about the privacy of their data and their belief that e-commerce websites are not transparent about how they use data for personalization. This suggests that a lack of transparency is strongly associated with increased privacy concerns among customers. Between the two variables: the likelihood of trusting AI recommendations if they become more advanced and accurate in the future, and the belief that AI can help improve e-commerce by providing more personalized experiences and improved user experience there was a strong positive correlation (r=0.858). This suggests that customers who are likely to trust AI recommendations if they become more advanced and accurate also strongly believe that AI can improve e-commerce by providing more personalized experiences and enhancing user experience. This implies that advancements in AI accuracy and capabilities are expected to increase trust in AI-driven personalization and its perceived benefits in e-commerce.

5.3. Reliability Testing/ Cronbach's Alpha

Cronbach's alpha was used to assess the internal consistency of the survey questions related to customer satisfaction and privacy concerns. The Cronbach's alpha for the customer satisfaction items was 0.968, indicating excellent internal consistency. Privacy concerns items gave a Cronbach's alpha of 0.875, and the trust in AI items had a Cronbach's alpha of 0.923. These results suggest that the survey instruments reliably measure the intended constructs.

6. DISCUSSION

The findings from both the quantitative and qualitative research suggest that AI-powered personalization in e-commerce offers significant benefits to consumers, while also presenting challenges related to privacy and data transparency. The survey revealed that the majority of respondents appreciate the convenience and relevance of personalized recommendations, which enhance their shopping experience by helping them discover products more efficiently. This aligns with existing literature, which highlights the role of AI in improving customer satisfaction and driving engagement through tailored experiences. However, privacy remains a critical concern for many users. More than half of the respondents expressed discomfort with the level of data collection involved in AI-driven personalization, with some opting out of personalized recommendations altogether. This reflects the ongoing tension between the benefits of personalization and the privacy-personalization paradox, where consumers desire personalization but are wary of how their personal data is being used. The qualitative data further underscored this concern, with participants describing personalized ads as intrusive and expressing frustration with irrelevant or excessive recommendations. The trust issue also emerged in the discussion on AI's future role in e-commerce. While most respondents are optimistic about AI's potential to improve accuracy and enhance the shopping experience, there is a clear need

for companies to improve transparency and give users more control over their data. Respondents expressed interest in features that allow them to manage their data preferences, emphasizing the importance of fostering trust in AI systems. Additionally, respondents suggested that AI could be further enhanced by incorporating user feedback and supporting personal goals, which would make the system more responsive to individual needs.

7. CONCLUSION

This study highlights both the opportunities and challenges associated with AI-powered personalization in e-commerce. On one hand, personalization is widely recognized for improving customer experience by making shopping more efficient and tailored to individual preferences. On the other hand, concerns about privacy, data transparency, and trust in AI systems persist. The research suggests that for AI to continue enhancing the e-commerce experience, companies must address these concerns by improving transparency and offering users more control over their personal data. However, one limitation of this study is the relatively small sample size, which may not fully capture the diversity of experiences and attitudes toward AI-powered personalization across broader populations. Future research could focus on larger, more varied samples to generalize findings more effectively. Future developments in AI should focus on creating a balance between delivering personalized experiences and maintaining user trust. Incorporating feedback mechanisms, increasing transparency in data collection, and allowing users to customize their personalization settings are critical steps toward achieving this balance. As AI continues to evolve, it has the potential to create even more engaging and efficient shopping experiences, provided that ethical considerations remain a priority.

References

Adomavicius, D., & Tuzhilin, A. (2006). Personalization technologies: A process-oriented perspective. *Wirtschaftsinformatik, 48*(6), 449-450. https://doi.org/10.1007/s11576-006-0098-7

Alburger, J. (2020). 6 Ways Sephora Creates Personalized Digital Experiences. Retrieved from https://www.hubtype.com/blog/sephora-personalized-digital-experiences

Anderson, J., & Johnson, D. (2024). *The role of artificial intelligence in enhancing e-commerce customer experience* (EasyChair Preprint No. 13355). EasyChair.

Areiqat, A. Y., Hamdan, A., Alheet, A. F., & Alareeni, B. (2021). Impact of artificial intelligence on e-commerce development. In A. Alareeni, A. Hamdan, & R. Elgedawy (Eds.), *The importance of new technologies and entrepreneurship in business development: In the context of economic diversity in developing countries* (pp. 571–578). Springer. https://doi.org/10.1007/978-3-030-69221-6_43

Babatunde, O., Odejide, N. O. A., Edunjobi, E., & Ogundipe, O. (2024). The role of AI in marketing personalization: A theoretical exploration of consumer engagement strategies. *International Journal of Management & Entrepreneurship Research (Print)*, *6*(3), 936–949. https://doi.org/10.51594/ijmer.v6i3.964

Bughin, J., Hazan, E., Ramaswamy, S., Chui, M., Allas, T., Dahlström, P., Henke, N., & Trench, M. (2017). *Artificial intelligence: The next digital frontier?* McKinsey Global Institute. https://www.mckinsey.com/featured-insights/artificial-intelligence

Gomez-Uribe, C. A., & Hunt, N. (2016). The Netflix recommender system: Algorithms, business value, and innovation. *ACM Transactions on Management Information Systems, 6*(4), 1–19. https://doi.org/10.1145/2843948

Gupta, C. P., Ravi Kumar, V. V., & Khurana, A. (2024). Artificial Intelligence Application in E-Commerce: Transforming Customer Service, Personalization and Marketing. 2024 11th

International Conference on Computing for Sustainable Global Development (INDIACom), 10-16. https://doi.org/10.23919/indiacom61295.2024.10498474

Gupta, P., Singh, S., Ranjan, R., Kharayat, G., Raman, S., & Balaji, V. (2019). Analysis of Delivery Issues that Customer Face upon E-Commerce Shopping. *International Journal of Management Studies, VI*(3), 14. https://doi.org/10.18843/ijms/v6si3/03

Khyat, J., & Kumre, S. (2023). A comprehensive review on the role of artificial intelligence in e-commerce. *UGC Care Group I Listed Journal, 13*(11). http://junikhyatjournal.in/no_1_Online_23/31_online_nov.pdf

Kouayep, C. S., Tagne, A. P. T., & Hee, K. C. (2024). Enhanced experiences: Benefits of AI-powered recommendation systems. In *Proceedings of the International Conference on Advanced Communications Technology (ICACT)* (pp. 216–220).

Kumar, S. S., Singh, P., & Yogendra, Y. (2022). *New perspectives on commerce & management* (Vol. 1). Nitya Publications. https://books.google.ca/books?id=C8RrEAAAQBAJ&printsec=frontcover#v=onepage&q&f=false

McKinsey & Company. (2021). *The future of personalization—and how to get ready for it.* Retrieved from https://www.mckinsey.com/business-functions/marketing-and-sales/our-insights/the-future-of-personalization-and-how-to-get-ready-for-it

Mohamed, D. (2024). *Customer Perceptions of AI-Driven Recommendations in Online Shopping.* Bachelor's thesis. LAB University of Applied Sciences. Retrieved from https://www.theseus.fi/handle/10024/123456

Nimbalkar, A., & Berad, A. T. (2022). The increasing importance of AI applications in e-commerce. *Vidyabharati International Interdisciplinary Research Journal, 13*(1), 388–391. https://www.researchgate.net/publication/361361169_THE_INCREASING_IMPORTANCE_OF_AI_APPLICATIONS_IN_E-COMMERCE#fullTextFileContent

Pallathadka, H., Upadhyay, P., Mishra, A., & Sharma, S. (2023). Role of AI in customer behavior prediction and recommendation systems. *International Journal of Management Studies, 10*(1), 23–32.

Raji, M. A., Olodo, H. B., Oke, T. T., Addy, W. A., Ofodile, O. C., & Oyewole, A. T. (2024). E-commerce and consumer behavior: A review of AI-powered personalization and market trends. *GSC Advanced Research and Reviews, 18*(3), 066–077. https://doi.org/10.30574/gscarr.2024.18.3.0090

Ramesh, R., & Vijayalakshmi, S. (2022). Improvement to Recommendation system using Hybrid techniques. 2022 2nd International Conference on Advance Computing and Innovative Technologies in Engineering (ICACITE), 778-782. https://doi.org/10.1109/icacite53722.2022.9823879

Riegger, A.-S., Merfeld, K., Klein, J. F., & Henkel, S. (2022). Technology-enabled personalization: Impact of smart technology choice on consumer shopping behavior. *Technological Forecasting and Social Change, 181*, 121752. https://doi.org/10.1016/j.techfore.2022.121752

Shao, Z., Zhang, L., Pan, Z., & Benitez, J. (2023). Uncovering the dual influence processes for click-through intention in the mobile social platform: An elaboration likelihood model perspective. *Information & Management, 60*(5), 103799. https://doi.org/10.1016/j.im.2023.103799

Sinha, M., & Rakhra, M. (2023). Leveraging artificial intelligence to personalize the consumer shopping journey. *International Journal of E-Business Research*, *19*(2), pp. 45–60.

Song, X., Yang, S., Huang, Z., & Huang, T. (2019). The Application of Artificial Intelligence in Electronic Commerce. *Journal of Physics: Conference Series, 1302*(3), 032030. https://doi.org/10.1088/1742-6596/1302/3/032030

Wang, K., Zhang, T., Xue, T., Lu, Y., & Na, S.-G. (2020). E-commerce personalized recommendation analysis by deeply-learned clustering. *Journal of Visual Communication and Image Representation, 71*, 102735. https://doi.org/10.1016/j.jvcir.2019.102735

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Potential of *Datura Stramonium* for Phytoremediation of Soils Contaminated with Heavy Metals

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Abstract: *Comparative studies have been carried out to determine the amounts of toxic metals and nutrients in the vegetative and reproductive organs of Datura stramonium, the composition and quality of the oil, and to establish the possibilities for phytoremediation of heavy metal-contaminated soils. The field experiment was conducted on an agricultural field contaminated by the Non-Ferrous Metals Plant near Plovdiv, Bulgaria. The Datura is tolerant to heavy metals and can be grown on highly contaminated soils (2423.9 mg/kg Zn, 2509.1 mg/kg Pb, and 63.7 mg/kg Cd). Pb, Cd, Zn, Ni, Fe, Mn, Cu, K, and Mg accumulate in the leaves, Cr in the root system, and P accumulates in the seeds. The D. stramonium can be classified as a potential accumulator of Cd, an indicator for Pb, and an excluder of Zn. It can also be successfully used in phytoremediation of soils contaminated with heavy metals. The oil is a rich polyunsaturated linoleic fatty acid source with potential beneficial therapeutic activity.*

1. INTRODUCTION

Datura Stramonium is a poisonous flowering plant in the Daturae, family Solanaceae (Sayyed & Shah, 2014). It is known as thornapple, jimson weed, or devil's trumpet. In our country, it is known as horse chestnut. The most important species of *Datura* are *Datura innoxia, Datura metel, Datura discolor*, and *Datura stramonium* (Gupta, 2008). The plant was first described by the Swedish botanist Carl Linnaeus in 1753. It is distributed in various parts of the world, including the Americas, Africa, Asia, and Europe, and is considered to be native to Central America. *D. stromonium* is cultivated in Germany, France, Hungary, South America, and worldwide (Gaire & Subedi, 2013). *Datura* is also used for landscaping terraces and balconies.

Datura is an easy-to-cultivate species. It grows in open and sunny places. It develops best on limestone-rich soils or sandy loam soils. *D. stramonium* is an annual plant that reaches a height of up to 1 m (Soni et al., 2012). The stem is herbaceous, branched, and lightly covered with hairs. The leaves are large and covered with hairs. *Datura* blooms throughout the summer (from May to September). The flowers are funnel-shaped, white, or purple. The flowers emit a strong, sweet smell and open at night, attracting insects. *Datura* seeds are kidney-shaped and black (Gupta, 2008). The fruits are the size of walnuts and have spines (Soni et al., 2012). When the fruit ripens, it splits into four parts, each containing red seeds. When cut, these seeds emit an unpleasant odor. The seeds contain non-volatile oil with an unpleasant smell and taste.

The plant is harvested when the fruits are ripe but still green. To harvest, the entire plant is cut off, the leaves are stripped, and everything is left to dry. When the fruits begin to open, the seeds are collected.

The plant is highly narcotic but has specific effects on humans that make it very valuable as a medicine. The entire plant is poisonous, with the most toxic seeds (Oseni et al., 2011). Symptoms

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of acute *Datura* poisoning include dry mouth and intense thirst, dry skin, dilated pupils, blurred vision, urinary retention, rapid heart rate, confusion, anxiety, hallucinations, and loss of consciousness (Dugan et al., 1989).

Plants of the genus *Datura* exhibit antibacterial, anti-inflammatory, nematocidal, fungicidal, cytotoxic, antioxidant, and acaricidal activities (Singh & Singh, 2013). Members of the genus *Datura* are rich in biologically active substances and are used in traditional medicine. *Datura* is prescribed for whooping cough, Parkinson's disease, severe anxiety, and stomach pain. It is applied externally for rheumatism, radiculitis, and various edemas. In the past, *Datura* leaves were smoked against shortness of breath and tuberculosis. It has also been used as a hallucinogen, taken entheogenically to induce intense, sacred, or occult visions (Soni et al., 2012).

Datura Stramonium is a raw material for isolating biologically active substances such as fatty acids, alkaloids (atropine, scopolamine, hyoscyamine), coumarins, etc. Oils from poisonous plants are not used as edible oils, but in the past, they were used in medicine to treat skin diseases caused by bacteria and fungi. Fatty acids obtained from the seeds of plants such as *Datura* are used as central components in some drugs and cosmetics. *Datura stramonium* oil is used as an analgesic in neurological practice and for hair removal in cosmetics (Yuldasheva et al., 2020). The oils of some Datura species are used to produce biodiesel as an alternative fuel source (Gupta, 2020; Koria & Nithya, 2012).

Phytoremediation is an inexpensive and environment-friendly method for cleaning up heavy metal-contaminated soils and waters (McGrath et al., 2002). This is a cost-effective approach to cleaning and remediation, in which the pollutant/toxic heavy metal is removed from the contaminated soil with various plants. According to the ability of plants to absorb heavy metals, they are classified as indicators, accumulators, hyperaccumulators, or excluders. The plants are planted in metal-contaminated soils and grown according to established agronomic practices. Being a plant-based technology, the success of phytoremediation will depend on the extent of uptake of metals by the root system, shrinkage, and accumulation in the shoots. Factors such as short growing cycles, rapid growth, large biomass production, disease resistance, and tolerance to heavy metals are also essential in plant selection (Baker et al., 1994). Plants used for phytoremediation must be tolerant of metals, translocate them from the roots to the aerial parts (Reeves & Baker, 2000), tolerate difficult soil conditions (i.e., soil pH, soil salinity, soil texture, water content), form a dense root system, and be easy to grow.

The search for suitable plants for phytoremediation is still the subject of much scientific research. Experiments have been conducted with plants of the genus *Datura* because they have shown the ability to accumulate various heavy metals with adequate capacities and the feasibility of cultured with high biomass production. *Datura metel* is a heavy metal tolerant plant and can grow well in polluted regions (Bhattacharjee et al., 2004). Previous studies have shown that *D. stramonium* can tolerate and accumulate Cd, with the potential for remediation of heavy metal-contaminated soils (Shirkhani et al., 2018). Eeshu et al. (2020) confirmed that *D. stramonium* could be a possible indicator of heavy metal-polluted soil since it tends to accumulate heavy metals from polluted soils rapidly. *Datura stramonium* was suitable for phytostabilization soils contaminated with Ni and Cu (Ibrahim et al., 2013).

The present study aimed to determine the amounts of heavy metals, macro, and microelements in the vegetative and reproductive organs of *Datura stramonium*, the composition and quality of the oil, and to establish the possibilities for phytoremediation of heavy metal-contaminated soils.

2. MATERIAL AND METHODS

The research was carried out during the period 2022 - 2024. The experiment was performed on an agricultural field contaminated by Zn, Pb, and Cd, located 0.5 km from the source of pollution, the Non-Ferrous-Metal Works (NFMW) near Plovdiv, Bulgaria. Characteristics of soils are shown in Tables 1 and 2. The soils were neutral to slightly calcareous, with moderate organic matter and essential nutrients (N, P, and K). The pseudo-total content of Zn, Pb, and Cd is high and exceeds the maximum permissible concentrations (MPC) in soil from 0.5 km from the NFMW (Table 2). The results presented in Table 2 show that in the soil samples (taken from the area situated at the distance of 0.5 km from NFMW), the reported values for Pb exceeded MPC approved for Bulgaria and reached 2509.1 mg/kg. Similar results were obtained for Cd and Zn. The results for the mobile forms of the metals extracted by DTPA show that the mobile forms of Cd in the contaminated soils are the most significant portion of its total content and reached 58.1%, followed by Pb with 33.8 % and Zn with 9.8%.

Table 1. Soil characteristics of the study area

	pH	EC, dS/m	Organic C, %	N Kjeldal, %	P, mg/kg	Ca, mg/kg	Mg, mg/kg	K, mg/kg
0.5 km	7.5	0.15	1.54	0.12	607.2	24355.8	12573.9	8029.5

Source: Own research

Table 2. Total and DTPA-extractable heavy metals (mg/kg) in soil sampled from NFMW

	Pb	Cd	Zn	Cr	Ni
Total	2509.1	63.7	2423.9	126.7	136.5
DTPA -extractable	849.1	37.0	236.8	2.2	2.5
DTPA -extractable / total content	33.8	58.1	9.8	1.7	1.8

MPC (pH 6.0-7.4); Pb-100 mg/kg, Cd-2.0 mg/kg, Zn-320 mg/kg, Cr-200 mg/kg, Ni-110 mg/kg

Source: Own research

The study included *Datura stramonium*, which was grown using conventional technology. *Datura stramonium* seeds were sown in April at a depth of 3 cm, with the distances between rows and within rows being 70 and 20 cm, respectively. The plants were harvested in the technological maturity phase (end of September). Samples of plant material (roots, stems, leaves, and seeds) from *Datura stramonium* were analyzed. The roots stems, and leaves samples were dried at room temperature to obtain an air-dry mass, after which they were dried at 105ºC. The oil from *Datura stramonium* was derived under laboratory conditions through an extraction method with Socksle's apparatus, allowing the extraction of the oil from the ground seeds of *Datura stramonium* using petroleum ether and the subsequent liberation of the latter through distillation. Gas chromatography determined the oil's fatty acid composition (ISO, 1990). The concentrations of contents of heavy metals, micro, and macroelements in different parts of *Datura stramonium* (roots, stems, leaves, seeds), and oils were determined by microwave mineralization. The total content of heavy metals in soils was determined by ISO (2001). The mobilizable heavy metal contents in soils, considered a "potentially bioavailable metal fraction," were extracted by a solution of DTPA (ISO, 1955). The quantitative measurements were carried out with inductively coupled plasma emission spectrometry (ICP) (Jobin Yvon Emission - JY 38 S, France).

Statistical analyses were conducted with Statistica v. 7.0.

3. RESULTS AND DISCUSSION

The content of heavy metals in plants depends on the geochemistry of the soil where the plant grows and on the plant's ability to accumulate metals. Metal concentrations in plants vary with plant species (Kabata-Pendias, 2010). Plant uptake of heavy metals from soil occurs either passively with the mass flow of water into the roots, or through active transport crosses the plasma membrane of root epidermal cells. Under normal growing conditions, plants can accumulate metal ions in magnitude more significant than the surrounding medium (Kabata-Pendias, 2010).

Table 3 and Figure 1 present the results obtained for the content of heavy metals, micro and macro elements in the vegetative and reproductive organs of the *Datura stramonium*.

Table 3. Content of heavy metals, micro and macroelements in *Datura stramonium*

	Roots	Stems	Leaves	Seeds
Pb	150.2	44.1	2011.7	86.1
Cd	34.0	17.9	165.5	9.1
Zn	193.1	170.1	1381.2	117.1
Cr	2.7	0.1	2.4	0.3
Ni	2.6	0.1	3.7	0.5
Cu	18.0	3.8	169.3	17.2
Fe	700.3	32.1	704.6	162.2
Mn	22.8	5.9	129.0	18.1
P	463.0	191.4	2698.0	3887.3
Ca	8111.4	6406.9	22288.2	1303.4
Mg	1807.6	553.2	2261.2	2192.5
K	12131.0	9132.6	24889.0	3950.5

Source: Own research

Significant differences were found in the content of elements in the vegetative and reproductive organs of the *Datura stramonium*. The central part of Pb, Cd, Zn, Ni Fe, Mn, Cu, K, Ca, and Mg accumulates in the aboveground parts of the *Datura stramonium* (leaves), Cr in the root system, and P accumulates in the seeds. Probably via the conductive system, the heavy metals had been moved to the aboveground parts of these plants and were predominantly accumulated there. The *Datura stramonium* accumulates heavy metals through its root system. Still, the roots retain a small part of the heavy metals, and the main part moves and accumulates in the aboveground parts (leaves).

The Pb content in the *Datura stramonium* roots reaches 150.2 mg/kg, Zn – 193.1 mg/kg, Cd – 34.0 mg/kg, Cr – 2.7 mg/kg, and Ni – 2.6 mg/kg. The obtained values for heavy metals (Cd, Pb, and Zn) in roots are much higher than the values considered by Kabata-Pendias (2010) to be toxic to plants (0.1 mg/kg Cd, 30 mg/kg Pb, 100 mg/kg Zn). The roots also accumulate fewer microelements and macroelements compared to other organs. The content of Cu reaches 18.0 mg/kg, Fe – up to 700.3 mg/kg, Mn – up to 22.8 mg/kg, P -463.0 mg/kg, Ca - 8111.4 mg/kg, Mg – 1807.6 mg/kg and K – 12131.0 mg/kg.

The anatomical and morphological features of the *Datura stramonium* can explain the obtained results. The root system consists of a thick yellowish spindle-shaped root with several lateral branches that reach a depth of up to 100 cm. The primary root mass is located at a depth of about

50 cm. Previous studies by Angelova (2012) show that in *Datura stramonium*, only a small part of the heavy metals are absorbed by the roots, and a great part of them is accumulated in the aboveground parts (stems and leaves). Similar results were obtained by Ibrahim et al. (2013), who found higher values of Cd and Pb in the aboveground mass than in the roots. However, Olowoyo et al. (2012) found the highest content of heavy metals in the roots of the *Datura stramonium*.

The movement of heavy metals and their accumulation in the vegetative organs of the *Datura stramonium* is specific. The content of heavy metals and macro and microelements in the aboveground mass is higher compared to the root system. Regarding Fe and Cr, the values obtained are comparable between the roots and leaves.

A significant accumulation of Pb has been established in the leaves of the *Datura stramonium*. The content of this element reaches 2011.7 mg/kg in the leaves. Numerous studies have shown that only a small part of the available Pb from the soil is absorbed by most plants. It is also known that most of the accumulated Pb accumulates in the roots and does not move to the aboveground parts of the plants. However, obtained results show the *Datura stramonium*'s significant ability to accumulate Pb in the leaves. Accumulation in the leaves was likely due to the uptake of heavy metals (from the contaminated soil) by roots and the movement of the heavy metals through the conductive system, as well as due to airborne heavy metals that fall onto the leaves as a result of their dispersion into the air by aerosols. Their more substantial accumulation in *Datura stramonium* was probably because the leaves of *Datura Stramonium* had hairs, which contributed to the fixing of the aerosol pollutants and their accumulation there.

The Cd content in the leaves of *D. stramonium* reaches 165.5 mg/kg, values considered toxic to plants. According to Kabata-Pendias (2010), 5.0 mg/kg is considered toxic for plants. The obtained results show the ability of *D. stramonium* to accumulate Cd in its aboveground mass. Similar results were obtained by Shirkhani et al. (2018), who found that Concentrations of Cd in the shoots of *D. stramonium* were higher than those in the roots.

The Zn content in the leaves of *D. stramonium* reaches 1381.2 mg/kg, which are also higher than the critical values for plants - 100 - 400 mg/kg. Zn toxicity in plants is manifested as a restriction of the growth of both the roots and the aboveground mass and purple-red wilting of the leaves. These symptoms of Zn toxicity were not observed in the plants of this study. The Cu content in the stems and leaves of the *Datura stramonium* reached 3.8 and 169.3 mg/kg, respectively, which are higher than the critical values for plants - 20 - 100 mg/kg.

The content of Cr in the stems and leaves of the *Datura Stramonium* a varies from 0.12 to 2.4 mg/kg, Ni - from 0.14 to 3.77 mg/kg, Fe - from 32.1 to 704.6 mg/kg, Mn - from 5.9 to 129.0 mg/kg, K - from 9132.6 to 24889.0 mg/kg, P - from 191.4 mg/kg to 2698.0 mg/kg, Mg - from 553.2 to 2261.7 mg/kg and Ca - from 6406.9 mg/kg to 22288.2 mg/kg.

The seeds of the *Datura Stramonium* can be a good source of minerals due to their high Ca, K, Mg, and P content. In the seeds, macroelements (K, P, Mg, and Ca) prevail, followed by Fe and Zn (Table 3). The content of Cu and Mn is significantly lower. The seeds also contain the heavy metals Pb, Cd, Cr, and Ni, and their content in the seeds is considerably lower compared to the aboveground mass of the plants.

The P and Mg content in the *Datura Stramonium* seeds is the highest compared to the other parts of the plant, while the content of K is lower compared to the stems and leaves.

The distribution of heavy metals, micro and macro elements in the organs of the *Datura stramonium* are selective and specific for the elements. Pb, Cd, Zn, Ni Fe, Mn, Cu, K, and Mg accumulate in the aboveground parts of the *Datura stramonium* (leaves), Cr in the root system, and P accumulates in the seeds (Fig. 1).

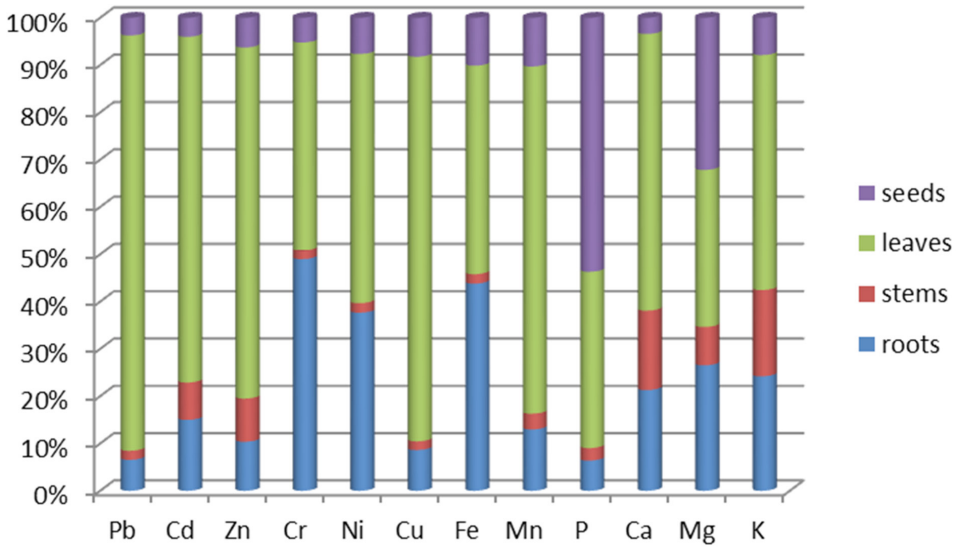

Figure 1. Distribution of heavy metals, micro and macroelements in *Datura stramonium*
Source: Own research

Oil was obtained from the seeds of *Datura stramonium* in laboratory conditions by extraction method with the Soxhlet apparatus, allowing extraction of the fat from the pre-ground seeds with petroleum ether and subsequent distillation of the latter.

The results showed that a significant part of the heavy metals contained in the seeds of *Datura stramonium* were not transferred into the oil during processing, which caused their content in the oil to be considerably lower.

The Pb content in the *Datura* oil reaches 0.08 mg/kg, Cd - up to 0.04, and Zn - up to 4.8. The content of Ni and Cr is very low and near the detection limits of the techniques used (ICP-OES). The ML for Pb in oil of vegetable origin is 0.1 mg/kg, Zn - 10 mg/kg, and Cd should not exceed 0.05 mg/kg. The results show that the Pb, Zn, and Cd quantities in *Datura* oil are lower than the accepted Maximum Permissible Values and meet the requirements for ecologically clean products.

Bioaccumulation factor (BCF) and translocation factor (TF) are often used to characterize the phytoremediation efficiency of plants, which is mainly dependent on soil conditions, the type of selected plant, and the bioavailability of heavy metals The bioconcentration factor (BCF) is the ratio of the metal content of each plant organ to the concentration of metal in the soil. TF is the ratio of the concentration of metal in the aboveground parts to the concentration of metal in the root. The coefficients The BCF and TF, which were used to evaluate the ability of plants to absorb and translocate metals, were calculated according to the following equations:

$$TF = Cshoots / Croots$$

where Cshoots represent the element contents (in mg/kg) in the plant shoots, and Croots shows the element concentration in the roots (in mg/kg),

$$BCF = C_{plant\ parts} / C_{soil}$$

where Cplant parts represent the element contents (in mg/kg) in the plant organs (roots, stems, leaves, seeds), and Csoil (in mg/kg) shows the element concentration in the corresponding soils.

Table 4. Bioaccumulation (BCF) and translocation (TF) factor

	TF	BCFoos	BCFstems	BCFleaves	BCFseeds
Pb	13.39	0.06	0.02	0.80	0.03
Cd	4.87	0.53	0.28	2.60	0.14
Zn	7.15	0.08	0.07	0.57	0.05

Source: Own research

Generally, a plant species can be considered a good candidate for phytoextraction purposes when, for a given metal, the TF > 1; otherwise, it is considered suitable for phytostabilisation. The results show that for Pb, the translocation factor *for Datura stramonium* reaches 13.4, Cd up to 4.87, and Zn up to 7.15.

The results for BCFroots show that this ratio reaches 0.06 for Pb, 0.53 for Cd, and 0.08 for Zn. Lower values than 1 were obtained for BCF stems and seeds (Table 4).

BCF leaf indicates the plant's ability to absorb and move metals to the leaves, which can be easily collected. A plant is an excluder if BCF < 1, an indicator if BCF=1, an accumulator if 1 < BCF < 10, and if BCF > 10, the plant is a hyperaccumulator. Plants with a BCF value > 1 are suitable for phytoextraction.

The results show that for Pb, the bioconcentration coefficient for the leaves reaches 0.80; for Cd, it is up to 2.60; and for Zn, it is up to 0.57. The study results show that *Datura stramonium* can be classified as a potential accumulator of Cd, a potential indicator for Pb, and an excluder for Zn when grown on contaminated soils.

Similar results were obtained by Shirkhani et al. (2018), who concluded that *D. stramonium* is a Cd-accumulator plant with phytoremediation potency.

Fatty acid composition of Datura oil. The fatty acid composition of the oil is the main factor that determines the quality of the oil and its use for industrial purposes and culinary use, with the variety, climate, and region of production having a significant influence.

Table 5 and Figure 2 present the results for the fatty acid composition of *Datura stramonium* seeds.

Table 5. Fatty acid composition of *Datura* oil (expressed as % of total fatty acid composition)

Saturated fatty acids (SFA)

Caproic acid (C 6:0)	Myristic acid (C 14:0)	Palmitic acid (C 16:0)	Stearic acd (C 18:0)	Arachidic acid (C 20:0)	Total
Trace	Trace	11.55	2.39	0.51	14.45

Usaturated fatty acids (UFA)

Palmioletic acid (C16:1)	Oleic acid (C18:1)	Linoleic acid (C 18:2)	Linolenic acid (C 18:3)	Gadoleic acid (C20:1)	Arachidonic acid (C 20:4)	Total
Trace	23.00	62.54	Trace	trace	trace	95.54

Source: Own research

The percentage of oil content varies from 10.3 to 23.2% in the seeds of different types of *Datura* (Zhang et al., 2008), which is by obtained results (22.0%).

Datura stramonium oil is a rich source of unsaturated fatty acids such as linoleic and oleic. In contrast, the content of saturated fatty acids (palmitic and stearic acids) is much lower (Sheveleva et al., 2021), which is confirmed by the results obtained. In the fatty acid composition of the oil studied, unsaturated fatty acids predominate, with their amount reaching 85.54 % respectively. Similar results were obtained by Valieva et al. (2022) (83.1%. unsaturated fatty acids).

Linoleic acid (C18:2, 62.54 %), followed by oleic acid (C18:1, 23.0 %), dominates the oil composition. Traces of palmitic (C16:1), C20:0 linolenic (C18:3), gadoleic (C20:1), and arachidonic acid (C20:4) acids were detected.

Of the saturated fatty acids, palmitic acid (C16:0) predominates in the amount of 11.5%, followed by stearic (C18:0, 2.39%) and arachidic acid (C20:0, 0.51%) acids. The oil also contains margaric (C16:0) and myristic (C16:0) acids. The content of saturated fatty acids in *Datura Stramonium* oil reaches 14.45% (Table 5).

Similar results were obtained by Valieva et al. (2022) for oil from Azerbaijan, where linoleic (64.52%), oleic (18.38%), palmitic (12.42%), and stearic (2.29%) acids predominate, and constitute 97% of the total fatty acids.

According to Yuldasheva et al. (2020), the main compounds found in *Datura* seed oils are polyunsaturated cis-linoleic acid (C18:2), monounsaturated oleic acid (C18:1) and saturated palmitic (C16:0) and stearic acids (C18:0).

The distribution of fatty acids is presented in Figure 2. The ratio of unsaturated: saturated fatty acids in *Datura stramonium* oil is 85.54:14.45.

The total content of saturated fatty acids (SFA) in *Datura stramonium* oil reaches 14.45% of the total amount of fatty acids. The monounsaturated fatty acids (MUFA) content reaches 23.0%, and polyunsaturated – up to 62.54%. Similar results do not correspond to the findings of Yuldasheva et al. (2020) and Koria and Nithya (2012), who found that the content of polyunsaturated fatty acids is lower than monounsaturated fatty acids. Koria and Nithya (2012) identified 83.3% unsaturated fatty acids, of which 65.59% are monounsaturated and 17.72% are polyunsaturated. It is known that the physiological activity of polyunsaturated fatty acids increases with increasing their unsaturation. The presence of these compounds in *Datura stramonium* and the possibility of growing this plant on contaminated soils make *Datura* seeds a valuable source of fatty oils. The results of this study may be helpful for future studies on the application of these oils in the pharmaceutical, cosmetic, fuel, and other industries.

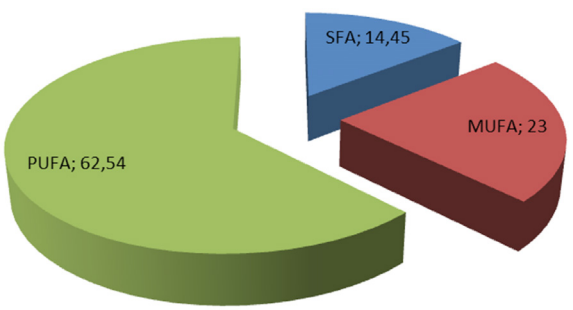

Figure 2. Distribution of fatty acids in *Datura stramonium* oil

Source: Own research

4. CONCLUSION

Based on the results obtained, the following important conclusions can be drawn:

1. The *Datura stramonium* is a crop that is tolerant to heavy metals, can be grown on highly contaminated soils (2423.9 mg/kg Zn, 2509.1 mg/kg Pb, and 63.7 mg/kg Cd) and is successfully used in phytoremediation of soils contaminated with heavy metals.
2. The *Datura stramonium* can be classified as a potential accumulator of Cd, indicator for Pb and excluder for Zn when grown on contaminated soils.
3. There is a clearly outlined peculiarity in the absorption of heavy metals, micro and macro elements in the vegetative and reproductive organs of the *Datura stramonium*. Their distribution in the organs of *Datura stramonium* has a selective nature, specific for individual elements: Pb, Cd, Zn, Ni Fe, Mn, Cu, K, and Mg accumulate in the above-ground parts of *Datura stramonium* (leaves), Cr in the root system, and P accumulates in the seeds.
4. The quantities of Pb, Cd and Zn in the oil of *Datura stramonium* cultivated 0.5 km from the NFMW, were lower than the accepted Maximum permissible concentrations, and the resulting oil could be used in the pharmaceutical, cosmetic, and other industries..
5. Polyunsaturated fatty acids (PUFA-62.54%) predominate in *Datura stramonium* oil, followed by monounsaturated fatty acids (MUFA-23.0%) and saturated (SFA-14.45%) fatty acids.
6. *Datura stramonium* oil is a rich source of polyunsaturated linoleic fatty acid with potential beneficial therapeutic activity.

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References

Angelova, V. (2012). Potential of some medicinal and aromatic plants for phytoremedation of soils contaminated with heavy metals. *Agricultural Science, 11*, 61-66

Baker, A. J. M., McGrath, S. P., Sidoli, C. M. D., & Reeves, R. D. (1994). The possibility of in situ heavy metal decontamination of polluted soils using crops of metal-accumulating plants. *Resources, Conservation and Recycling, 11*(1-4), 41-49. https://doi.org/10.1016/0921-3449(94)90077-9

Bhattacharjee, S., Kar, S., & Chakravarty, S. (2004). Mineral Compositions of Datura: A Traditional Tropical Medicinal Plant. *Communications in Soil Science and Plant Analysis, 35*(7-8), 937-946. https://doi.org/10.1081/css-120030565

Dugan, G. M., Gumbmann, M. R., & Friedman, M. (1989). Toxicological evaluation of jimson weed (Datura stramonium) seed. *Food and Chemical Toxicology, 27*(8), 501-510. https://doi.org/10.1016/0278-6915(89)90045-8

Eeshu, O. V., Abeng, F. E., Ushie, O. A., Ikpemehenry, I., & Mlumun, K. (2020). Comparative study on the differences in elemental-uptake by seeds and leaves of *Datura Stramonium* (Linn). *Bioscience Research, 17*(3), 2009-2014.

Gaire, B. P., & Subedi, L. (2013). A review on the pharmacological and toxicological aspects of Datura stramonium L. *Journal of Integrative Medicine, 11*(2), 73-79. https://doi.org/10.3736/jintegrmed2013016

Gupta, A. (2020). Experimental Investigation of Datura stramonium biodiesel. *IJARIIT, 6*, 1-5.

Gupta, D. P. (2008). The herb, habitat, morphology and pharmacognosy of most important popular Indian medicinal plant. 1st ed. Madhya Pradesh: Printwell Offset Publisher.

Ibrahim, M. M., Alsahli, A. A., & El-Gaaly, G. (2013). Evaluation of phytoremediation potential of six wild plants for metal in a site polluted by industrial wastes: A field study in Riyadh, Saudi Arabia. *Pak. J. Bot., 42*(2), 571-576.

ISO. (1955). *ISO 11466:1995 - Soil quality - Extraction of trace elements soluble in aqua regia*.
ISO. (1990). *ISO 5508:1990 - Animal and vegetable fats and oils - Analysis by gas chromatography of methyl esters of fatty acids*.
ISO. (2001). *ISO 14870:2001 – Soil quality — Extraction of trace elements by buffered DTPA solution*.
Kabata-Pendias, A. (2010). Trace Elements in Soils and Plants. https://doi.org/10.1201/b10158
Koria, L., & Nithya, G. (2012). Analysis of *Datura stramonium* Linn. biodiesel by gas chromatography-mass spectrometry (GC-MS) and influence of fatty acid composition on the fuel related characteristics. *J Phytol*., *4*,6-9.
McGrath, S. P., Zhao, J., & Lombi, E. (2002). Phytoremediation of metals, metalloids, and radionuclides. *Advances in Agronomy*, 1-56. https://doi.org/10.1016/s0065-2113(02)75002-5
Olowoyo, J. O., Okedeyi, O. O., Mkolo, N. M., Lion, G. N., & Mdakane, S. T. R. (2012). Uptake and translocation of heavy metals by medicinal plants growing around a waste dump site in Pretoria, South Africa. *South African Journal of Botany, 78*, 116-121. https://doi.org/10.1016/j.sajb.2011.05.010
Oseni, O. A., Olarinoye, C. O., & Amoo, I. A. (2011). Studies on chemical compositions and functional properties of thorn apple (*Datura stramonium* L) *Solanaceae*, *Afric J Food Sci., 5*(2), 40-44.
Reeves, R. D., & Baker, A. J. M. (2000). Metal accumulating plants. In: Raskin, I. & Ensley, B. (Eds.), Phytoremediation of Toxic Metals: Using Plants to Clean Up the Environment. Publisher: Wiley, New York, pp. 193–229.
Sayyed, A., & Shah, M. (2014). Phytochemistry, Pharmacological and Traditional Uses of Datura stramonium L. *Rev. J. Pharm. Phytochem., 2*, 123–125.
Sheveleva, Y. A., Litvinenko, Y. A., Mukhtarova, N. M., & Khutoryanskiy, V. V. (2021). AMINO AND FATTY ACID COMPOSITION OF DATURA STRAMONIUM L. (SOLANACEAE). *SERIES CHEMISTRY AND TECHNOLOGY, 4*(448), 61-67. https://doi.org/10.32014/2021.2518-1491.68
Shirkhani, Z., Chehregani Rad, A., Gholami, M., & Mohsenzadeh, F. (2018). Phytoremediation of Cd-contaminated Soils by Datura stramonium L. *Toxicology and Environmental Health Sciences, 10*(3), 168-178. https://doi.org/10.1007/s13530-018-0361-5
Singh, L. R., & Singh, O. M. (2013). *Datura Stramonium*: an overview of its phytochemistry and pharmacognosy. *Pharmacognosy and phytochemistry. 5*(3),143-148.
Soni, P., Siddiqui, A. A., Dwivedi, J., & Soni, V. (2012). Pharmacological Properties of *Datura stramonium* L. as a Potential Medicinal Tree: An Overview. *Asian Pac. J. Trop. Biomed., 2*, 1002–1008. https://doi.org/10.1016/s2221-1691(13)60014-3
Valieva, A., Garaev, E., Karamli, A., & Huseynova, N. (2022). Analysis of Fatty Acids of Some Hyoscyamus, *Datura*, and Atropa Species from Azerbaijan. *Turk J Pharm Sci.,19*(4),442–446. https://doi.org/10.4274/tjps.galenos.2021.75317
Yuldasheva, N. K., Kadirova, D. B., Ibotov, S. K., Gusakova, S. D., & Aripova, S. F. (2020). Lipids from Seeds of Datura Stramonium. *Chemistry of Natural Compounds, 56*(2), 303-304. https://doi.org/10.1007/s10600-020-03013-2
Zhang, H., Han, C., Wang, M., & Yang, Q. (2008). Fatty acid components in oil from seeds of *Datura stramonium*, 28, 2538–2542.