



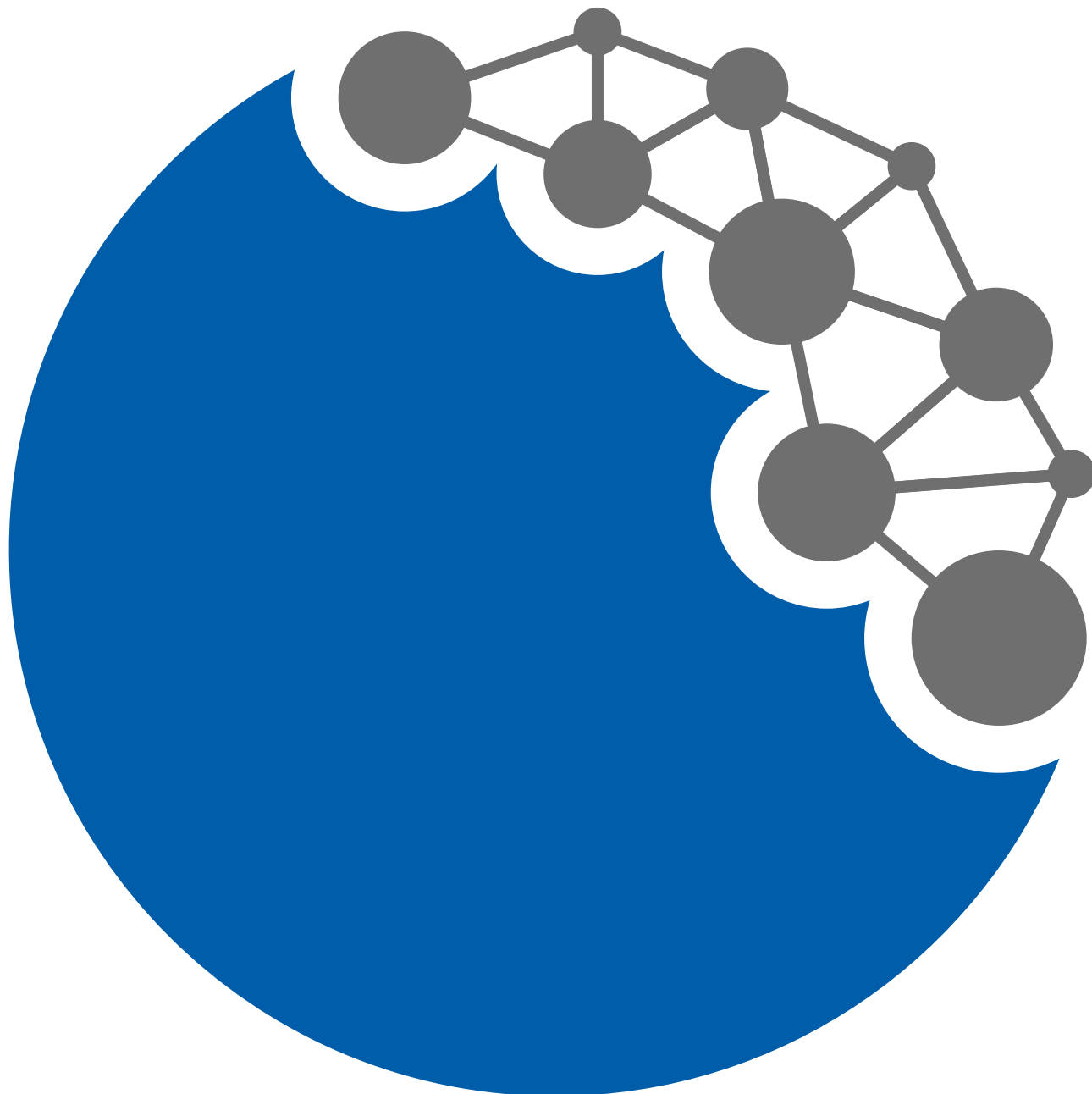
Petr David, Hana Vránová (eds.)

PEFnet 2024

28th European Scientific Conference
of Doctoral Students

November 21, 2024
Extended Abstracts

- MENDELU
- Faculty
- of Business
- and Economics



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PEFnet 2024

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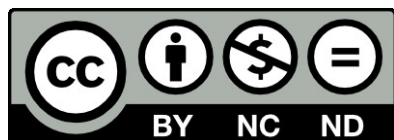
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SUSTAINABILITY AND FLEXIBLE MANAGEMENT

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KEY WORDS

sustainability, flexible management, literature review, business strategies

1 INTRODUCTION

Today, sustainability is recognized as a management approach that is not only limited to the fulfillment of environmental and social responsibilities by businesses, but also enables them to achieve economic success in the long term. In addition, rapidly changing global economic conditions require businesses to show flexibility in the face of uncertainties and develop dynamic strategies. This relationship

between sustainability and flexible management has the potential to increase the competitive advantage of businesses. The purpose of this study is to investigate how the concepts of sustainability and flexible management work together, their applications in the business world and their interactions with each other by examining the existing literature.

2 MATERIAL AND METHODS

In this study, the literature review method was used to address the issues of sustainability and flexible management. The literature review is based on articles, books and reports available in academic databases. The research focused on studies published in the last decade and included studies on the effects of flexible management approaches on sustainability

strategies. The literature review examined conceptual models explaining the links between sustainability and flexibility and their applications in various sectors. In addition, case studies of businesses with successful sustainability practices and their contributions to flexible management processes are analyzed.

3 RESULTS

As a result of the literature review, it has been observed that there are many studies supporting the positive relationship between sustainability and flexible management. In order to successfully implement sustainability strategies, businesses need the ability to adapt quickly to changes in market conditions. There is strong evidence that flexible management approaches improve sustainability performance, especially in the technology, energy and agriculture sectors.

The relationship between flexible management and sustainability: The findings suggest that flexible management approaches provide businesses with resilience in the face of uncertainty, which enables them to effectively implement sustainability strategies. Sectoral differences: The relationship between sustainability and resilience is found to vary across sectors. Especially in the agriculture and energy sectors, where the efficient use of natural resources is vital, flexible management practices facilitated the

achievement of environmental sustainability goals. Examples of successful practices: There are case studies of some successful businesses in the literature that show that flexible management strategies played

a key role in achieving sustainability goals. Thanks to their ability to respond quickly to changing market conditions, these businesses have achieved significant success in achieving their sustainability goals.

4 CONCLUSIONS

This study reveals that the concepts of sustainability and flexible management have a strong relationship with each other and that it is necessary for businesses to adopt flexible management approaches to achieve their sustainability goals. The rapid changes and uncertainties in the business world make it imperative for businesses to have flexible management capabilities to implement long-term sustainability strategies. The findings of the study show that sustainability is not only limited to environmental and social responsibility, but also needs to be supported by the strategic flexibility capabilities of the business.

As a result, it is recommended that businesses should integrate flexible management practices into their strategic plans in order to achieve successful sustainability performance. This integration will both contribute to the realization of long-term environmental goals and enhance the ability of businesses to cope with global uncertainties. Future research can contribute to a deeper understanding of the relationships between resilient management and sustainability by examining the applicability of these two concepts in different sectors and regions.

5 REFERENCES

- [1] BROWN, D., & MARSHALL, S. (2020). *Sustainability in Business: Global Strategies and Management*. Oxford University Press.
- [2] SMITH, R. (2019). Resilience and Flexibility in Management: A Strategic Approach. *Journal of Business Strategy*, 45 (3), 115–130.
- [3] MILLER, J. (2021). Sustainability and Corporate Governance: Bridging the Gap with Adaptive Management. *Harvard Business Review*, 99 (4), 78–89.
- [4] JOHNSON, K., & THOMPSON, G. (2018). The Role of Flexibility in Achieving Sustainable Business Goals. *International Journal of Business Research*, 32 (2), 45–67.
- [5] WILLIAMS, P. (2022). Sectoral Differences in Sustainable Practices: The Impact of Adaptive Management. *Green Business Journal*, 15 (7), 22–35.

INFORMAL INSTITUTIONS IN THE EU AND THEIR IMPACT ON THE UN SUSTAINABLE DEVELOPMENT GOAL 8

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KEY WORDS

sustainable growth, SDG 8, informal institution, European union

JEL CODES

O47, E24, J24

1 INTRODUCTION

This paper focuses on informal institutions' role in achieving the 8th Sustainable Development Goal (SDG 8) of the United Nations, which promotes inclusive and sustainable economic growth, full and productive employment, and decent work for all. SDG 8 is an integral part of the global 2030 Agenda, which seeks balanced economic, social, and environmental development. A key aspect of the successful implementation of SDG 8, alongside formal policies, is the role of informal institutions such as social norms, traditions, and cultural values, which can significantly influence the achievement of these goals in different regions (Bezner-Kerr & Colvin, 2017). The goal is to explore the influence of informal institutions,

represented by public attitudes, on the achievement of SDG 8, which focuses on promoting sustainable economic growth and decent work.

This study finds that Satisfaction with Life and the Importance of Environment have a positive impact on the achievement of SDG 8, as higher life satisfaction encourages greater economic participation, and environmental awareness drives support for sustainable development and innovation. In contrast, the Importance of Traditions negatively affects SDG 8 by resisting change and innovation, which can slow economic progress and reduce the creation of new job opportunities.

2 MATERIAL AND METHODS

Within the European Union, characterised by its economic and cultural diversity, informal institutions play a crucial role in shaping public opinion, economic behaviour patterns, and attitudes toward work (Ostrom, 2009). This article examines how these institutions directly or indirectly impact the fulfilment of SDG 8, particularly in terms of sustainable employment, equitable access to job opportunities, and support for inclusive growth. Based on research by Bezner-Kerr & Colvin (2017) and Marchetti (2021) and Bezner-Kerr (2021), the article analyses the extent to which informal institutions can either support or hinder the effectiveness of sustainable economic policies. The significance of this research lies in linking formal

and informal institutions when designing policies that contribute to achieving SDG 8 across different economic and cultural contexts (Rodrik, 2004).

This study examines the relationship between variables from the European Social Study (ESS, 2024) and the SDG Index (2024), analysing the contribution of each variable to changes in the SDG Index. Data from 24 EU countries from 2014 to 2023 are analysed using panel regression with the OLS method and fixed effects. The model includes control variables such as population density, education, economic openness, economically active population, and inflation. Because of the problems with statistical testing, robust standard errors are used. The main

explanatory variables are: life satisfaction, satisfaction with the economy, gender discrimination, environmental protection, and the importance of traditions are derived from ESS data. These variables are expected to have

a significant impact on the achievement of SDG 8, particularly in the areas of sustainable employment and inclusive growth.

3 RESULTS

The main variables explaining the fulfilment of SDG 8 in the EU were identified as Satisfaction with Life, Importance of Environment, and Importance of Traditions. The control variables include inflation (HICP index), population density, and the labour force share. Higher Satisfaction with Life positively influences the achievement of Goal 8 because, when basic needs are met, people are more engaged in economic activities, promoting growth and job creation. The Importance of Environment also has a positive effect, as those

who prioritise environmental protection often support sustainable development and innovation. In contrast, the Importance of Traditions has a negative impact, as an emphasis on tradition can hinder innovation and the adoption of new technologies, slowing down economic growth. The impact of the control variables is more complex. For example higher inflation reduces purchasing power, leading to lower demand, decreased production, and less need for employees, which in turn hampers economic growth.

4 CONCLUSIONS

This study demonstrates the significant role of informal institutions in influencing the achievement of SDG 8 within the EU, particularly in sustainable economic growth and decent work. Variables such as Satisfaction with Life and the Importance of the Environment positively contribute to these goals by fostering greater engagement in economic activities and supporting sustainable development. Conversely, the Importance of Traditions has a negative impact, as resistance to innovation and new technologies

slows economic progress. The analysis also reveals that socio-economic factors, such as inflation and population density, play a more complex role in shaping outcomes. By highlighting the interplay between formal policies and informal institutions, the study underscores the need for an integrated approach when designing policies to achieve SDG 8, ensuring that cultural and societal norms are considered alongside economic strategies.

5 REFERENCES

- [1] BEZNER-KERR, R., COLVIN, R.: The Role of Informal Institutions in Achieving the Sustainable Development Goals. *World Development* vol. 95 (2017), 25–38.
- [2] BEZNER-KERR, R., COLVIN, R., MUDE, A.: Informal Institutions and the Sustainable Development Goals: Exploring the Interactions between Formal and Informal Institutions. *Journal of International Development* vol. 31, (2019) 789–803.
- [3] European Social Survey (ESS ERIC): *European Social Survey Database*. European Social Survey European Research Infrastructure, (2024).
- [4] MARCHETTI, E.S.P., BEZNER-KERR, R.: Informal Institutions and the Implementation of the Sustainable Development Goals. *Journal of Sustainable Development* vol. 14, 45–60 (2021).
- [5] OSTROM, E.: A general framework for analyzing sustainability of social-ecological systems. *Science* vol. 325 (2009), 419–422.
- [6] RODRIK, D.: Institutions and economic performance: Getting institutions right. *CESifo DICE Report* vol. 2, no. 2 (2004), 10–15.
- [7] SACHS, J.D., LAFORTUNE, G., FULLER, G.: *The SDGs and the UN Summit of the Future*. Sustainable Development Report 2024. Paris: SDSN, Dublin: Dublin University Press, (2024).

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GENERATION Y AND Z ON INSTAGRAM: THE PERCEPTION OF GASTRO BUSINESSES

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KEY WORDS

social media, Instagram, gastro business

JEL CODES

M31, M37

1 INTRODUCTION

Social networks are important in people's daily lives [1]. People share their experiences and emotions, and communicate with friends and family, but also find inspiration and follow different celebrities and popular businesses [2]. However, networks have also become an important marketing communication tool, not excluding the gastronomy sector [3]. Stylized photos of various foods and different video recipes have become such widespread content that they have theoretically earned their own label of "food porn"

[4]. Instagram, which allows sharing both photos and different video formats, is thus an ideal place for product promotion [5].

This contribution aims to identify segments that have a similar perception of the marketing communication of gastronomy businesses and gastronomy-related profiles on the social network Instagram. The research focuses on Generations Z and Y, who are the most active on the networks and are most connected to them [2].

2 MATERIAL AND METHODS

To gather data for further analysis, a qualitative survey conducted through a questionnaire survey (data collection, 2/3/9 2024; n = 465) on Gen Z (n = 253) and Gen Y (n = 212) respondents is used. The questionnaire consists of questions and statements focusing on social network behaviour and preferences regarding Instagram content in the context of the food and food business context. The questions are

mostly closed-ended using a 5-point Likert scale. To establish segments, k-means cluster analysis is used to divide respondents into homogeneous groups according to their preferences. The analysis is performed on the sample of both generations and also on the sample of each generation separately. These segments are then compared with each other.

3 RESULTS

Cluster analysis performed on both generations simultaneously divided respondents into 3 segments (S1, S2, S3) according to their preferences. In the S1 segment (Occasional follower, n = 202; m/f,

57.5/42.5), Generation Z respondents predominate. It is important for this segment that the company has a profile, but they do not follow it regularly. Important for them is mainly the visual aspect of

the profile. Segment S2 (Not following, $n = 60$; m/f, 38.3/61.7) is not interested in company profile, they only search for them occasionally. However, the visual aspects of profiles are also important to them. In the S3 segment (Following, $n = 203$; m/f, 47.3/52.7), Generation Y is dominant. For this segment, the overall presentation of the business is more important, including the visual aspect, but also other content from behind the scenes of the business (such as posts about the raw materials used, sustainability, etc.). At the same time, collaboration between the company and footbloggers is important to them. If they are interested in a profile, they will then start following it.

The third and first segment looks at food-related content most frequently (several times a week).

We obtain similar segments with similar preferences if we apply cluster analysis only to Generation Z respondents. Applying cluster analysis to Generation Y, we obtain similar segments for “Following” and “Not following”. However, the third segment is different and should be defined as “Not following but requiring content”. This segment prefers businesses to have a profile that presents not only visually appealing content but also behind-the-scenes contributions. At the same time, users do not follow businesses and do not plan to follow them.

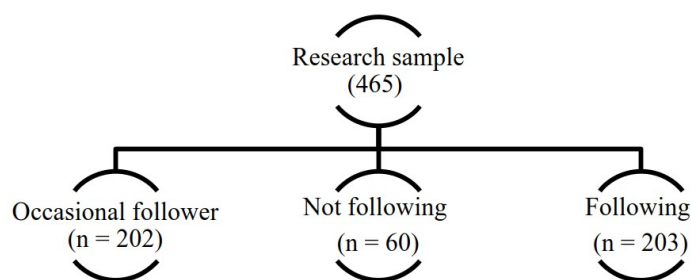


Fig. 1: Size of the segments. Cluster analysis on the sample of both generations

4 CONCLUSIONS

Based on the analysis, we were able to identify two segments in Generation Z and Y with similar preferences. The third segment then differs in content

preferences, with the Generation Y segment having higher requirements for business profile content than Generation Z.

5 REFERENCES

- [1] ZAREIE, A., SHEIKHAHMADI, A., JALILI, M.: Identification of influential users in social networks based on users' interest. *Information Sciences* vol., 493 (2019), 217–231.
- [2] KARDES, F. R., CRONLEY, M. L., CLINE, THOMAS W.: *Consumer behavior*. Boston: Cengage 2e, 2015.
- [3] ELLIOTT, C, TRUMAN, E.: Food Marketing on Digital Platforms: What do teens see?. *Public health nutrition* vol., 27 (2024), 1-27.
- [4] TOOMING, U.: Aesthetics of Food Porn. *Crítica. Revista Hispanoamericana de Filosofía* vol., 53 (2021), 127-150.
- [5] LEE, H., KANG, J. AND NAMKUNG, Y.: Instagram Users' Information Acceptance Process for Food-Content. *Sustainability* vol. 13(5), (2021).

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FUNCTIONAL CURRENCY

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KEY WORDS

functional currency, Act accounting, IAS 21, Exchange differences

JEL CODES

M41, M48, F65

1 INTRODUCTION

This paper focuses on the introduction of functional currency into the accounting legislation in the Czech Republic and its impact on the accounting entity. Until the end of 2023, all accounting units were

obliged to keep their accounts only in the Czech currency, but on the basis of the amended Act it is possible to keep the accounts in USD, EUR or GBP under certain conditions [1].

2 MATERIAL AND METHODS

With effect from 1 January 2024, the consolidation package of the government allowed accounting units to keep their accounts in a currency other than the Czech currency. The condition they had to fulfil was that this currency was their functional currency, i.e. the currency corresponding to their economic environment. At the same time, it could only be the euro, the US dollar or the British pound [5].

The inspiration for the introduction of a functional currency into Czech accounting legislation is the International Accounting Standard IAS 21 - The Effects of Changes in Foreign Exchange Rates. However, it has not been adopted in its full form. The fundamental difference is the fact that the use of the functional currency according to this standard is mandatory, but the draft of the new Accounting Act enshrines it as a right, i.e. only the possibility of its use based on the decision of the accounting unit itself [2]. It follows that even if an entity meets all the conditions for using a functional currency, it does not have to use it compulsorily and can therefore

use the Czech currency even if it is not a functional currency. The purpose of this decision is to allow accounting units to use the currency in which the majority of their transactions are carried out, which will make accounting more efficient. In particular, it will reduce the number of exchange rate conversions and the generation of exchange rate differences and their subsequent accounting treatment [3].

In addition, a decree of the Ministry of Finance may determine the methods of determining the functional currency, the hyperinflationary currency, the conversion upon a change of currency, the conversion to the reporting currency or the methods of converting accounting documents and data of the entities of consolidation of the state into the Czech currency in the case of the preparation of proper consolidated financial statements of the Czech Republic [4].

In this paper, an entity has been selected that meets the conditions for the transition to a functional currency. The proportion of transactions in the

currency to which the entity could switch compared with transactions in CZK was determined. Based on the determined methods, the opening balance sheet was restated for the selected functional currency, the resulting economic transactions were recorded and

then the closing statements were prepared in the functional currency and CZK. Based on a comparison of the results of operations using different currencies, the effects on the entity's operations were determined [6].

3 RESULTS

Based on the statements prepared, it was determined that the change to the functional currency did not have a material impact on the entity's financial result. Exchange differences using the functional currency are lower when using the Czech currency,

but exchange differences have not completely disappeared because the entity must account for exchange differences on all transactions that are in a currency other than the functional currency.

4 CONCLUSIONS

It has been demonstrated that the change to a different accounting currency does not materially affect the entity's profit or loss. It can be assumed that companies belonging to large international holding companies will take advantage of the currency switching option and thus their accounts will be consistent with those of other companies in the holding company, thus facilitating, for example, the consolidation of financial statements.

At the same time, it should be noted that in the Czech Republic, switching to a functional currency

is fraught with pitfalls with regard to the possibility, but not the obligation, to do so. Reverting back to CZK is a very difficult process. Other pitfalls are related to the unpreparedness of the public administration systems for a currency other than CZK. Currently, there are no statistics on the number of accounting units that have used the option of introducing a functional currency. However, given the above mentioned negatives, this will be only a very small percentage of accounting units.

5 REFERENCES

- [1] DAUC.cz. *Česká účetní legislativa od 1. 1. 2024 (podrobněji) a hlavně jak to bude dál?* [online] Dostupné z: <https://www.dauc.cz/clanky/12767/ceska-ucetni-legislativa-od-1-1-2024-podrobneji-a-hlavne-jak-to-bude-dal>
- [2] ALIBHAI, SALIM; BAKKER, ERWIN; BALASUBRAMANIAN, T. V.; BHARADVA, KUNAL; CHAUDHRY, ASIF et al. *Wiley 2023 interpretation and application of IFRS® standards*. Hoboken: Wiley, [2023]. ISBN 978-1-394-18630-3.
- [3] Vyhláška č. 500/2002 Sb.: Vyhláška, kterou se provádějí některá ustanovení zákona č. 563/1991 Sb., o účetnictví, ve znění pozdějších předpisů, pro účetní jednotky, které jsou podnikateli účtujícími v soustavě podvojného účetnictví. In: *Sbírka zákonů*. 2024
- [4] MINISTERSTVO FINANCÍ ČESKÉ REPUBLIKY. *Úpravy konsolidačního balíčku schválené stranami vládní koalice včetně paragrafového znění*. Online. MINISTERSTVO FINANCÍ ČESKÉ REPUBLIKY. Mfcr.cz. 2023. Dostupné z: <https://www.mfcr.cz/cs/ministerstvo/media/tiskove-zpravy/2023/upravy-konsolidacniho-balicku-schvalene-stranami-v-52702>.
- [5] Wolters Kluwer ČR, a. s. *Dopady novely zákona o účetnictví: funkční měna, čistý obrat a zprávy související s účetní závěrkou*. ASPI. [online] Dostupné z: LIT322693CZ - Dopady novely zákona o účetnictví: funkční měna, čistý obrat a zprávy související s účetní závěrkou | ASPI | Wolters Kluwer ČR, a. s.
- [6] KAČR. *Auditor 9/2023: Seznamte se s funkční měnou v novele zákona o účetnictví*. [online] Dostupné z: <https://www.kacr.cz/file/7469/auditor-9-2023.pdf>

UNLOCKING REGIONAL POTENTIAL: HOW SECONDARY TECHNICAL SCHOOLS DRIVE INNOVATION IN CZECH REPUBLIC

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KEY WORDS

regional innovation system, innovation, secondary education, secondary technical education, regional development, regional institutions

JEL CODES

O31, O38, H75, I25

1 INTRODUCTION

Regional Innovation Systems (RIS) represent a model that facilitates the mapping of innovation activities and synergies between diverse regional actors. While previous research on RISs has primarily focused on universities and research institutions (education, science, and research sector), there is a research gap concerning the significance of lower levels of the education, as Krasikova & Ognev (2019) observe. Secondary technical schools (STSs) play a vital role in the formation of human capital, and their involvement in RISs has implications for regional innovation and economic development (Chi & Quian, 2010; Toner, 2011; Pelinescu, 2015; Runde et al., 2017). Furthermore, this involvement is closely related to the development of

regional human capital (Ozier, 2018; Khaemba, 2014). The technical skills and practical experience provided are essential for students' individual career paths and for promoting regional innovation potential. The objective of this research is to map the involvement of STSs in RIS in selected regions of the Czech Republic, examine the ways in which these schools and other RIS actors cooperate and the potential benefits of such cooperation for regional innovation activities. Furthermore, the research investigates the extent to which STSs align with the projected future fields and the manner in which individual RIS actors address them.

2 MATERIAL AND METHODS

This quantitative research was based on a combination of data collection methods and their subsequent analysis. The literature review mapped the theoretical framework and its main trends in RIS research. Subsequently, a web content analysis was conducted, which led to the identification of two categories of joint activities between STSs and RIS actors for all 52 STSs in the selected regions of the Czech Republic (Ústí Region, Karlovy Vary Region, Pilsen Region, and South Moravian Region): 1) activities financed from EU resources and other sources; 2) cooperation between secondary technical schools and

RIS actors. Based on the dataset, the STSs and RIS actors identified as "active" were selected for an empirical investigation conducted in the form of four types of semi-structured interviews with firms, universities and research institutions, regional government, and STSs. The final synthesis provided an extension of the theoretical framework of the RIS model by its expansion to include STSs. Furthermore, the investigation identified functional models of cooperation between RIS actors and STSs in selected regions.

3 RESULTS

The principal findings of the study are the identification of functional collaborations between STSs and RIS actors in four regions of the Czech Republic, which serve to enhance the region's innovation potential. The identified functional collaborations are primarily those between firms or universities and STSs. Such collaborations frequently assume the form of practical training, which is often linked to unique projects that firms and universities are addressing. Moreover, a functional model of cooperation has been developed to elucidate the motivations, modes of

cooperation, outputs and impacts of the joint activities of STSs and individual RIS actors. These functional models of cooperation indicate that motivations and positive outcomes can be identified for all the aforementioned actors, thereby providing evidence that strengthening the degree of their interconnection is a desirable state of affairs. Furthermore, the mapping of “fields of the future”, which are specific to each region, and their reflection by STSs and RIS actors is also beneficial, but not yet well established.

4 CONCLUSIONS

The RIS model can be expanded to reflect a greater focus on education and human resources. While universities and research institutions undoubtedly play a pivotal role, engaging with skilled human resources that are linked to innovation is a far more intricate and long-term endeavour. In addition to the three actors originally conceptualised, STSs also assume a significant role in a complex RIS. The involvement of STSs in RIS comprises a wide range of joint activities with other RIS actors. Typically, collaboration between firms or universities and STSs. Regional government is also involved, often in an initiating capacity. The advantages of collaboration are distributed among all parties involved, fostering a

strong sense of motivation. Nevertheless, at the present time, a considerable number of RIS actors, and even STSs, in the regions of the Czech Republic do not engage in joint activities. This is largely attributable to the transaction costs inherent to the process of negotiation, or alternatively, to a lack of awareness of the potential benefits. Nevertheless, the dissemination of good practices identified in the research can facilitate the advancement of collaboration and inspire RIS actors, including STSs. However, it is not only STSs that play a role in RIS. Further research could concentrate on the role of other sectors of education or other actors (such as the non-profit sector or local leaders).

5 REFERENCES

- [1] CHI, W., & QIAN, X. (2010). The role of education in regional innovation activities: spatial evidence from China. *Journal of the Asia Pacific Economy*, 15(4), 396–419. <https://doi.org/10.1080/13547860.2010.516158>.
- [2] KHAEMBA, B. & SAKWA, DR & WACHILONGA, L. (2014). Relationship between Education Financing and Human Capital Investment: a survey of Public secondary schools in Kimilili-Bungoma Sub- County. *International Journal of Academic Research in Business and Social Sciences*. 4. 10.6007/IJARBS/v4-i4/772.
- [3] KRASIKOVA, T. Y. & OGNEV, D. V. (2019). Regional Educational System as an Element of Regional Innovative System. *Proceedings of the Internation Conference on 'Humanities and Social Sciences: Novations, Problems, Prospects' (HSSNPP 2019)*, 710–714. doi:10.2991/hssnpp-19.2019.135.
- [4] OZIER, O. (2018). The Impact of Secondary Schooling in Kenya. *Journal of Human Resources*, 53 (1) 157-188; DOI: 10.3368/jhr.53.1.0915-7407R.
- [5] PELINESCU, E. (2015). The Impact of Human Capital on Economic Growth. *Procedia Economics and Finance*. 22. 10.1016/S2212-5671(15)00258-0.
- [6] RUNDE, D. F. & RICE, C. & YAYBOKE, E. (2017). Education and Human Capital Development. In *Innovation-Led Economic Growth: Transforming Tomorrow's Developing Economies through Technology and Innovation* (pp. 1–7). Center for Strategic and International Studies (CSIS). <http://www.jstor.org/stable/resrep23182.6>.
- [7] TONER, P. (2011). Workforce Skills and Innovation: An Overview of Major Themes in the Literature. *OECD Education Working Papers*, No. 55, OECD Publishing, Paris, <https://doi.org/10.1787/5kgk6hpnhxzq-en>.

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BRIDGING THOUGHT AND APPLICATION: PATCHING THE BLOCKS AND NAVIGATING A TECHNICAL PROJECT WITHOUT A MAP

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KEY WORDS

analysis, innovation, design, development, management

JEL CODES

O31, O32, I23

1 INTRODUCTION

In technical fields, transforming a conceptual idea into a practical application poses several challenges. This study focuses on the analysis and management of a project developing new, cost-effective soldering technology for high-precision applications, such as lithography, medical devices, and aerospace. Current soldering technologies are expensive, making them inaccessible to smaller firms with limited budgets[1]. Working in a small team, I balance technical devel-

opment with time management, financial constraints, and multidisciplinary challenges. The objective of this study is to analyse the project's current state and prepare recommendations of the relevant management tools implementation. While doing so, I demonstrate the need to move away from traditional corporate-driven approaches and adopt a human-centered, dynamic framework for R&D projects within an academic setting.

2 MATERIAL AND METHODS

The current status of the project is illustrated with the SWOT analysis[2]. I assess project's internal strengths and weaknesses, along with external opportunities and threats. To refine the project's management strategies, a modified solution tree[3] is utilized. I map out encountered challenges and possible solutions exploring relevant management methods on the way. It is found out that several management tools have already been intu-

itively implemented (vendor consolidation[4], 5S[5]) at the workplace. The implementation effect is demonstrated in examples. In an effort to move towards a more sustainable approach, I examine applicable methods such as Eisenhower Matrix[6], Gantt charts[7], Agile mindset and additional Agile extensions as Mindfulness Practices and Weekly Stand-up Meetings[8-10].

3 RESULTS

The application of management tools in the development of cost-effective glass-metal soldering technology was evaluated. A SWOT analysis revealed key strengths such as technical expertise and access to resources, while highlighting weaknesses like limited funding and undefined deadlines leading to crunch time practice and team burnout. Opportunities for partnerships were identified, alongside the threat of losing investor interest if milestones are not met.

4 CONCLUSIONS

This study offers a glimpse into the realities of managing technical research and development (R&D) projects. The objective was to demonstrate how management techniques can be effectively applied to the often “unmanageable” aspects of R&D, illustrating that even in the face of dynamic project demands, structured approaches can help streamline progress. While some management tools are applied

The practical example of successful management is presented: vendor consolidation was implemented intuitively to reduce logistical costs, while 5S practices helped streamline workspace organization and improve overall efficiency.

The recommendation of the introduction of new management tools is prepared. Expected result is the improvement of long-term planning and task prioritization as well as enhanced team communication.

intuitively, a mindful and deliberate approach is essential. This research moves beyond traditional corporate models, advocating for a more nuanced understanding of project management in an academic setting. Additionally, it highlights the urgent need for talented, open-minded managers in niche scientific environments.

5 REFERENCES

- [1] RIBES-PLIEGUEZUELO, P.: Solderjet bumping packaging technique optimization for the miniaturization of laser devices. *Journal of the European Optical Society*, 13, 34 (2017).
- [2] HELMS, M.: Exploring SWOT analysis – where are we now?: A review of academic research from the last decade. *Journal of Strategy and Management*, 3, 3 (2010), 215-251.
- [3] SNOWDON, W.: Problem and solution trees: a practical approach for identifying potential interventions to improve population nutrition. *Health Promotion International*, 23, 4 (2008), 345-353.
- [4] ÜLKÜ, M.: Dare to care: Shipment consolidation reduces not only costs, but also environmental damage. *International Journal of Production Economics*, 139, 2 (2012), 438-446.
- [5] SENTHIL KUMAR, K. M.: Implementation of 5S practices in a small scale manufacturing industry. *Materials Today: Proceedings*, 62, 4 (2022), 1913-1916.
- [6] KENNEDY, D.: The Illusion of Urgency. *American Journal of Pharmaceutical Education*, 86, 7 (2022), 8914, 789-795.
- [7] WILSON, J.: Gantt charts: A centenary appreciation. *European Journal of Operational Research*, 149, 2 (2003), 430-437.
- [8] ANDRIYANI, Y.: Reflection in Agile Retrospectives. *Agile Processes in Software Engineering and Extreme Programming: 18th International Conference*, Springer Nature, Gewerbstrasse 11, 6330 Cham, Switzerland, 2017, 3-19.
- [9] DEN HEIJER, P.: Don't Forget to Breathe: A Controlled Trial of Mindfulness Practices in Agile Project Teams. *Agile Processes in Software Engineering and Extreme Programming: 18th International Conference*, Springer Nature, Gewerbstrasse 11, 6330 Cham, Switzerland, 2017, 103-118.
- [10] ANDRIYANI, Y.: Knowledge Management and Reflective Practice in Daily Stand-Up and Retrospective Meetings. *Agile Processes in Software Engineering and Extreme Programming: 18th International Conference*, Springer Nature, Gewerbstrasse 11, 6330 Cham, Switzerland, 2017, 285-297.

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DECENTRALIZED IDENTITY AND SELF-SOVEREIGN IDENTITY IN IOT ENVIRONMENTS: NEW BLOXBERG BLOCKCHAIN DID METHOD

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KEY WORDS

Decentralized Identity, Self-Sovereign Identity, Internet of Things, Bloxberg Blockchain, Identity Management

JEL CODES

C63, D83, L86

1 INTRODUCTION

The rapid expansion of the Internet of Things (IoT) has intensified the need for effective identity management solutions that are robust, scalable, and secure. Traditional centralized identity systems are increasingly inadequate due to vulnerabilities related to privacy, data security, and user control. Decentralized Identity (DID) and Self-Sovereign Identity

(SSI) present promising alternatives by decentralizing identity data control, thereby enhancing security and user autonomy (Lesavre, 2020; Drăgnoiu et al., 2020). This paper explores the integration of SSI within IoT environments and introduces a novel DID method based on the Bloxberg blockchain to address existing challenges.

2 MATERIAL AND METHODS

This study evaluates current SSI solutions in IoT through a comprehensive literature review, identifying key benefits, challenges, and limitations (Lesavre, 2020; Stokkink et al., 2021). We propose a decentralized identity method leveraging the Bloxberg blockchain, a permissioned blockchain developed by

the Max Planck Society. The technical architecture encompasses identity generation, resolution, and verification processes, utilizing smart contracts for access control. Performance evaluations are conducted via simulations and real-world testbeds to assess scalability, latency, and security metrics.

3 RESULTS

The proposed Bloxberg-based DID method demonstrates significant improvements in scalability and security within IoT environments. Simulations

indicate reduced latency and enhanced transaction throughput compared to traditional centralized systems. Real-world testbed implementations confirm

the method's robustness against common security threats and its ability to efficiently manage a high volume of IoT device identities. The integration

of smart contracts facilitates automated and secure access control, ensuring reliable identity verification and resolution.

4 CONCLUSIONS

This research presents a viable blockchain-based SSI solution tailored for the dynamic IoT landscape. The novel DID method using Bloxberg blockchain addresses critical issues of scalability, security, and user autonomy inherent in traditional

identity management systems. Future work will focus on optimizing the method for broader IoT applications and exploring additional blockchain integrations to further enhance system resilience and interoperability.

5 REFERENCES

- [1] DRĂGNOIU, A., OLIMID, F. R., ȘTEFĂNESCU, A.: *Identity Management on Blockchain – Privacy and Security Aspects*. Cornell University (2020), 1-13.
- [2] LESAVRE, L.: *A Taxonomic Approach to Understanding Emerging Blockchain Identity Management Systems*. NIST Cybersecurity White Paper (2020), 1-27.
- [3] STOKKINK, Q. et al.: *A Truly Self-Sovereign Identity System*. *Proceedings of the IEEE Local Computer Networks (LCN) Symposium* (2021), 1-8.

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ILLUMINATING INEQUALITY: INTRA-STATE ECONOMIC CONVERGENCE AND REGIONAL DISPARITIES IN KARNATAKA, INDIA

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1 INTRODUCTION

The concept of regional economic convergence, where poorer regions grow faster than richer ones, remains a central theme in economic research. While classical theory suggests convergence should occur due to diminishing returns to capital, the reality is more complex, particularly in developing economies. In India, state-level studies have shown mixed results, with some regions diverging rather than converging due to disparities in infrastructure, productivity, and policy decisions. Intra-state inequalities, especially in

large states like Karnataka, have received less attention. Karnataka's north-south divide, particularly between the prosperous Bengaluru region and the underdeveloped Hyderabad-Karnataka (HK) region, highlights these disparities. This paper examines economic convergence between villages in Karnataka, using nightlight data. The paper also looks at the disparity between regions within Karnataka regarding the growth.

2 DATA

We measure village-level economic growth using data from the DMSP (Defense Meteorological Satellite Program) and VIIRS (Visible Infrared Imaging Radiometer Suite) satellites. The DMSP satellite provides annual average light intensity data ranging from 0 to 63, from 1992 to 2013, at a minimum

spatial resolution of 2.7 square kilometers per pixel. With a spatial resolution of 750 meters per pixel, VIIRS (Visible Infrared Imaging Radiometer Suite) is recognized as a superior source for nightlight data to proxy economic activities, particularly in less densely populated regions (Gibson et al, 2021).

3 EMPIRICAL METHODS

This study tests the absolute convergence and conditional convergence of nightlight growth through β convergence method (Baumol, 1986). The following models are employed.

$$g_{y_{i,d,t,t-k}} = \beta_0 + \beta_1 \log y_{i,d,t-k} + \epsilon_{i,t,t-k}, \quad (1)$$

Where $g_{y_{i,d,t,t-k}}$ stands for the compounded annual growth of night lights of village i in the district of d between years t and $t - k$, $y_{i,d,t-k}$ is the light in the initial year, ϵ is the error term.

$$g_{y_{i,d,t,t-k}} = \beta_0 + \beta_1 \log y_{i,d,t-k} + \beta_2 \text{zerodumm } y_{i,t-k} + \gamma_d + \epsilon_{i,t,t-k} \quad (2)$$

In this equation, which is modified from eq(1), β_2 captures the impact of night light growth of those villages that had no nightlight in the initial year. γ is the district-level fixed effects.

To understand the difference in growth rate between different regions within Karnataka, we employ the equation (3).

$$g_{y_{i,d,t,t-k}} = \beta_0 + \beta_1 \text{Region } n_{i,d} + \epsilon_{i,t,t-k} \quad (3)$$

4 KEY FINDINGS

Results from our beta convergence tests revealed that absolute and conditional convergence exists between villages in Karnataka in both periods we have examined, i.e. 1994 – 2013 and 2012-2019. These convergence tests demonstrate that less developed regions are catching up with the more prosperous states in terms of growth since 1994, at a much higher convergence rate than previously predicted by literature. However, rapid convergence regional imbalances persist within Karnataka. The Hyderabad-Karnataka region has been significantly behind the

Here, the $\text{Region}_{i,d}$ is a dummy variable indicates 1 if the village i is in the district d that belong to HK region and 0 otherwise.

rest of the state in terms of nightlight growth over the years. This suggests that, despite several states in India experiencing rapid economic growth, particularly after liberalisation policies, growth tends to cluster in specific areas within these states. This trend is also evident in Karnataka, where Bangalore dwarfs other regions regarding economic growth. This study highlights the need for region-specific development policies and the promotion of infrastructure and industry investment to achieve more balanced growth within the state.

5 REFERENCES

- RAO, M. G., & SEN, K. (1997). Internal migration, center-state grants, and economic growth in the states of india: A comment on Cashin and Sahay. *Staff Papers (International Monetary Fund)*, 44(2), 283-288.
- TRIVEDI, K. (2003). *Regional convergence and catch-up in India between 1960 and 1992*. UK: Nuffield College.
- BANDYOPADHYAY, S. (2004). Twin peaks: distribution dynamics of economic growth across Indian states. *Growth, inequality and poverty: prospects for pro-poor growth*.
- GHATE, C., & WRIGHT, S. (2012). The “V-factor”: Distribution, timing and correlates of the great Indian growth turnaround. *Journal of Development Economics*, 99(1), 58-67.
- CHAKRAVARTY, P., & DEHEJIA, V. (2017). Will GST exacerbate regional divergence. *Economic and political weekly*, 52(25&26), 97-101.
- BAUMOL, W. J. (1986). Productivity growth, convergence, and welfare: what the long-run data show. *The american economic review*, 1072-1085.
- BARRO, R. J., & SALA-I-MARTIN, X. (1992). Convergence. *Journal of political Economy*, 100(2), 223-251.
- DE LONG, J. B. (1988). Productivity growth, convergence, and welfare: comment. *the american Economic Review*, 78(5), 1138-1154.
- BERNARD, A. B., & JONES, C. I. (1996). Comparing apples to oranges: productivity convergence and measurement across industries and countries. *The American Economic Review*, 1216-1238.
- KUMAR, U., & SUBRAMANIAN, A. (2012). Growth in India’s states in the first decade of the 21st century: four facts. *Economic and Political Weekly*, 48-57.
- HENDERSON, J. V., STOREYGARD, A., & WEIL, D. N. (2012). Measuring economic growth from outer space. *American economic review*, 102(2), 994-1028.
- LESSMANN, C., & SEIDEL, A. (2017). Regional inequality, convergence, and its determinants—A view from outer space. *European Economic Review*, 92, 110-132.
- BASHER, S. A., BEHTARIN, J., & RASHID, S. (2022). Convergence across subnational regions of Bangladesh—what the night lights data say?. *World Development Sustainability*, 1, 100001.
- CHANDA, A., & KABIRAJ, S. (2020). Shedding light on regional growth and convergence in India. *World Development*, 133, 104961

THE SECTOR CONCEPT TO THE VAT GAP

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KEY WORDS

Value added tax (VAT), VAT gap, Gross Value Added, economic sectors

JEL CODES

H26, C33

1 INTRODUCTION

Several economic, social, or political factors influence the VAT gap. Some authors interested in VAT gap factors have implemented into their research share of some sectors of total GDP, e.g.: construction; manufacturing; industry, and agriculture (Cevik et al., 2019; Poniatowski et al., 2020). Christou et al. (2021) dealt with an analysis, of which productive sectors play a more significant role in Greece's VAT revenue collection, their research was focused only on the economy of Greece. A broader sectoral analysis of the VAT gap is still lacking.

This paper fills this gap by presenting a broad analysis of the impact of all economic sectors on

the VAT gap. It processes data from 21 European countries for the period 2000 to 2021. Strongly balanced panel data like this contains observations about different cross sections across time, so it contains more information, more variability, and more efficiency.

Studying the VAT gap from a sectoral perspective helps identify sectors with the biggest (and significant) volume of VAT fraud. With this knowledge, it is possible to develop recommendations targeted at the sector with the largest VAT gap.

2 MATERIAL AND METHODS

The research processes panel data, containing information over different periods for separate cross-sectional units. Panel data enables us to control for characteristics that do not change over time but vary across entities (country-fixed effects), or characteristics that change over time but not across entities (time-fixed effects). To estimate the Fixed effects model with different intercepts between entities, the dummy variable technique is used. Such estimation models are often referred to as the Least Squares Dummy Variable (LSDV) technique (Zulfikar, 2018),

Equation 1 contains this technique:

$$Y_{it} = \alpha_0 + \sum_{k=1}^{I-1} \alpha_k D_{k,it} + \sum_{l=1}^{T-1} \theta_l T_{l,it} + \beta_1 X_{1,it} + \dots + \beta_{k,it} X_{k,it} + \alpha_i + u_{it} \quad (1)$$

Data for the analysis were collected mainly from the Eurostat database and the World Bank database. Data are collected from 22 European countries for the period from 2000 to 2021, which gives in total of 462 observations.

The dependent variable in this study is the VAT gap calculated by the Center for Social and Economic Research (hereinafter 'CASE'). In these reports is used top-down approach for estimation of the VAT

gap, specifically the consumption-side method. This method aims to calculate the VAT total theoretical liability (VTTL) as the sum of the liability from components: final consumption of households, governments, and non-profit institutions servings to households (NPISH), intermediate consumption, and gross fixed capital formation (Poniatowski et al., 2020). The biggest advantage of this method is the fact, that authors account for country-specific tax regulations, such as exemptions for small businesses, non-deductible business expenditures and so on (Poniatowski et al., 2020). Each CASE final report included VAT gap calculations for a longer period (5

to 10 years), so the examined period from 2010 to 2021 is covered by at least two reports.

The independent variables consist mainly of the share of each sector's gross value added on the total of each country's gross value added for every year. Sectors are broken down by NACE Revision 2 Standard at the level of sections which are coded under letter A to U.

As control variables, there are added World governance indicators from the database of World Bank Group: voice and accountability, political stability and absence of violence/terrorism, government effectiveness, regulatory quality, rule of law, and control of corruption.

3 RESULTS

According to the model with individual fixed effects 14 sectors out of 17 total play a significant role in the extent of the VAT gap in European countries.

According to the model with individual and time-fixed effects, only 7 sectors out of 17 total sectors play a significant role in the extent of the VAT gap in European countries.

Among time fixed effects variables are eight years statistically significant. These years are 2005, 2015, 2016, 2017, 2018, 2019, 2020, 2021. As the next step, it is appropriate to test for structural breaks in the panel data model. Sequential test for multiple breaks at unknown breakpoints detected 4 breaks, specifically: 2003, 2008, 2011, and 2015.

4 CONCLUSIONS

A model with country-fixed effects revealed 14 sectors (agriculture, industry sector, and sector of services) out of 17 total as significant to the VAT gap. A model with time and country fixed effects revealed only 7 sectors (agriculture and industry sector) out of 17, these findings may indicate some structural changes that affect all of the countries.

A model with time-fixed effects revealed some statistically significant time dummy variables, so a test for multiple breaks at unknown breakpoints was implemented on the model, this test revealed 4 structural breaks in a year: 2003, 2008, 2011, and 2015. As a further investigation, it is recommended to focus on changes in legislation related to the VAT in each country in these years.

5 REFERENCES

- [1] CEVIK, S., GOTTSCHALK, J., HUTTON, E., JARAMILLO, L., KARNANE, P., & SOW, M. Structural transformation and tax efficiency. *International Finance*, vol. 22 (2019) , 341-379.
- [2] CHRISTOU, A., ERIOTIS, N., LOMIS, I., PAPADAKIS, S., & THALASSINOS, E. The Greek VAT gap: the influence of individual economic sectors. *European Research Studies Journal* vol. 24 (2021), 851-882.
- [3] PONIATOWSKI, G., ŚMIETANKA, A., & BONCH-OSMOLOVSKIY, M. *Study and reports on the VAT gap in the EU-28 member states: 2020 final report*. CASE Research Paper(503).
- [4] ZULFIKAR, R. Estimation model and selection method of panel data regression: An overview of common effect, fixed effect, and random effect model. *JEMA: Jurnal Ilmiah Bidang Akuntansi*, vol. 9 (2021), 1-10.

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HYBRID MANAGEMENT ORGANISATIONS AND PROCESSES USING THE EXAMPLE OF A NON-PROFIT ORGANISATION

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KEY WORDS

Obedience principle, management methods, hybrid management

JEL CODES

D23, M12, N01

1 INTRODUCTION

The VUCA (Volatility, Uncertainty, Complexity, Ambiguity) model, which describes the environment, is being replaced by the BANI (Brittle, Anxious, Nonlinear, Incomprehensible) model, which focuses more on human reactions and coping strategies in chaotic situations. In this context, the paper explores the benefits of a corporate management model of the Order of St. John, a charitable organisation founded in the 11th century. Over the last centuries, the Order adapted to changing circumstances, eventually becoming a modern welfare organisation. A central theme in the Order's management is the principle of obedience, which ensures disciplined and efficient

operations. This principle is not about blind subordination but about respecting and implementing leadership decisions while allowing for questioning if decisions are deemed wrong or immoral. The paper compares this with modern management methods, which blend traditional hierarchical control with participatory approaches to enhance efficiency and employee motivation. The paper also highlights the importance of recruiting highly motivated and ethically stable managers in non-profit organisations who can navigate the complexities of modern management while upholding the organisation's values and mission.

2 MATERIAL AND METHODS

The paper uses a so-called "Group Discussion Procedure" (GDP) to analyse the relevance of the principle of obedience in the Order of St John for modern organisations. The guided discussion of three senior managers of the Order of St John explores how integrating hybrid management approaches can help organisations balance clear structures with flexibility and employee engagement. On the one

hand, the GDP is chosen as the qualitative research instrument, focusing on collective attitudes and group orientations rather than individual experiences [1]. On the other hand, the GDP is based on Mannheim's sociology of knowledge and aims to uncover stable collective orientation patterns rather than changeable opinions [2].

3 RESULTS

The results present a comprehensive analysis of the challenges faced by the discussing key figures (Master, Chancellor and Secretary-General) of the Order of St. John. Trust is a recurring theme, illustrating how the leadership relies on each other for operational and strategic decisions. The paper notes that while excessive affirmation can be perceived negatively, the discussants maintain a balanced approach. The paper also compares the right to give instructions with the principle of obedience, suggesting a differentiated and nuanced approach to management and leadership. Unlike rigid command structures in military contexts, the Order emphasises trust and performance. Managers are encouraged to foster a respectful environment, balancing performance metrics with trust-building efforts. This dual focus is vital for adapting to

changes and maintaining organisational effectiveness. The Order is confronted with significant challenges, including financial, personnel, and managerial issues, requiring a shift in corporate culture. In contrast to traditional profit-driven companies, the Order's mission combines social service with promoting Christian values. The present paper highlights the importance of strategic development in addressing these challenges while maintaining a commitment to ethical service. Despite the potential of its traditions, the Order grapples with modern leadership deficits and the integration of artificial intelligence in its operations. Overall, the paper underlines the complexity of managing the navigation between tradition and modernity, which should also meet the mission and organisational structure requirements.

4 CONCLUSIONS

Hybrid management benefits non-profits facing uncertain funding and changing demands, enabling quicker adaptation to external challenges. Transitioning to hybrid structures can be difficult, requiring cultural changes and a willingness to move away from traditional hierarchies. Successful implementation involves thorough training, ongoing support, and clear communication to prevent conflicts between traditional and agile teams. Trust within the

organisation is highlighted as crucial, alongside performance metrics, to foster a positive culture and enhance adaptability during change. Overall, hybrid management approaches can significantly improve the efficiency and effectiveness of non-profits, allowing them to better fulfil their missions by integrating traditional values with modern management practices.

5 REFERENCES

- [1] LAMNEK, S. *Gruppendiskussion. Theorie und Praxis*. 2., überarb. und erw. Aufl. Beltz, Weinheim, Basel, 2005.
- [2] HUSCHBECK, T. Die Wissenssoziologie Karl Mannheims anhand seiner Theorie und einhergehender lebensnaher Betrachtungen. In: EAB - Publishing, ed. *Akademische Essays aus dem Bereich der interdisziplinären Wissenschaften zur Anwendung in Theorie und Praxis*, Readbox Unipress, Dortmund, 2020, pp. 82-95.

CSR IN THE BANKING SECTOR: LITERATURE REVIEW AND MATERIAL DESCRIPTION

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KEY WORDS

ESG, Stakeholder, Sustainability, Millennials

JEL CODES

A13, E59, M14

1 INTRODUCTION

The Global Financial Crisis of 2007-2009, one of the most significant financial downturns since the Great Depression, reshaped global financial markets and regulatory frameworks [1]. A key issue was the erosion of trust in financial institutions due to unethical banking practices [2]. In response, the financial sector has placed greater emphasis on Corporate Social Responsibility (CSR), as stakeholders demand more transparency and ethical conduct.

CSR has become a crucial tool for banks to rebuild trust, particularly among younger generations like millennials, whose values strongly influence corporate reputations. This study explores the CSR measures most valued by German bank customers, focusing on millennials, and examines how these contribute to trust and corporate reputation in the financial sector.

2 MATERIAL AND METHODS

A mixed-method approach was used to address the research questions, combining qualitative and quantitative methods to offset each approach's limitations. Triangulation was applied to enhance validity [3]. The study included extensive literature research, followed by quantitative data collection and primary analysis, complemented by expert interviews to ensure causality.

For the literature review, only recent, high-quality sources (preferably within the last 10 years) from peer-reviewed journals and professional sources were included. Non-peer-reviewed articles were excluded, and only English and German literature was considered. MaxQDA software was used to code the

literature inductively and deductively. A total of 2,276 codes were analyzed.

To estimate the relationship between CSR, trust, reputation, and economic value, a quantitative method was applied using a web-based structured questionnaire. Data collection occurred between January 12, 2024, and February 11, 2024, targeting a random sample of millennials in Germany. The questionnaire, based on validated literature, consisted of two parts: socio-demographic data and questions addressing the research model variables. These questions assessed CSR (6 items), trust (5 items), and corporate reputation (5 items) using a 5-point Likert scale [4-12].

3 RESULTS

The study found that millennials prefer financial institutions that align with their values, particularly in terms of ethical practices and social responsibility. CSR was shown to significantly impact corporate reputation and trust. A key finding was that trust serves as a mediator between CSR initiatives and

corporate reputation, highlighting the importance of ethical banking practices in rebuilding customer relationships. The survey also indicated that millennials are more likely to engage with banks that demonstrate a genuine commitment to social and environmental issues.

4 CONCLUSIONS

CSR plays a critical role in enhancing corporate reputation and building trust in the banking sector, particularly among millennial customers. The findings support the idea that CSR is not merely a marketing tool but an integral part of long-term business strategy. Banks that prioritize ethical

behaviour and transparency are better positioned to maintain customer loyalty and foster sustainable development. Future research should further explore the relationship between CSR, trust, and corporate performance in different banking contexts.

5 REFERENCES

- [1] AKINBAMI, FOLARIN (2011). Financial services and consumer protection after the crisis. *International Journal of Bank Marketing* 29 (2), 134–147. <https://doi.org/10.1108/02652321111107620>.
- [2] HONEGGER, CLAUDIA/NECKEL, SIGHARD/MAGNIN, CHANTAL (Eds.) (2010). *Strukturierte Verantwortungslosigkeit. Berichte aus der Bankenwelt*. Berlin, Suhrkamp Verlag.
- [3] BAUR, NINA/BLASIUS, JÖRG (Eds.) (2014). *Handbuch Methoden der empirischen Sozialforschung*. Wiesbaden, Springer Fachmedien Wiesbaden.
- [4], [12] LECLERCQ-MACHADO, LUIGI/ALVAREZ-RISCO, ALDO/ESQUERRE-BOTTON, SHARON/ALMANZA-CRUZ, CAMILA/LAS MERCEDES ANDERSON-SEMINARIO, MARIA DE/DEL-AGUILA-ARCENTALES, SHYLA/YÁÑEZ, JAIME A. (2022). Effect of Corporate Social Responsibility on Consumer Satisfaction and Consumer Loyalty of Private Banking Companies in Peru. *Sustainability* 14
- [5] PÉREZ, ANDREA/MARTÍNEZ, PATRICIA/DEL RODRÍGUEZ BOSQUE, IGNACIO (2013). The development of a stakeholder-based scale for measuring corporate social re-sponsibility in the banking industry. *Service Business* 7 (3), 459–481. <https://doi.org/10.1007/s11628-012-0171-9>.
- [6], [10] FATMA, MOBIN/RAHMAN, ZILLUR/KHAN, IMRAN (2015). Building company reputation and brand equity through CSR: the mediating role of trust. *International Journal of Bank Marketing* 33 (6), 840–856. <https://doi.org/10.1108/IJBM-11-2014-0166>.
- [7] MORGAN, ROBERT M./HUNT, SHELBY D. (1994). The Commitment-Trust Theory of Relationship Marketing. *Journal of Marketing* 58 (3), 20–38. <https://doi.org/10.1177/002224299405800302>.
- [8] SIRDESHMUKH, DEEPAK/SINGH, JAGDIP/SABOL, BARRY (2002). Consumer Trust, Value, and Loyalty in Relational Exchanges. *Journal of Marketing* 66 (1), 15–37. <https://doi.org/10.1509/jmkg.66.1.15.18449>.
- [9] ZULU-CHISANGA, STELLA (2019). Does CSR Enhance Young Bank Customers' Satisfaction and Loyalty in a Developing Economy? The Mediating Role of Trust. *Journal of Accounting and Finance in Emerging Economies* 5 (2), 325–342. <https://doi.org/10.26710/jafee.v5i2.938>
- [11] PETRICK, JAMES F. (2002). Development of a Multi-Dimensional Scale for Measuring the Perceived Value of a Service. *Journal of Leisure Research* 34 (2), 119–134. <https://doi.org/10.1080/00222216.2002.11949965>.

LITERATURE REVIEW: COLLABORATIVE VR IN EDUCATION

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KEY WORDS

virtual reality, teaching, education, collaboration, spatial data

JEL CODES

C88, L86

1 INTRODUCTION

In recent years, the idea of using virtual reality in teaching is emerging in many studies and experiments. Although immersive virtual reality appears to be a valuable tool to be used in teaching different topics, many authors and teams faced problems while implementing this technology into practical use. Problems begin with students having little or none of experience with virtual reality and needed hardware, inability to obtain enough of the hardware to fulfill the needs of the whole class, complexity of implementation of study resources in virtual reality environment, to finding a practical applications of experiments, where the virtual reality can really

benefit the students in comparison to traditional methods.

Several research papers [1, 2, 3] agree that there need to be more experiments in different study fields to create a set of topics, where virtual reality can be beneficial. Intent of this research is to summarize pros and cons of previously conducted experiments that can be used to improve the design of these types of experiments in our future research. Focus will be given to specific attributes of the experiment, such as number of participants, environment or teaching use cases.

2 MATERIAL AND METHODS

First, regarding the number of participants, most papers [3, 4, 5] use a group of students at their institute or people that need some specific training for their work. According to a systematic review of teaching in virtual reality between years 2009 and 2022 that analyzed 46 articles [3], the number of participants there varied from 24 to 162 participants in teaching experiments, most commonly from 40 to 90 participants. During collaborative VR experiments, also the size of collaborating groups matters. Paulsen et al. [2] provided information that in 11 analyzed

collaborative experiments, the group sizes varied with groups of 2, 3, 5 and 6 participants.

Secondly, regarding time spent in VR during experiments, participants spent less than one hour in VR, usually even less than 15 minutes [2, 3]. The time was a little longer for collaborative VR tasks. According to the provided information, participants spent only one such session in VR during experiments. The only exception is [1] with a two-day experiment that took place over a two-week period. Students without experience with VR

became more comfortable with the technology thanks to the extended period.

Regarding the experiment environment, the first option are 360-degree photographs or videos [4]. The second option is a setup with artificial 3D models, e.g. a serious game [6]. Usually, lower resolution artificial models are used there and such applications are less realistic but enable more interactivity. Alqurafi et al. [1] created a simulated laboratory where dangerous experiments can take place.

3 RESULTS

Previous research included a sufficient number of participants and various environments. However, a crucial problem lies in the experiment length. We believe a single-term experiment is not sufficient as users do not have time to learn working in VR

Finally, regarding the testing method, most studies focus on the impact of VR on learning and subjective emotions of participants. Students are usually given a pretest, posttest and a qualitative questionnaire. Most studies measure performance either only in VR, or have 2 groups, one in VR and the second taught traditionally. However, the comparison is often difficult as the content is significantly different for VR and 2D [1, 5].

4 CONCLUSIONS

We performed a thorough review to find out the current state in the field of collaborative VR for teaching. A research gap was identified and a series of

effectively. Hence, the results may be biased. Our plan is to perform experiments that will involve multiple sessions over several weeks. The focus will be on teaching water management courses with the use of collaborative VR and spatial data.

5 REFERENCES

- [1] ALQURAFI, M., MAQSOOD, E., ALSAGGAF, W.: Effectiveness of a Virtual Laboratory to Develop the Skills of Identifying Fiber Type Using Chemical Methods. *Comp. IT. Sci* 12, 2 (2023), 39-53.
- [2] PAULSEN, L., DAU, S., DAVIDSEN, J.: Designing for collaborative learning in immersive virtual reality: A systematic literature review. *Virtual Reality* 28, 1 (2024).
- [3] PELLAS, N., MYSTAKIDIS, S., KAZANIDIS, I.: Immersive Virtual Reality in K-12 and Higher Education: A systematic review of the last decade scientific literature. *Virtual Reality* 25, 3 (2021), 835-861.
- [4] SEDLÁK, M., ŠAŠINKA, Č., STACHOŇ, Z., CHMELÍK, J., DOLEŽAL, M.: Collaborative and individual learning of geography in immersive virtual reality: An effectiveness study. *PLOS ONE*, 17, 10 (2022), e0276267.
- [5] ALLCOAT, D., VON MÜHLENEN, A.: Learning in virtual reality: Effects on performance, emotion and engagement. *Research in Learning Technology*, 26 (2018), 1-12.
- [6] SOUZA, V., MACIEL, A., NEDEL, L., KOPPER, R., LOGES, K., SCHLEMMER, E.: The Effect of Virtual Reality on Knowledge Transfer and Retention in Collaborative Group-Based Learning for Neuroanatomy Students. *2020 22nd Symposium on Virtual and Augmented Reality (SVR)* (2020), 92-101.

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HOW INFLATION EXPECTATIONS INFLUENCE HOUSEHOLD WELL-BEING: AN EMPIRICAL INVESTIGATION

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KEY WORDS

Well-Being, Inflation, Expectations, Households

JEL CODES

D10, D84, I31

1 INTRODUCTION

Subjective well-being, measured through self-reported happiness, or financial well-being, assessed from the perspective of financial freedom, has been a key area of research for decades due to its importance for individual quality of life and policy decisions (Helliwell et al., 2019; Brügggen et al., 2017). Inflation, including historical experiences, current rates, and expectations about future trends, plays a crucial role in shaping well-being (Cupak and Siranova, 2023;

Dolan et al. 2009; Coibon et al., 2019). Yet, the literature presents mixed findings, with some studies suggesting that inflation reduces well-being (Prati, 2023), while others find the opposite (Perovic et al., 2010). This paper seeks to explore the relationship between inflation expectations and well-being from the household perspective, addressing a gap in the literature, particularly in times of high inflation and its fluctuations.

2 MATERIAL AND METHODS

The study utilizes data from the 2021 Household Finance and Consumption Survey (HFCS) for Slovakia, focusing on the impact of inflation expectations influence on subjective well-being at the household level. The cross-sectional dataset contains responses from 2174 Slovak households, providing a comprehensive snapshot of household financial behavior and perceptions. To analyze the

relationship between inflation expectations and well-being, we employ Ordinary Least Squares (OLS) regression. Inflation expectations are captured through 3 distinct variables: anticipated changes in property prices, expected household income growth, and perceived future price changes. The dependent variable, subjective well-being, is measured through households' self-reported overall life satisfaction.

3 RESULTS

Our results suggest the impact of negative inflation expectations on the reduction of household well-being, and positive inflation expectations have a positive effect on household well-being. If the price of the property is expected to fall within the next 12 months, this expectation has a significant negative impact on household well-being. If household expect an increase in real estate prices, the positive effect on well-being is not significant. We assume that this result is in line with the prospect theory,

household react more sensitively to expected loss (fall in property price) than to gains (rise in property price). If households expect only a modest increase in prices in the next 12 months, the effect on subjective well-being is positive. We explain this result by the fact that household count on a certain stable rate of inflation, and thus a moderate increase in prices is acceptable to them. Overall, the effect of negative inflation expectation negatively affect subjective well-being, vice versa.

4 CONCLUSIONS

The findings of this study highlight the significant influence of inflation expectations on subjective well-being. Negative inflation expectations have a pronounced negative impact on well-being, reflecting households' greater sensitivity to potential losses. On the other hand, while expectations of rising property

prices do not significantly enhance well-being, modest expectations of price increases positively affect subjective well-being. These insights underscore the importance of managing inflation expectations to support household well-being, particularly during periods of economic uncertainty.

5 REFERENCES

- [1] BRÜGGEN, E. C., HOGREVE, J., HOLMLUND, M., KABADAYI, S., & LÖFGREN, M. (2017). Financial well-being: A conceptualization and research agenda. *Journal of Business Research*, 79, 228–237. <https://doi.org/10.1016/j.jbusres.2017.03.013>
- [2] COIBION, O., GEORGARAKOS, D., GORODNICHENKO, Y., & VAN ROOIJ, M. (2019). *How Does Consumption Respond to News about Inflation? Field Evidence from a Randomized Control Trial*. National Bureau of Economic Research. <https://doi.org/10.3386/w26106>
- [3] CUPAK, A., & SIRANOVA, M. (2023). *Fear of the Dark: Inflation Experiences and Subjective Well-Being*. <https://doi.org/10.2139/ssrn.4542011>
- [4] DOLAN, P., PEASGOOD, T., & WHITE, M. (2009). Do we really know what makes us happy? A review of the economic literature on the factors associated with subjective well-being. *Journal of Economic Psychology*, 29(1), 94–122. <https://doi.org/10.1016/j.joep.2007.09.001>
- [5] HELLIWELL, J., LAYARD, R., & SACHS, J. (2019). *World Happiness Report 2019*, New York: Sustainable Development Solutions Network.
- [6] PEROVIC, L. M., & GOLEM, S. (2010). Investigating Macroeconomic Determinants of Happiness in Transition Countries. *Eastern European Economics*, 48(4), 59–75. <https://doi.org/10.2753/eee0012-8775480403>
- [7] PRATI, A. (2023). The Well-Being Cost of Inflation Inequalities. *Review of Income and Wealth*, 70(1), 213–238. Portico. <https://doi.org/10.1111/roiw.12631>

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THE IMPACT OF INNOVATION CENTERS ON REGIONAL INNOVATION ECOSYSTEMS

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KEY WORDS

innovation ecosystem, development, trust, value-added

JEL CODES

O10, R11

1 INTRODUCTION

Innovation is a key driver of economic success in the regional development process. A regional innovation ecosystem (RIE or RIS) is a set of research institutions and universities, organizations, enterprises, and networks that together shape and cultivate the innovation environment in a region [1]. An important role in these ecosystems is played by innovation centres, that is institutions involved in the creation, cultivation, management, and governance of the innovation environment in the region [2]. A successful innovation centre is able to ensure mutual trust between all RIS actors. Trust is what fosters collaboration, knowledge sharing, and synergies between stakeholders [3]. In addition, an effective innovation centre is able to attract and concentrate firms that generate higher value added. High-value-added companies contribute significantly to regional economic growth by promoting innovation, creating

new jobs, and promoting sustainable development [4]. However, despite the recognized importance of trust and value added in RIS, previous studies have not empirically examined the level of trust between actors or investigated the value added that firms create in these ecosystems [5].

Therefore, the objective of the study is to investigate the success of the innovation centre in managing the regional innovation ecosystem. The sub-objectives are: (1) to propose a way to measure and assess the trust between innovation ecosystem actors and (2) to assess the value-added creation of firms in the RIS. This evaluation can indicate the (in)effectiveness of the innovation center in managing the regional ecosystem, which may contribute towards better targeting of development, policy and innovation strategies.

2 MATERIAL AND METHODS

The first part of the study focused on assessing trust among RIS actors. For this purpose, the South Moravian region was chosen for analysis, as the most developed and powerful ecosystem in the Czech Republic. At the same time, cooperation was established with the JIC Innovation Centre, which coordinates RIS in this region. In 2024, a questionnaire survey was carried out among the RIS actors whose selection was based on the internal

JIC database and who contribute significantly to its cultivation through their activities. Based on a literature study, to assess trust among actors, the “ABI trust model” was used, according to which the intersection of three essential dimensions of trust (Ability, Benevolence, and Integrity) must be taken into account. These are assessed by the individual towards the counterpart and then shape their overall level of trust. Each of the trust dimensions contained

one or two questions in the questionnaire, which were then statistically evaluated using mean, median, and standard deviation. The second part of the study focuses on the analysis of value-added creation, which will be carried out through the reports of all firms in the high-tech and medium-high-tech sectors in all regions of the Czech Republic over a period of 10 years (2015-2024). The source base of the data will be the Cribis database; access to the Cribis is currently

being purchased, so the analysis will be carried out in early 2025. Accounting value-added is calculated from the “income statement” and expresses the difference between production and output plus a trading margin. For the fulfilment of this part, the “difference in differences” method will be used, examining the difference in the development of value-added creation before and after the establishment of the innovation centre in the region. Regression analysis will also be used.

3 RESULTS

The survey was attended by 258 respondents from public administration, universities, companies, support and non-profit organizations of the South Moravian Region. Respondents were selecting qualitative response options to the questions using 4 linguistic variables (strongly disagree - strongly agree), the variables were then assigned quantitative values, with a higher average value indicating a better rating (max possible value was 4.00). Based on the literature, it was hypothesized that each actor would be positively rated, indicating the successful effect of the innovation center in building relationships and trust among stakeholders. Through the results obtained, it was found that in all three dimensions of trust, each actor scored higher than 2.86 on

average, and thus each of the RIS actors was rated positively in terms of trust towards their innovation capabilities, competencies and expertise. Across all three dimensions of trust, the public administration actor achieved the lowest average ratings, while support organisations and large companies achieved the highest (and therefore best) ratings. Within the dimension “benevolence”, respondents most often chose universities, which they trust in innovation activities. The analysis of the added value will answer the question of whether its evolution has changed (improved) since the establishment of the innovation centre; through regression, it will be identified which factors have a significant impact on its value.

4 CONCLUSIONS

This study proposes a way to measure trust among actors in the innovation ecosystem using a questionnaire survey and ABI trust dimensions. The pilot investigation confirmed that the innovation

center is effective in building mutual cooperation and trust between the RIS actors of the South Moravian Region. Value-added investigation can further confirm this effectiveness and reveal key factors that influence this value.

5 REFERENCES

- [1] JANOŠEC, A. et al.: Regional Innovation Systems as a Remedy for Structurally Affected Regions—Empirical Evidence from the Czech Republic. *Urban Science* 8, 88 (2024).
- [2] SMOLKA, M.: Responsible Innovation ecosystem governance: socio-technical integration research. *Journal of Re-sponsible Innovation* 10, 1 (2023).
- [3] STEINBRUCH, F. et al.: The role of trust in innovation ecosystems. *Journal of Business & Industrial Marketing*, 37, 1 (2022), 195-208.
- [4] FASNACHT, D.: *Open Innovation Ecosystems: Creating New Value Constellations in the Financial Services*. Springer (2018).
- [5] BANG, M.H. et al.: Discovering regional digital innovation tasks to revitalize digital platform government. *Digital Government Research*, 4 (2024), 975-976.

DATA COLLECTION FOR NEURAL NETWORK TRAINING IN AGRICULTURE: AN OPEN DATASET FOR SMART AGRICULTURE

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KEY WORDS

Smart agriculture, Neural networks, Data collection, Open dataset

JEL CODES

Q16, Q55, O33, C88

1 INTRODUCTION

In the era of digital transformation, the agricultural sector increasingly adopts AI and neural networks to improve productivity. However, the effectiveness of these technologies depends on the availability of high-

quality datasets. This study focuses on creating an open dataset for crop and disease data, facilitating the training of AI models in smart agriculture.

2 MATERIAL AND METHODS

The dataset was created using drones and manually captured images to gather high-resolution data on crops. Drones equipped with multispectral and thermal cameras were flown over selected agricultural fields, capturing images under varying lighting conditions and at different times of the day, ensuring comprehensive coverage (Matese et al., 2015). The collected data was then pre-processed using segmentation techniques, where plant parts such as leaves, stems, and fruits were manually annotated to ensure consistency and accuracy (Grinblat et al., 2016). Additionally, data augmentation techniques

were employed to expand the dataset, which helped improve the robustness of the neural networks during training. However, challenges were encountered with the drones, especially the lower-cost models, which suffered from GPS inaccuracies and short battery life. These models, typically priced below 40,000 CZK, were not suitable for detailed, close-range data collection. Higher-end drones, offering better precision, were used for critical phases, but their higher cost limited broader deployment in the project.

3 RESULTS

The study encountered challenges with low-cost drones, including inaccurate GPS systems and short battery life. Commercial drones priced below

40,000 CZK were inadequate for precise, close-range data collection. Higher-end drones provided better accuracy but were significantly more expensive.

4 CONCLUSIONS

Low-cost drones are unsuitable for long-term, detailed data collection in agriculture. Open-source solutions could provide more affordable and customizable technologies for data collection. Future

research should explore new methods for improving the accessibility and efficiency of these technologies for agricultural applications.

5 REFERENCES

- [1] BERNI, J.A.J., ZARCO-TEJADA, P.J., SUÁREZ, L., & FERERES, E.: Thermal and narrowband multispectral remote sensing for vegetation monitoring from an unmanned aerial vehicle. *IEEE Transactions on Geoscience and Remote Sensing*, 47(3) (2009), 722-738.
- [2] MATESE, A., TOSCANO, P., DI GENNARO, S.F., et al.: Intercomparison of UAV, Aircraft and Satellite Remote Sensing Platforms for Precision Viticulture. *Remote Sensing*, 7(3) (2015), 2971-2990.

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RISK MANAGEMENT IN THE SUPPLY CHAIN

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KEY WORDS

Prediction, Risk Management, Supply Chain

JEL CODES

L17, P41, R41

1 INTRODUCTION

In a brittle, anxious, nonlinear and incomprehensible (BANI) environment, supply chain management is needed to ensure the resilience and continuity of globally operating companies. In particular, risk management (RM) can help minimise disruptions' impact and maintain competitiveness. Technologies such as machine learning (ML) and artificial intelligence (AI) can support risk identification in the resulting supply chain risk management (SCRM).

The board game Go is an analogy to illustrate the power of ML and AI. AlphaGo Zero, an AI without human experience data, defeated the version AlphaGo trained with human data by 100:0. This feat demonstrates the potential of predictive SCRM, which, like AlphaGo Zero, uses millions of data to recognise patterns and predict disruptions for offering a promising future.

2 MATERIAL AND METHODS

The article presents a comprehensive systematic literature review focused on the role of predictive SCRM, which is relevant in the context of increasing global market volatility. The search retrieved nine articles from Web of Science and 146 from EBSCOhost. After eliminating duplicates and assessing abstracts, three articles from Web of Science and ten from EBSCOhost were selected for detailed analysis. This selection was based on criteria ensuring relevance and comprehensiveness in exploring predictive risks in the supply chain. The chosen articles encompass a variety of research methodologies, including literature reviews and quantitative and qualitative analyses,

contributing to a multi-faceted understanding of the subject. The article includes tables summarising the studies found, detailing authors, publication years, titles, keywords, and methodologies used. A word cloud analysis was conducted to highlight frequently occurring terms in the literature, with "process," "machine," and "information" being the most prominent keywords. The review aims to provide insights into current research trends and methodologies in predictive RM within supply chains, emphasising the importance of integrating advanced technologies like ML and AI.

3 RESULTS

The results synthesise research findings on integrating ML and AI in SCRM. It highlights the challenges and solutions identified across various studies. There is a correlation between drug SCRM and predictive parameters using ML methods, particularly during disease outbreaks like COVID-19. ML can significantly enhance drug demand predictions, although challenges like production gaps and user uncertainty persist [1]. Other authors pointed out that despite significant research in SCRM, industries face ongoing challenges in managing supply chain risks exacerbated by unpredictable events like pandemics. They advocate for a proactive, data-driven approach using AI and ML to enhance risk prediction accuracy and propose a comprehensive framework for RM [2].

4 CONCLUSIONS

The article underscores AI and ML's transformative potential in enhancing SCRM by improving risk prediction and management. It identifies significant gaps in current research and emphasises the need for interdisciplinary approaches to fully leverage these

Supporters of a Corporate Credit Risk Assessment explored non-traditional data sources in corporate credit risk assessments, demonstrating that incorporating supply chain data can significantly improve predictive accuracy. Their findings suggest that intelligent algorithms like Support Vector Machines (SVM) outperform traditional methods in risk evaluation [3]. Finally, the manufacturing supply chain's digital transformation highlights the uncertainties introduced by new technologies. The research proposes using Principal Component Analysis (PCA) and Backpropagation Neural Networks (BPNN) to predict risks associated with digitalisation, showing improved prediction performance over traditional models [4].

technologies in addressing supply chain complexities. The findings advocate for a shift towards more integrated, data-driven strategies to bolster supply chain resilience and efficiency in the face of ongoing global challenges.

5 REFERENCES

- [1] EMMANUEL, G. et al. Machine learning in drug supply chain management during disease outbreaks. *International Journal of Electrical and Computer Engineering (IJECE)*, 13(5), (2023), 5517.
- [2] DEIVA GANESH, A. & KALPANA, P. Future of artificial intelligence and its influence on supply chain risk management. *Computers & Industrial Engineering*, 169, (2022), 108206.
- [3] NI, D. et al. Monitoring corporate credit risk with multiple data sources. *Industrial Management & Data Systems*, 123(2), (2023), 434-450.
- [4] LIU, C. Risk Prediction of Digital Transformation of Manufacturing Supply Chain Based on Principal Component Analysis and Backpropagation Artificial Neural Network. *Alexandria Engineering Journal*, 61(1), (2022), 775-784.

THE APPLICATION OF PRINCIPAL COMPONENT ANALYSIS (PCA) AND CLUSTER ANALYSIS TO EXAMINE THE RELATIONSHIP BETWEEN ESG FACTORS AND CORPORATE PERFORMANCE

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KEY WORDS

ESG, ESG Score, Financial performance, PCA, Cluster

JEL CODES

M14, Q56, C38

1 INTRODUCTION

In the last few years, the integration of ESG (Environmental, Social, Governance) factors into corporate evaluation and investment strategy has become a central topic. Investors and companies are faced with the challenge of understanding the influence of ESG on financial performance. Previous studies have shown that ESG factors can have a significant impact on company values and financial results [1]. Nevertheless, the question of how exactly ESG ratings are related to a company's profitability

and its valuation remains largely unanswered and is influenced by numerous other factors. Principal component analysis (PCA) offers a way to analyze this relationship by reducing the data dimensionality and highlighting the significant factors that explain the variance in the ESG and financial data [1]. The aim of this paper is therefore to identify clusters of companies with similar ESG profiles and financial performance and to find out which variables contribute most to the principal components.

2 MATERIAL AND METHODS

This study is based on data from 7,353 ESG-rated companies worldwide (excluding financial companies). The data was collected annually from Refinitiv Datastream over an 11-year period from 2011 to 2021 and includes the Refinitiv Eikon ESG score. The data for this study, if not uniformly comparable, was standardized to bring variables to comparable scales. The variables include ESG score, return on assets (ROA), capital expenditure, debt-equity ratio, market value, beta, total debt, dividend payments and cash flow. Principal component analysis (PCA)

was used to reduce the complex correlation between ESG scores and financial metrics and identify the significant components that explain the variance in the data. Subsequently, a k-means cluster analysis was conducted to divide companies into groups based on the scores of the principal components. These companies were categorized into three clusters that reflect their ESG and financial characteristics. The data cleaning and analysis was conducted using STATA. The results of the analysis are presented below.

3 RESULTS

The Principal component analysis identified five principal components that together explain 79.6% of the variance in the data:

Component 1 (31.6% variance): Heavily influenced by capital spending, market value and total debt. This component captures company size and investment behavior.

Component 2 (18.08% of variance): Primarily characterized by ROA and cash flow. This component represents the profitability and liquidity of the companies.

Component 3 (11.63% of variance): Strongly influenced by leverage. This component reflects the financial structure of the companies.

Component 4 (9.92% of variance): Largely influenced by beta, which represents the market risk of the companies.

Component 5 (8.37% of variance): This component has moderate contributions from dividend payments and other factors.

The PCA shows that ESG scores and financial measures such as investments and debt play an important role in the variance between companies. Companies with high investments and debt (high values in component 1) tend to have higher ESG scores as well. The correlations between the principal component scores and the variables confirm the interpretation of the PCA. The cluster analysis based on the first two principal components identified three main groups of companies:

Cluster 1: companies with low ESG scores, high debt and negative cash flow. These companies have high risks and low profitability.

Cluster 2: companies with moderate ESG scores, stable profitability and low risk. This group is financially stable and has a balanced profile in terms of ESG and profitability.

Cluster 3: companies with high ESG scores, high capital expenditure and positive cash flow. These companies are strongly committed to ESG initiatives, but also have high debt and high capital expenditure.

4 CONCLUSIONS

The results of the principal component analysis and cluster analysis show that ESG factors and financial variables such as investment, debt and profitability are strongly linked. Cluster 3, with the highest ESG scores, is characterized by high capital investment and high debt, indicating significant investment in sustainability. These companies have positive cash flow despite the high debt, suggesting a solid financial base. This group of companies seems to consider ESG investing as a long-term growth strategy, although this increases debt in the short term. By contrast,

cluster 1 shows low ESG scores, high debt and negative cash flows, indicating financial and sustainability weaknesses. Overall, the results suggest that ESG factors play an important role in today's corporate valuation. Companies with higher ESG scores tend to invest in their sustainability goals over the long term, but this can have varying effects on their financial structure. This suggests that investors should not look at ESG in isolation, but always in the context of overall corporate performance.

5 REFERENCES

[1] ENGIDA, G., TADESSE, RAO, X., BERENTSEN, P.B.M., LANSINK, A.G.J.M.O. (2018). Measuring corporate sustainability performance the case of

European food and beverage companies. *Journal of Cleaner Production*, Vol. 195, 734-743.

APPLICABILITY OF PROJECT MANAGEMENT METHODOLOGIES IN DIVERSE DEVELOPMENT PROJECTS: PRACTICAL LIMITATIONS AND USEFULNESS IN REAL-WORLD SCENARIOS

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KEY WORDS

PRINCE2, PRINCE2 Agile, Scrum methodology, project management, tailoring

JEL CODES

M15, O22

1 INTRODUCTION

There are many publications that describe the advantages and disadvantages of project management using the PRINCE2 methodology. Currently, none of the found publications describes the real problems that occurred when managing a project in a commercial environment using PRINCE2. The methodology is not suitable for project management in an agile way, however, there are many advantages and principles that can be applied to projects managed in an

agile way. The goal of this research project will be a comprehensive analysis and comparison of the use of project methodologies within three different projects implemented for one customer during one year. The result of the research will be the draft of an adapted project methodology, which will be created by synthesizing the positive aspects of the investigated approaches and will reflect the real needs and specifics of the customer.

2 MATERIAL AND METHODS

The knowledge of project methodologies obtained from training and certification for project management will be used as part of the research. The basis is also the data of the given customer. The research will last 10 months. The projects will be managed by the given methodology and the results will be recorded. Subsequently, there will be a comparison of outputs and results of using the methodology on projects. The output of the evaluation of project management according to the given methodology

will be the proposal of the project methodology, which will be applicable and usable for the given customer's projects as well as others within the company according to the nature of the project. 1. Projects selection. 2. Project management using Prince2, Prince2 Agile and SCRUM methodology. 3. Evaluation of project management using Prince2, Prince2 Agile and SCRUM methodology. 4. Draft of tailored project methodology for customer purposes.

3 RESULTS

The added value of this research is in the practical application of theoretical knowledge obtained on the basis of training and certification, when it is possible to apply the data to a specific customer in the state enterprise in the Czech Republic.

The projects we chose were implemented using Prince2, Prince2 Agile and Scrum methodologies. As part of the implementation of the projects, we had to deal with several problems, such as inconsistencies in the chosen methodology, since the analytical phase of the project was implemented as a classic Prince2 project, or waterfall model, but the actual implementation of the project was carried out according to the agile methodology, precisely based on the customer's requirements. Another problem was that the customer did not know how to define the scope of the solution and what he wanted in general, until he saw the given solution ready. The Prince2 methodology places a strong emphasis on documentation within project management. [1] In the Scrum methodology, it is recommended that the team is composed of specifically dedicated members

who work on only one project. This recommendation is based on the fact that team stability has a direct impact on planning and estimating reliability. [2] The problem we encountered during the project managed by the Scrum methodology is that it was not possible to allocate a specific team of people, but we had to share resources.

The way we communicate with the customer has proven very useful for individual projects. In general, great emphasis was placed on a pro-customer approach and on the involvement of the customer in the events of individual projects, so that he was present at all important decisions. This is supported by the Prince2 Agile and Scrum methodology itself, which say that customer involvement is a key factor for project success. The Scrum methodology emphasizes regular feedback through meetings, where the customer has the opportunity to influence the direction of the project and ensure that the final product will be in line with his expectations. [3] In the case of projects managed in an agile way, respond effectively to changing requirements and conditions have proven very useful. [4]

4 CONCLUSIONS

The created hybrid approach will combine risk and quality management from Prince2 with flexibility and adaptation to changes from Prince2 Agile. It will use shorter iterations with sprints and daily standups from Scrum, along with retrospectives for continuous improvement. Hybrid roles are introduced - the project manager monitors the project structure, while the Scrum Master focuses on agile processes, and the product owner ensures that the results meet the customer's needs. The approach involves creating an MVP in the analysis phase, allowing the customer to provide feedback that we incorporate into sub-

sequent iterations. Documentation is minimized to "Just Enough Documentation" to effectively achieve project goals. The key to success is the maximum involvement of the customer through continuous presentations and workshops, which supports a better adaptation to their expectations and needs. The tailored methodology can be used if the projects are implemented from the framework, or of the framework contract with the given supplier. As a follow-up to this research, it would be appropriate to verify whether this tailored methodology is also applicable to other types of projects.

5 REFERENCES

- [1] AXELOS. *Managing Successful Projects With PRINCE2 2017th Edition*. ISBN 978-0113315338.
- [2] Scrum.org. (n.d.). *Scrum Guide*. Retrieved from <http://www.scrum.org/scrum-guide>
- [3] BOURNE, L. (2023, October 6). *Why and how client involvement aids Scrum success*. Retrieved from <https://www.bournepm.com/insights/2023/10/06/why-and-how-client-involvement-aids-scrum-success>
- [4] AXELOS. (2022). *PRINCE2 Agile*. PeopleCert. ISBN: 978-9925-600-021.

USE OF SATELLITE DATA TO STREAMLINE SOME PROCESSES OF THE NATIONAL FOREST INVENTORY

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KEY WORDS

remote sensing, machine learning, data science, national forest inventory

JEL CODES

C63

1 INTRODUCTION

On the basis of Act 289/1995, regular monitoring of the state of forest areas takes place in the Czech Republic under the name National Forest Inventory (NFI). This is a statistical survey aimed at providing accurate and up-to-date data on the state and development of forests throughout the state. The main principles of NIL include sampling, in which data are obtained from inventory plots directly in the field. On the basis of field data, parameters of forest stands for larger territorial units (NUTS) are estimated with the expression of uncertainty using interval estimation. To increase efficiency, in addition to field data collection, auxiliary methods such as aerial photographs are used [1].

Among the main advantages of this approach are its accuracy and reliability, as direct field measurements enable detailed analyses. On the other hand, these advantages are redeemed by

the high financial, time and personnel demands associated with field data collection. Other problems include limited data update frequency and expensive hardware. In this context, there is a growing interest in technologies that could complement or partially replace traditional approaches and offer faster and more cost-effective solutions [2].

One of the technologies for monitoring forest ecosystems is satellite Earth sensing data. These images are currently taken in relatively high quality and at regular time intervals [3]. The use of remote sensing data is currently increasingly represented in scientific works dealing with landscape change analysis, agriculture or forestry [4]. The goal is to compare the estimates of the Random Forest model on the state of afforestation in individual regions of the Czech Republic with official NIL data.

2 MATERIAL AND METHODS

All data collection, calculations and data manipulations were performed in the Google Earth Engine platform [5]. Supervised machine learning models (Random Forest, Support Vector Machines, CART, Naive Bayes) were used to estimate the state of afforestation. The first step was to obtain suitable

training data for model estimation. This data had to be manually collected and labeled. A total of 2,800 pixels were collected, which were divided into 4 classes of 700 pixels. Specifically, these were the Crop, Forest, Construction and Water classes. A total of 6 multispectral bands (B2 – blue, B3 –

green, B4 – red, B8 – near-infrared, B11 – short-wave infrared 1, B12 – short-wave infrared 2) were used for classification. Normalized Difference Vegetation Index (NDVI), which is calculated from bands B8 and B4 was also added. The final classification was performed on the median Sentinel 2 image.

The aforementioned models were trained on the collected training dataset and they were subjected to accuracy tests (F-score, Kappa, Consumer Accuracy,

Producer Accuracy and Overall Accuracy). Based on these metrics, the prediction quality of individual models was compared, and the model with the highest prediction quality was used to classify satellite images of the entire Czech Republic. The results obtained in this way were compared with official NIL estimates of the total area of afforestation in hectares and the relative representation of forests within individual regions of the Czech Republic.

3 RESULTS

Based on the above-mentioned metrics, the Random Forest model (RF) was chosen, which achieved the best overall accuracy and consistency within individual classes. This model was then used to estimate the area of forests and their relative share within individual regions. The RF model estimates

provided relatively accurate predictions compared to the official NIL estimates. Model estimates of forest area agree in several cases with official NIL estimates. In other cases, the estimates were very close to the officially stated intervals. The same was true in the case of the relative representation of forest areas in the given regions.

4 CONCLUSIONS

In this paper, the possibilities of using machine learning methods applied to Sentinel-2 satellite data for streamlining some processes of the National Forest Inventory (NFI) were investigated. The obtained results indicate that the use of satellite images can provide relevant estimates for solving some tasks, such as the estimation of forest area or its relative representation in a given region. This approach can offer a time and financially efficient method not only for NFI but also for other areas of

forest management. Given the significant resources required for traditional NFI methods, which lead to low frequency of heavy surveys, this study encourages further investigation into the use of satellite data and other technologies to improve forest monitoring and reduce data collection costs. More advanced classification tasks, such as the classification of forest species composition, are the subject of further research.

5 REFERENCES

- [1] Institute for forest management: *NIL - National Forest Inventory*. 2024. Accessed: 20 September 2024. Available at: <https://www.uhul.cz/portfolio/nil/>
- [2] McROBERTS, R. and TOMPPO, E.: Remote sensing support for national forest inventories. *Remote sensing of environment* 110, 4 (2007), 412–419. DOI: <https://doi.org/10.1016/j.rse.2006.09.034>
- [3] COOPS, N., TOMPALSKI, P., GOODBODY, T., ACHIM, A. and MULVERHILL, C.: Framework for near real-time forest inventory using multi source remote sensing data. *Forestry* 96, 1 (2023), 1–19. DOI: <https://doi.org/10.1093/forestry/cpac015>
- [4] FASSNACHT, F., WHITE, J., WULDER, M. and NÆSSET, E.: Remote sensing in forestry: current challenges, considerations and directions. *Forestry: An International Journal of Forest Research* 97, 1 (2024), 11–37. DOI: <https://doi.org/10.1093/forestry/cpad024>
- [5] GORELICK, N., HANCHER, M., DIXON, M., ILYUSHCHENKO, S., THAU, D. and MOORE, R.: Google Earth Engine: Planetary-scale geospatial analysis for everyone. *Remote sensing of Environment* 202 (2017), 18–27. DOI: <https://doi.org/10.1016/j.rse.2017.06.031>

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THE ROLE OF INFRASTRUCTURE INVESTMENTS IN REGIONAL DEVELOPMENT: EVIDENCE FROM THE CONSTRUCTION OF THE D11 MOTORWAY IN THE CZECH REPUBLIC

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KEY WORDS

Highway infrastructure, Highways, economic growth, unemployment rate, housing completion rate, establishment of companies, population growth, difference in differences, synthetic control unit

JEL CODES

R11, R23, R40, R42

1 INTRODUCTION

Transport is considered a key factor in economic growth. Developing transport infrastructure reduces transport costs, improves market accessibility, and supports regional economies. The development of transport networks, especially in regions connected to major corridors such as the TEN-T, increases productivity, promotes trade relations, attracts investment and promotes competitiveness and the reduction of regional disparities. The study focuses

on the impact of the construction of the D11 motorway between Prague and Hradec Kralove, which opened in 2007. The results show that infrastructure investment can stimulate economic activity and increase the attractiveness of regions, but the strength and direction of the effect of the construction itself depends on the economic strength of the region and its geographical location.

2 MATERIAL AND METHODS

The Difference in differences methodological framework is used in conjunction with the synthetic control unit method to assess the causal impact of the newly constructed motorway section on selected socio-economic variables. The DID method assesses the impact effects of the construction of a highway section by comparing real data with control groups and analyzing the differences after the intervention. The DID method is used to estimate the impact of infrastructure changes using panel regressions with time fixed effects and allows for the assessment of the causal effects of a newly constructed highway section on selected socioeconomic variables. The

synthetic control method provides a solution in the form of constructing a synthetic control unit, which is a weighted average of all available untreated controls, in order to achieve an optimal match with the unit under study in the pre-intervention period. This study uses data with annual frequency from 2002 to 2021 obtained from the Czech Statistical Office database at the level of municipalities with extended jurisdiction (hereafter ORP). For the purpose of the study, the dataset is divided into 5 pre-intervention periods and 14 post-intervention periods. The subject of the study is a total of 6 ORP out of a total of 205 in the Czech Republic.

3 RESULTS

The results indicate an increase in unemployment immediately after the completion of the motorway section, along with the potential presence of the “straw effect.” The higher rate of firm formation was not proven to be significant. The interaction between motorway construction and time had no notable impact on the number of completed housing units, with the effect of the construction only becoming apparent directly after the motorway section was completed. There was lower population growth following the motorway’s construction, but this trend

gradually reversed, suggesting that the investment’s impact became more evident over time.

The regions affected by the new motorway section gained improved transport links to Prague and other economically significant cities, reducing traffic barriers and enhancing overall accessibility for nearby regions. The observed ‘straw effect,’ which refers to a preference for more developed areas with larger market sizes at the expense of less developed regions could explain why the effects differed from initial expectations.

4 CONCLUSIONS

Since the effects of highway construction often manifest themselves over longer time horizons, our research also examined how these effects unfold over longer periods. The findings suggest that the construction of the road section has the potential to positively affect socio-economic development in the study area of Hradec Králové and the surrounding municipalities with extended jurisdiction. Our research shows that the positive effect of the construction may not occur automatically. The results suggest that motorway construction may stimulate economic activity and increase the attractiveness of

regions, but the strength of this effect, or rather its direction, may vary depending on the size, location and especially the economic strength of specific regions and the proximity of other attractive centres. The economic development of a region and its geographical location are key to assessing the impact of road infrastructure development. These factors have the potential to influence the impacts of construction and the expected outcomes and benefits. It is therefore important to take into account the specificities of each region when designing and implementing such projects.

5 REFERENCES

- LECHNER, M. (2010). The Estimation of Causal Effects by Difference-in-Difference Methods Estimation of Spatial Panels. *Foundations and Trends® in Econometrics*, 4, 165–224. <https://doi.org/10.1561/0800000014>
- ABADIE, A., DIAMOND, A., & HAINMUELLER, J. (2010). Synthetic Control Methods for Comparative Case Studies: Estimating the Effect of California’s Tobacco Control Program. *Journal of the American Statistical Association*, 105(490), 493–505. <https://www.tandfonline.com/doi/abs/10.1198/jasa.2009.ap08746>
- ZHANG, Y., & CHENG, L. (2023). The role of transport infrastructure in economic growth: Empirical evidence in the UK. *Transport Policy*, 133, 223–233. <https://doi.org/10.1016/j.tranpol.2023.01.017>
- CRESCENZI, R., DI CATALDO, M., & RODRÍGUEZ-POSE, A. (2016). Government Quality And The Economic Returns Of Transport Infrastructure Investment In European Regions. *Journal of Regional Science*, 56, 553–582.
- VICKERMAN, ROGER, KLAUS SPIEKERMANN and MICHAEL WEGENER. Accessibility and Economic Development in Europe: Evidence from the Slovak Republic. *Regional Studies*. 2010, 33(1), 1-15. ISSN 0034-3404. Available from: [doi:10.1080/00343409950118878](https://doi.org/10.1080/00343409950118878)
- HABRMAN, MICHAL and BRANISLAV ŽÚDEL. *Od Tatier k Dunaju, diaľnice stavajú: Vplyv diaľnic a rýchlostných ciest na regionálnu mieru nezamestnanosti* [online]. 24.7.2017, 1-8 [cit. 2023-03-19]. Available from: https://www.mfsr.sk/files/archiv/priloha-stranky/4947/40/2017_10_Dialnice.pdf

FACTORS SHAPING PURCHASING DECISIONS FOR SUSTAINABLE FOOD AND EVERYDAY PRODUCTS

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KEY WORDS

consumer accessibility, environmental responsibility, pricing, product features, sustainable behaviour

JEL CODES

D12, P46

1 INTRODUCTION

Responsible consumption is one of the Sustainable Development Goals defined by the United Nations (2024). Consumer behaviour plays a crucial role in this area and change towards sustainable responsible consumption should be initiated at the consumer level. Understanding the factors that influence consumers' purchasing decisions helps to understand the consumer's situation. Through the identified factors, consumers can be guided to change toward sustainable behaviour.

Waldman et al. (2023) distinguish four segments of consumers with regard to sustainable behaviour: the first segment behaves sustainably if it is economically advantageous or if they believe in health benefits, the second segment sees the benefits of sustainability in the freshness of products, the third segment is characterised by a high level of environmental awareness and the fourth segment behaves unsustainably.

However, many studies still report that price is a decisive factor in purchasing decisions even in the context of sustainability (Hough & Contarini, 2023; Kaczorowska et al., 2019; Ran et al., 2022). Zámková et al. (2022) state that customer preferences change over time, with product quality coming to the fore, but also other aspects such as health benefits or origin.

The objective of this paper is to identify the factors that influence consumer decision-making when purchasing sustainable food and daily necessities, and subsequently to define the determinants of sustainable purchasing decisions based on the correlation between the identified factors. The identified determinants will be used as input variables in modelling real consumer behaviour in further research.

2 MATERIAL AND METHODS

An online questionnaire survey was conducted in 2023 to gain insights into consumer perceptions of sustainable shopping. A total of 700 respondents

were selected through the use of quota sampling. The quotas applied are gender, age group, economic activity and highest level of education of the respondent.

Respondents rated the importance of each factor in their purchase decision-making process on a scale of 1-7, with a value of 7 representing the highest importance of that factor, i.e. the factor that consumers consider most in their purchasing decisions.

3 RESULTS

Factor analysis constructed four components from the observed variables that influence consumers' purchasing decisions for food and everyday products, explaining a total of 60.547% of the variability in all factors.

The first component is called Product features, as it contains variables such as Product quality, Origin, Nutritional composition or Health benefits. The second group of Environmental responsibility factors includes variables related to product pack-

aging, sustainable production and brand. The third component, Comfort and accessibility, includes the accessibility and distance of the retail store, the friendliness of the service and also the loyalty of the customer to the retail store chain. The last component is Pricing covering only Price and Discount Promotions. However, when these two variables are considered together, they account for 12% of the total variability of the examined situation.

4 CONCLUSIONS

In summary, consumers' purchasing decisions for food and everyday products are influenced not only by product characteristics and price aspects, but also by environmental responsibility factors related to the

aging, sustainable production and brand. The third component, Comfort and accessibility, includes the accessibility and distance of the retail store, the friendliness of the service and also the loyalty of the customer to the retail store chain. The last component is Pricing covering only Price and Discount Promotions. However, when these two variables are considered together, they account for 12% of the total variability of the examined situation.

products and the accessibility of the chosen retailer. The following research will investigate the direction of influence of the assembled component factors using structural modelling methods.

5 REFERENCES

- [1] HOUGH, G., CONTARINI, A.: Can low-income consumers choose food from sustainable production methods? *Current Opinion in Food Science* 51, (2023), 101035.
- [2] KACZOROWSKA, J., REJMAN, K., HALICKA, E., SZCZEBYŁO, A., GÓRSKA-WARSEWICZ, H.: Impact of Food Sustainability Labels on the Perceived Product Value and Price Expectations of Urban Consumers. *Sustainability* 11, 24 (2019), 7240.
- [3] RAN, Y., NILSSON LEWIS, A., DAWKINS, E., GRAH, R., VANHUYSE, F., ENGSTRÖM, E., LAMBE, F.: Information as an enabler of sustainable food choices: A behavioural approach to understanding consumer decision-making. *Sustainable Production and Consumption* 31, (2022), 642–656.
- [4] United Nations: *The 17 Goals*. (2024), available at: <https://sdgs.un.org/goals> (accessed 18th September 2024).
- [5] WALDMAN, K. B., GIROUX, S., BLEKKING, P. J., NIX, E., FOBI, D., FARMER, J., TODD, M. P.: Eating sustainably: Conviction or convenience? *Appetite* 180, (2023), 106335.
- [6] ZÁMKOVÁ, M., ROJÍK, S., PROKOP, M., ČINČALOVÁ, S., STOLÍN R.: Czech Consumers' Preference for Organic Products in Online Grocery Stores during the COVID-19 Pandemic. *Journal of Environmental Research and Public Health* 19, 20 (2022), 13316.

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SUSTAINABLE CONSUMPTION: A STUDY OF HOUSEHOLD WATER CONSUMPTION

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KEY WORDS

Sustainable consumption, Water consumption in households, Household Water Consumption, Consumer behavior, Theory of Planned Behaviour

JEL CODES

D10, M30, Q25

1 INTRODUCTION

Water plays a key role in life, and is essential for human life and the biochemical processes that enable the origin and development of organisms [1]. Household water consumption is an often overlooked problem because it is relatively readily available (for now). Still, the amount of water that households consume daily is difficult to estimate. Household water consumption is a rather abstract issue for many members of the general public. Thus, in terms of sustainability, issues that are linked to the food or fashion industry (often slow and fast fashion) tend to resonate more strongly in society. However, water is an integral part of our lives and its seemingly unlimited availability in households can lead to unsustainable consumption. However, potential barriers to reducing household water consumption may be not only a lack of awareness but also a lack of trust in institutions at the government or European Union level and the difficulty of measuring the environmental impacts of reducing water consumption, which discourages the general public from changing their attitudes on this issue [2].

By applying the Theory of Planned Behaviour (TPB), we can explore what determinants may influ-

ence consumer intentions and behavior. The TPB is a conceptual framework that attempts to explain and predict human behavior in different contexts. The TPB is based on three main components: attitudes toward behavior (AT), subjective norms (SN), and perceived behavioral control (PBC). Together, these factors influence an individual's intentions, which are considered strong predictors of real behavior [3]. TPB has been widely used in various areas of consumer behavior studies, however, there are no studies related to household water consumption, only, for example, bottled water consumption [4].

The research aims to investigate household consumption behavior in relation to water. The main objective is to identify the factors that influence the sustainability of household water consumption. Furthermore, through the application of TPB explore the influence of attitudes, subjective norms, and perceived control toward intention and real behavior in relation to sustainable water consumption. Based on the results of the work, recommendations for interventions and educational activities that will reduce unsustainable household water consumption will emerge. The paper presents partial results of this research and outlines its future progress.

2 MATERIAL AND METHODS

The research based on primary data collection uses two questionnaire surveys. The first questionnaire survey aims to investigate household water consumption behavior in more detail. Data collection is still being conducted using the CAWI method. Currently, the number of respondents is equal to $n=56$, but the survey aims to collect 400 respondents to obtain a representative sample based on selected quotas (gender, education, generation, ...). Respondents rate their level of agreement on a 7-point Likert scale on statements related to household water consumption and their environmental preferences. In addition, respondents answer questions regarding water consumption in relation to household management (well, rainwater, sink), appliances (dishwasher,

washing machine), personal hygiene, and filtered water.

The second questionnaire survey aims to explore the influence of determinants according to the TPB theory on intention and real behavior in terms of sustainable household water consumption. Data will be collected again according to the CAWI method by an agency (11/12 2024). The expected number of respondents is $n=700$. The questions in the questionnaire will be structured in such a way that the data collected can be used to develop a TPB model to test the influence of AT, SN, and PBC on intention and actual consumption behavior concerning sustainable household water consumption. The model will be constructed using the PLS-SEM structural modeling in SmartPLS v4 software.

3 RESULTS

Preliminary results show that economic reasons are the biggest motivation to reduce unsustainable water consumption, with social reasons coming in last. The results also show that 75% of respondents make no

effort to reduce their household consumption, 82% leave the water on when washing their hands, and 67% leave the water on when brushing their teeth.

4 CONCLUSIONS

Preliminary results suggest that most consumers make no effort to reduce their household water consumption and do not have habits that would reduce

unsustainable water consumption. Thus, there is scope for designing interventions and educational activities.

5 REFERENCES

- [1] WESTALL, F., BRACK, A.: The Importance of Water for Life. *Space Science Reviews* vol. 214 (50) (2018).
- [2] PROBERT, J., KOENIG-LEWIS, N., STACEY, K., ZHAO, A., XUAN, Y.: Sustainable Water Consumption: the role of consumer behaviour in (re)shaping water utility business models. *ISIS Report #6*, Graz, Austria (2014).
- [3] AJZEN, I.: The theory of planned behavior. *Organizational Behavior and Human Decision Processes* vol. 50 (1991), 179–211.
- [4] QIAN, N. Bottled Water or Tap Water? A Comparative Study of Drinking Water Choices on University Campuses. *Water* vol. 10(1) (2018).

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FOSTERING A DIGITAL MINDSET AND BUILDING TRUST IN AI: PRACTICAL, SHORT-TERM INTERVENTIONS

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KEY WORDS

artificial intelligence, digital mindset, trust

JEL CODES

M15, O32

1 INTRODUCTION

Integrating artificial intelligence in organisations and their processes presents both opportunities and challenges. Generative artificial intelligence (hereafter, GenAI), as many people refer to it, could, in a couple of years, become a headline-making technology, and this is precisely because it can generate content on its own without human effort (Feuerriegel et al., 2024). GenAI reduces the time on repetitive small tasks that would otherwise be time-consuming and allow the employees to concentrate on more strategic ones (Shamim et al., 2023). One of the necessary parts concerning the improvement of the competitiveness of firms, recognising and utilising the possibilities provided by information technologies, is that the workers need to shift their mindset to be able to effectively leverage them. The Digital Mindset is the basic and positive productivity attitude toward both existing and potential digital opportunities. This consists of being open to digital technologies and challenging existing methods and processes

(Kollmann et al., 2022). The social experience that we are living through at the moment, and the turbulence caused by it, heavily influences the level of a digital mindset of employees, but most importantly the level of their workforce digital skills.

Trust in technology means that the employer knows that the employees in the company are likely to face risks as AI has the potential to enhance the output (Guitton et al., 2023). However, the role of advanced digital technologies including that of ChatGPT is urging the employees' training to achieve success in this environment. Furthermore, when we focus our research on the part of SMEs, here the goal of a digital transformation can be even more difficult to grasp and develop, as there is a lack of digital leaders and limited human resources. The research aims to find a practical intervention for their existing employees, to build not only a digital mindset but also trust in AI.

2 MATERIAL AND METHODS

The review focused mainly on extracting findings from the WOS and Scopus databases with insights and targeted methods that can enhance digital mindset, trust, and AI adoption within organiza-

tions. As the primary research method, this paper conducted a literature systematic review in the Web of Science (WOS) database with the keywords "Artificial Intelligence" & "Trust" & "Employees" &

“Digital Mindset”. The filtered records were marked as conference papers or articles written in the English language. A systematic review was also conducted in the Scopus database, where the keywords were set to “Artificial Intelligence” & “Digital Mindset”

3 RESULTS

The literature search in WOS and Scopus shows 67 articles in total. This paper aims to identify the most relevant studies within the limited time frame, as the rise of artificial intelligence and GenAI adoption is relevant for this research mainly from November 2022. This month, the first free research preview of ChatGPT was published. The literature review is classified into three groups, technology, organisations, and people, known as a TOP Framework. The framework suggests that the process of digital transformation also requires the adoption of AI technologies together with the critical skills needed to use AI efficiently, such as digital literacy, responsibility, and lifelong learning (Tursunbayeva et al., 2024). Employees’ confidence and readiness

& “Organisation” & “Competence”, limited to conference papers or articles, within the period 2022 to 2024. The literature analysis provided a solid base for proposing targeted interventions.

for AI-related work become higher when practical training for AI applications in companies is held. The paper highlights mainly practical methods, such as Customized Training Programs, Peer Learning and Mentorship, Agile Teams for Digital Projects, or giving employees a voice (organizational listening) which increases their engagement and acceptance of AI. It is important to include employees through tools that promote ethical behavior, decision-making, and resilience (Shamim et al., 2023).

In summary, it is critical for organizations to first tackle the ethical concerns and external influences to realize the potential of GenAI in enhancing performance and developing key capabilities.

4 CONCLUSIONS

According to recent research development, a digital mindset and effective trust-building measures are beneficial in enabling a proper understanding of AI. There is literature that states that targeted training activities or peer learning programs and teams can significantly enhance digital readiness and AI-activity performance. Also, employee participation in AI projects, through organizational listening,

increases acceptance and engagement. However, success in AI adoption actually extends beyond technology adoption to social issues, including ethics, responsibility, and continuous learning. Future efforts should pay attention to these issues as well as ethical issues undermining the effective deployment of AI in enhancing the organisation’s performance.

5 REFERENCES

- SHAMIM, S.; YANG, Y.; ZIA, N. U.; KHAN, Z.; SHARIQ, S. M. Mechanisms of cognitive trust development in artificial intelligence among front line employees: An empirical examination from a developing economy. *Journal of Business Research*, (2023), 167, 114168. <https://doi.org/10.1016/j.jbusres.2023.114168>.
- TURSUBAYEVA, A.; CHALUTZ-BEN GAL, H. Adoption of artificial intelligence: A TOP framework-based checklist for digital leaders. *Business Horizons*, (2024), 67(4), 357-368. <https://doi.org/10.1016/j.bushor.2024.04.006>.
- GUTTON, C.; MAYER, S.; TAMO-LARRIEUX, A.; VAN LANDUYT, D.; FOSCH-VILLARONGA, E.; KAMARA, I.; PAŁKA, P. Responsible automatically processable regulation. *AI & SOCIETY*, (2024). <https://doi.org/10.1007/s00146-024-01901-7>.

CONSUMER SENTIMENT ACROSS THE EU: INSIGHTS FROM GOOGLE TRENDS DATA

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KEY WORDS

Consumer Sentiment, Google Search Index, Principal Component Analysis, Private Consumption

JEL CODES

E21, C38

1 INTRODUCTION

This study explores sentiment trends and their country specifics using the Google Trends data that could be employed to predict private consumption in 14 EU countries (EU14), covering the period from 2004 to 2024. We obtained 51 consumption-related keywords by modifying the keyword categorization mentioned by Woo and Owen (2019). We created a new country-specific sentiment index by utilizing principal component analysis (PCA) and factor

analysis (FA). We reveal common sentiment trends and unique country patterns in our sample. Cluster analysis reveals three convergent clubs indicating similarities in consumer sentiment across countries. This study contributes to the relevant literature by providing a multi-country panel data approach that fills the gap in comparative research on consumer sentiment using large data sets.

2 MATERIAL AND METHODS

Our study examines monthly Google Trends data related to private consumption for the EU14 from 2004 to 2024. Based on the keyword categorization proposed by Woo and Owen (2019), after censoring, we collected 51 private consumption-related keywords and created a panel dataset for each country. Countries covered include Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain and Sweden.

First of all, we normalized the raw Google Trends data for each country and performed principal component analysis (PCA) and factor analysis (FA)

to reduce dimensionality. PCA allowed us to extract the key factors that accounted for at least 75% of the variance in the data for each country, ensuring that the most important trends were included in the analysis. These factors were used to construct a Google Trends Index (GTI) for each country to reflect private consumer sentiment.

In order to identify patterns of convergence across the 14 countries, we conducted a cluster analysis of the resulting GTI indices. We follow the k-means cluster methodology of Makles (2012) to test whether there is evidence of a club convergence in terms of consumption trends across countries.

3 RESULTS

In our empirical analyses, we utilize Principal Component Analysis (PCA), where we reduce the dimensionality of the data and identify patterns of similarity across countries. Factor analyses (FA) further support these findings, highlighting that while some countries show close consistency in consumer sentiment trends, others exhibit unique, country-specific dynamics. We find that the EU14 countries form three convergent clubs in terms of the Google Trends Index (GTI) related to private consumption. Most of these countries are concentrated in the first club (Austria, Belgium, Denmark, Finland,

Greece, Ireland, Netherlands, Portugal, and Spain). While a small number of countries are dispersed in the second (Germany, Luxembourg, and Sweden) and third (France and Italy) clubs. This suggests that countries in each group have similar long-term trends in consumer sentiment over the 20-year period from 2004 to 2024. These results highlight regional differences in consumer sentiment and provide insights into the different economic behaviors of European countries in terms of private consumption.

4 CONCLUSIONS

We utilize the latest Google Trends data to construct sentiment indicators related to private consumption for each of the EU14 countries. Employing panel data for cross-country analysis of consumer sentiment, fills a research gap, a methodology that is rare in existing research, with most researchers focusing on individual countries. Our results demonstrate the value of cross-country comparisons of sentiment

indicators across multiple countries over a 20-year period. Future research will expand the number of countries included and explore the potential of the indices created to explain trends and predict macroeconomic variables, such as private consumption. This will provide further insights into consumer behavior and economic forecasting in a broader international context.

5 REFERENCES

- [1] MAKLES, A.: Stata tip 110: How to get the optimal k-means cluster solution. *Stata Journal*, vol. 12 (2012), pp. 374-351.
- [2] WOO, J., and OWEN, A. L: Forecasting private consumption with Google Trends data. *Journal of Forecasting*, vol. 38, no. 2(2019), pp. 81-91.

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DIMENSIONS OF PERCEIVED BUSINESS SUCCESS: INSIGHTS FROM THE SMALL FARM BUSINESSES IN ZAMBIA

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KEY WORDS

Small farm businesses, Business success, Farm entrepreneurs; Zambia

JEL CODES

M10, M130

1 INTRODUCTION

The concept of business success in the small business context has received increasing recognition in research, yet it still remains a complex matter (Lampadari,2016; Simpson et al.,2012). To date there appears to be no universal agreement among scholars on how to define business success (Sadeghi,2018; Tehseen et al.,2021). However, prior research has indicated that success is a multidimensional construct that can be defined mostly in terms of financial and non-financial metrics in small businesses (Alfoqahaa,2018; Shakeel et al.,2020).

Although numerous studies have delved into understanding entrepreneurs' perceptions of small business success, a significant proportion of these

investigations have centred on small businesses in general. Moreover, many of these studies have been conducted in other contexts other than the Sub-Saharan Africa (SSA). Past studies have pointed out that the perception of small business entrepreneurs toward the essential dimensions of business success can vary depending on the context (Rodríguez-Gutiérrez, et al.,2015), thus the need for more specific context studies (Tehseen et al.,2021). In light of this, this study endeavours to explore the perceived business success dimensions from the specific context of Small farm Businesses (SFREs), focusing on the relatively underexplored region of SSA, with a particular emphasis on Zambia.

2 MATERIAL AND METHODS

This qualitative study employs a multiple case study design to explore the perceived dimensions of business success among small farming businesses in Zambia. Using case studies enables a thorough exploration of phenomena within their natural settings, offering detailed empirical descriptions (Saunders et al.,2019; Zhang et al.,2013). The study was conducted in the rural areas of Chongwe and

Chibombo districts where agriculture is the main economic activity. The study used Atlas.ti to manage and organize the data. Thematic analysis was utilized to identify patterns, themes, and insights within the qualitative data collected (Saunders et al.,2019). Through a systematic process of coding and categorization, key themes related to perceived dimensions of business success emerged.

3 RESULTS AND DISCUSSION

Consistent with literature, our findings reveal that perceptions of business success from the small farm entrepreneurs are multi-dimensional, encompassing both financial and non-financial elements (Tehseen et al.,2021; Simpson et al.,2012). In this study, the farm entrepreneurs elucidated their perceived success through common financial metrics such as increased income and higher yield. The farm entrepreneurs perceived tangible assets as a measure of their business success, reflecting a conventional understanding of success within the financial domain. These findings align with past studies that underscore the importance of economic or financial indicators as dimensions of business success in small businesses (Simpson et al.2012).

Our results also indicated that the non-financial and qualitative metrics gained prominence in assessing business success in this study context. These dimensions include food security, quality of life, community impact, and sense of recognition via involvement in local and international events. Similar to prior studies, our results indicate that the

rural farm entrepreneur's definitions of success were biased towards the more intrinsic factors (Ritchie et al.,2013). For instance, farm entrepreneurs regarded being selected to participate in local and international events as a form of recognition, providing them with a sense of achievement (Tehseen et al. (2021; Mabhungu and Van Der Poll 2017). Our findings therefore confirm previous studies that have stated that due to the strong connection between small businesses and the entrepreneurs, personal success may equate to business success (Walker and Brown, 2004; Gomezelj and Kusce, 2013).

The business owners underscored their success through community impact, exemplified by their commitment to giving back to society through the sharing of knowledge about farming practices (Wach et al.,2020). It can be deduced from our findings that the dimensions of business success, as perceived by the participants, leaned more towards non-financial metrics. This finding is similar to Tehseen et al. (2021) who revealed that entrepreneurs of retail small businesses in Bangladeshi perceived non-financial metrics to be the most important dimensions business success.

4 CONCLUSION

In conclusion, our findings support the relevance of both financial and nonfinancial indicators as measures of business success in the context of SFREs. However, the findings indicated that the farm entrepreneurs' perceived business success dimensions were notably more inclined towards non-financial

metrics. Therefore, we agree with prior studies that have highlighted that entrepreneurs of small business's evaluation of business success tilt more towards non-financial metrics. Our study aligns with prior research that challenges the conventional view of linking business success solely with financial performance, particularly in the small business context.

5 REFERENCES

- ALFOQAHA, S. (2018), *Critical success factors of small and medium-sized enterprises in Palestine*
- LAMPADARIOS, E. (2016). Critical challenges for SMEs in the UK chemical distribution industry. *Journal of Business Chemistry*, 13(1), 17-32.
- RODRÍGUEZ-GUTIÉRREZ, M. J., MORENO, P., & TEJADA, P. (2015). Entrepreneurial orientation and performance of SMEs in the services industry. *Journal of Organizational Change Management*, 28(2), 194-212.
- SAUNDERS, M., LEWIS, P. and THORNHILL, A. (2019). *Research methods for business students* (8th Ed), Harlow, England: Pearson.
- SADEGHI, A. (2018). Success factors of high-tech SMEs in Iran: A fuzzy MCDM approach. *The Journal of High Technology Management Research*, 29(1), 71-87.
- SHAKEEL, M., YAOKUANG, L., & GOHAR, A. (2020). Identifying the entrepreneurial success factors and the performance of women-owned businesses in Pakistan: The moderating role of national culture. *Sage Open*, 10(2), 2158244020919520. <https://doi.org/10.1177/2158244020919520>
- SIMPSON, M., PADMORE, J., & NEWMAN, N. (2012). Towards a new model of success and performance in SMEs. *International journal of entrepreneurial Behavior & Research*

REAL-TIME DATA VISUALISATION IN VIRTUAL REALITY USING SENSORTHINGS API STANDARD

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KEY WORDS

virtual reality, VR, metaverse, SensorThings API, spatial data, Open Geospatial Consortium, 3D Tiles, Universal Scene Description

JEL CODES

C88, L86

1 INTRODUCTION

Virtual reality (VR) is known for its ability to facilitate interaction with spatial data, such as natural phenomena or large urban environments. Several geographic information systems offer VR modes, including popular tools such as Google Earth VR and Esri ArcGIS 360. These allow for easy navigation of embedded or user-provided data. However, many use cases require the development of a specialized application. Sharing large datasets, such

as urban areas, requires specialized (geo)graphical formats that support features like tiling, level-of-detail (simplifying distant objects), and more. To keep the visualization up-to-date, we also need to incorporate real-time data streams such as temperature, humidity, air pollution, or traffic. Our goal was to design a flexible architecture that would connect any real-time data source to the corresponding 3D geospatial data.

2 MATERIAL AND METHODS

The Open Geospatial Consortium (OGC) oversees key standards for streaming large 3D geospatial datasets. One such standard is 3D Tiles, originally developed by Cesium, for managing large amounts of heterogeneous 3D content such as terrain and buildings. [1] It organizes data into a hierarchical structure of tilesets and tiles, with JSON files defining tilesets and glTF used to represent tile content, supporting level-of-detail (LOD) management. Another OGC standard, Esri's Indexed 3D Scene Layers (I3S), is tailored for high-performance streaming. Like 3D Tiles, I3S uses a hierarchical node-based structure to manage LOD, but is more tightly coupled to the Esri ecosystem. [2] Similarly, CityGML and CityJSON, both OGC standards,

focus on the representation and exchange of city models. Compared to 3D Tiles and I3S, they lack the focus on advanced visualization. [3] The Universal Scene Description (USD), developed by Pixar and now maintained by Khronos Group, supports the representation of large scenes, primarily for graphics and Industry 4.0 applications such as digital twins. [4] Although not originally designed for geospatial data, USD has been adapted to include a geospatial coordinate system (WGS-84). We also need a standard for real-time data delivery. Otherwise, the visualization application would have to be reimplemented for each new data source. Although there are many possible standards, the most promising is the OGC SensorThings API, which is designed for

easy integration with web services. [5] The above mentioned standards are used in most of the recent papers focused on digital twins, smart cities and similar projects. However, the particular choice of standards and the whole development stack is often not explained in detail.

Therefore, we focused on identifying the most appropriate combination of standards for tasks such as developing digital twins of cities or buildings. Based on the review, we focused on two key visualization standards: Universal Scene Description (USD) and 3D Tiles. Both offer advanced features such as level of detail (LOD), multi-file data distribution, and support for geospatial coordinates. We excluded I3S due to its limited adoption outside the ArcGIS ecosystem and CityGML due to its lack of optimization for real-time rendering. For real-time sensor data, after review, the SensorThings API maintained by the

OGC was selected as the most appropriate standard for this purpose.

An important research question was to compare the capabilities of software platforms implementing these standards. For most projects it is not economically feasible to develop an own rendering engine for 3D Tiles or USD. That is why we chose two key platforms for these standards: Unreal Engine with Cesium for Unreal for 3D Tiles and NVIDIA Omniverse for USD. In both cases the workflow was as follows: Spatial and sensory data were linked via a configuration file. Specific elements of the spatial data, such as a building, are identified by a unique ID. A visualization modifier, such as a different shader, is then applied to the element identified by that ID. The modifier uses sensor data to, for example, change the color of a building to reflect its temperature.

3 RESULTS AND CONCLUSIONS

Implementing tasks such as downloading files, parsing JSON, and integrating real-time sensor data is straightforward in both platforms, with the main difference being developer preference between Unreal Engine Blueprints and Omniverse Omnigraph. The main differences are in how visualization is handled. Cesium for Unreal excels at quickly visualizing 3D spatial data. Google's high-quality 3D Tiles photogrammetry of the cities allows users to visualize large cities without necessity to deal with own data, but treats the entire scene as a single surface, meaning that individual objects such as buildings or lamps cannot be separated, often requiring users to create their own layered 3D content. But even

these spatial layers are limited in their accessibility. A developer cannot address individual objects. To manage this, buildings must be stored in separate tilesets, which becomes impractical for large scenes with hundreds or thousands of elements. Omniverse, on the other hand, aims to be a comprehensive modeling and simulation platform that integrates multiple data sources. It provides full scene access, allowing users to save an entire scene in one file or split it into multiple files for larger projects, with support for 3D and VR visualizations. However, we are not able to produce different applications for web, mobile and desktop as in the case of Unreal Engine.

4 REFERENCES

- [1] Open Geospatial Consortium. *OGC 3D Tiles*. 2023. <https://www.ogc.org>
- [2] Open Geospatial Consortium. *Indexed 3D Scene Layers (I3S)*. 2023. <https://www.ogc.org>
- [3] NVIDIA. *Digital Twins: Develop and harness the power of physics-based, AI-enabled digital twins with OpenUSD*. 2024. <https://www.nvidia.com/>
- [4] Open Geospatial Consortium. *CityGML*. 2023. <https://www.ogc.org>
- [5] Open Geospatial Consortium. *OGC SensorThings API*. 2021. <https://www.ogc.org/>

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THE RELATIONSHIP BETWEEN TRANSNATIONALITY AND COMPANY SALES DURING THE COVID-19 CRISIS

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KEY WORDS

Transnationality, globalization, Covid-19 crisis, financial performance

JEL CODES

F23

1 INTRODUCTION

This study examines the relationship between the level of transnationality and company sales during the COVID-19 crisis, focusing on 50 of the most transnationalized firms globally. These firms, selected based on the Transnationality Index (TNI) by UNCTAD, represent a diverse range of industries and regions, providing a comprehensive overview of the impact of transnationality on corporate financial performance during the pandemic. The study demonstrates the validity of using this index in assessing these types of relationships and outlines possible directions for future measurements with extensions of this approach.

The relevance of this study is supported by the results of numerous studies conducted in recent

years. For example, a study by Buckley and colleagues (2020) demonstrates that firms with high levels of internationalization exhibit more resilient performance in global economic crises due to their ability to diversify risk and adapt to changes in global markets [1]. However, Borino et al. (2024) emphasize that high levels of internationalization may also lead to increased risks in global crises such as the COVID-19 pandemic [2]. For example, firms targeting international markets may face serious challenges related to lockdowns, border closures, and reduced consumer demand in foreign markets. This emphasizes the importance of investigating strategies to mitigate these risks and support firm resilience in a crisis.

2 MATERIAL AND METHODS

For this analysis, an experimental approach was used to identify the impact of the crisis factors of the 2020-2021 pandemic on firms' revenues depending on their level of internationalization, based on the Transnationality Index (TNI) by UNCTAD [3]. From the list of the 100 largest non-financial companies by foreign assets compiled by UNCTAD for the purpose of calculating this index, the 50 largest companies were selected. Company data for the pre-pandemic

period for 2019, the pandemic period 2020-2021, the post-pandemic period and the start of the military conflict in Ukraine 2022, and data for 2023 were selected for the calculation. The sample includes firms from different countries and sectors, which may also vary slightly depending on the updated ranking for the year under test, while always considering the top 50 largest firms by foreign assets.

As a measure of financial performance, total company sales data for the 2019-2023 period under study are used. The use of revenue in the calculation excludes differences in the valuation of companies' assets, their distribution within different jurisdictions, and the distribution of profits within the structure of several companies, such as management holdings, members of a group of companies in the supply chain, etc.

The Transnationality Index (TNI) by UNCTAD for each of the companies in the sample is used to cal-

culate the relationship between financial performance and the level of internationalization. The calculation is performed using regression analysis of company sales and TNI index using the Pearson correlation coefficient. The analysis is an experimental test to verify only this relationship without considering other potential factors such as the home economies of the companies under study, company size, sectors, etc.

3 RESULTS

Based on the performed calculations, it can be determined that for the study period from 2019 to 2023, there is mostly an insignificant or weak relationship between the measured indicators, which cannot be considered significant and based on it, conclusions about the effectiveness or ineffectiveness of the high transnationality strategy can be drawn.

The results for the pandemic crisis onset period in 2020 show a negative relationship between revenue

and TNI, which is also not high. The same relationship is observed in 2022, which is also statistically significant but with a moderate impact on revenue performance. The following year 2023 shows similar results as 2022, which can be considered in this study as a year of geopolitical shock in Europe. In this case, more data needs to be added to the research model to explore the results and relationships in more detail.

4 CONCLUSIONS

This study aimed to identify the relationships between the revenue of the top 50 largest companies in the world by foreign assets and their TNI index score for the period 2019-2023. Based on the data obtained, it can be stated that statistically significant results were obtained only for the period 2020, as well as 2022 and 2023. During the 2020-2021 pandemic crisis, the results showed a statistically significant relationship only for the first year, and such relationship was negative as in 2020 and 2023.

If we consider the pandemic crisis as 2 full years, it cannot be adequately determined from the results whether the TNI was positive or negative in the context of company revenues. If we consider the period of 2022 as a period of geopolitical shock that continued into 2023 and affected international businesses in Europe, the US and Asia, the results showed that high TNI scores had a rather negative impact, however small.

5 REFERENCES

- [1] BUCKLEY, P. J., STRANGE, R., TIMMER, M. P., & DE VRIES, G. J. (2020). Catching-up in the global factory: Analysis and policy implications. *Journal of International Business Policy*, 3(2), 79-106.
- [2] BORINO, F. & CARLSON, E. & ROLLO, V. & SOLLEDER, O. (2024). International firms and COVID-19: evidence from a global survey. *Review of World Economics*. 10.1007/s10290-024-00525-9.
- [3] TRENTINI, C. (2021). A reassessment of UNCTAD's transnationality indices in the digital economy. *Transnational Corporations Journal*, 28(3).

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BIBLIOMETRIC ANALYSIS OF BRAND EQUITY RESEARCH IN FAST FOOD BUSINESSES (2013–2023)

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KEY WORDS

Bibliometric analysis, Brand equity, Fast food, PRISMA, Scopus database, Web of Science database

JEL CODES

M21, M31

1 INTRODUCTION

This study aims to perform a bibliometric analysis of brand equity in fast-food businesses. Brand equity is a fundamental concept in business and marketing today. Its significance is nowhere more apparent than in the fast-food business (Oyewole, 1999) due to competition, ever-changing consumer preferences, and abundant choices. As such, marketers are preoccupied with finding strategies to sustain or

potentially boost their market share. (Suhartanto et al., 2019) and (Oyewole, 1999) believe that the key to surviving and thriving in this competitive environment lies in cultivating a base of loyal clients, a crucial aspect of brand equity. It must be noted that fast food brands have emerged as iconic symbols of not only convenience but also distinctiveness and trust among world economies (Farzin et al., 2023).

2 MATERIAL AND METHODS

To comprehensively cover the data, we gathered raw data from the Scopus and WoS databases. The Thomson Reuters Web of Science database was the only one that allowed bibliometric studies for more than 40 years; however, in 2004, the company Elsevier Science introduced Scopus, enabling researchers to conduct specific analyses by area and period in both databases (Sánchez et al., 2017). Based on the recommendation of (Alsharif et al., 2023), the article has followed the instructions of the preferred reporting items for systematic reviews and meta-analyses (PRISMA) protocol. The search strings used in the two databases were captured to fit the

study field and the topic, ‘brand equity’ AND ‘fast food businesses’ and ‘brand equity’ AND ‘food.’ The time frame spanned from 2013 to 2023, of which we target a recent decade. In bibliometric analyses, it is expected to set a substantial period of five years (Alsharif et al., 2023), a decade, or even several decades (Dong et al., 2023). The year 2023 was included, despite not yet ending, to capture the few publications completed at the time of the search, September 2023. This was so because we had prior information on fewer studies conducted in fast food companies. Henceforth, we captured all those for 2023 from January to August 2023.

The search yielded 368 results (159 from Scopus and 209 from WoS) (see Figure 1). The number of results, as expected, was not as high because there are few brand equity studies conducted in fast food businesses. The screening of the documents was done in such a way that all abstracts were read and adopted from the ideal documents. Figure 1

vividly shows that 68 documents were duplicates and thus excluded from the database. A total of 185 documents were further excluded from the list of 300 documents due to being irrelevant as they did not relate to the core topic at hand. Lastly, 82 full articles were downloaded and used for bibliometric analysis.

3 RESULTS

The review of the documents in Scopus and WoS revealed that only 19 articles published in the Scopus database were eligible for bibliometric analysis. Sixty-three eligible articles from the WoS database were also included for bibliometric analysis. In this regard, a total of 82 articles were bibliometrically analyzed. Eighty-two articles were the only types of documents reviewed.

The evolution of the articles published annually is captured in Table 1 below. The table clearly shows an increase in publications from 2013 to 2023. From this trajectory, the publications are expected to continue to increase even in the following years. This indicates that brand equity and food topics are very

significant, and researchers will continue to research such topics. It is also evident from the table that 2023 had the highest number of publications despite being a partial year. It is worth noting from the table that 2021 had the most significant increase in the number of publications, with a percentage increase of 16% (from 6 to 15 publications, all from the WoS). Table 1 further shows that in 2013, 2018, and 2021, there were no publications in the Scopus database. All publications were made in the WoS with 3, 8, and 24 percentages in 2013, 2018, and 2021, respectively. As per the observed pattern, the research of interest has been skewed towards the WoS from 2013 to 2023.

4 CONCLUSIONS

The analysis highlighted the popularity of specific journals publishing research on brand equity in fast-food businesses. The information can guide researchers in selecting the appropriate outlets for their work and provide a comprehensive understanding of the research landscape. The findings of the bibliometric analysis contribute to our understanding

of brand equity in fast-food businesses and serve as a foundation for future research. It is, however, progressive if the African continent and more countries from Europe also join other continents in contributing to studies within brand equity and fast-food businesses.

5 REFERENCES

- [1] FARZIN, M., BAGHERI ABBASSALIKOSH, A., SADEGHI, M., & MAKVANDI, R. (2023). The effect of sensory brand experience and brand equity on WTP a price premium in Iranian fast food restaurants: Mediating role of eWOM. *Journal of Foodservice Business Research*, 26(3), 528–548. <https://doi.org/10.1080/15378020.2021.2017212>
- [2] OYEWOLE, P. (1999). Multi-Attribute Dimensions of Service Quality in the Fast Food Restaurant Industry. *Journal of Restaurant & Foodservice Marketing*, 3(3–4), 65–91. https://doi.org/10.1300/J061v03n03_06

VALUATION OF NON-RECOURSE RISK UNDER WARRANTY LIMITATION: LITERATURE REVIEW AND MATERIAL DESCRIPTION

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KEY WORDS

Warranty costs, warranty risk, warranty cost sharing, non-recourse risk

JEL CODES

D81, G32, L62

1 INTRODUCTION

Warranty in the automotive industry assures the end consumer, that “(...) the purchased vehicle is free from defects in materials and workmanship that could cause the vehicle to fail to perform as intended”, see [3]. Carmakers depend on the contractors, respectively OEM of the supplier, at least in terms of delivery and their delivered product quality. Companies aim to control and reduce warranty costs [2]. Warranty cost sharing occurs here, where carmakers share the warranty return costs with suppliers (for their returned components),

[4]. There is a non-recourse phenomenon, where the supplier refuses to participate in warranty costs even though there is an agreement for this purpose. Carmakers must consider the risk of non-recourse and try to manage it appropriately. The research in non-recourse risk remains briefly addressed in the literature, despite the importance of handling financial risks [1]. Our work aims to describe non-recourse risk using data from a company operating in the automotive manufacturing sector.

2 MATERIAL AND METHODS

Data on warranty costs and recourse transactions of the company involved in the automotive industry are available for analysis. Data from 2013 to 2024 are available. In total, 6,239 recourse transactions have been collected. From this number, 569 recourse transactions had zero or negative warranty costs and had to be excluded. Additionally, 192 transactions have not been processed and must be excluded. Therefore, 5,478 transactions remain. The data on recourse transactions included (i) Transaction ID, (ii) Type (Recourse basket or Yearly recourse

settlement), (iii) Accounting year, (iv) Description, (v) Transaction categorisation, (vi) Supplier ID, (vii) Supplier, (viii) Part category, (ix) Processing status, (x) Processing status set on (date), (xi) Warranty costs, (xii) Compensation for defective part analysis, (xiii) Corrections on Compensation for defective part analysis, (xiv) Amount of accounted transaction, (xv) Corrections on amount of accounted transaction, and (xvi) Remaining recourse forecast. Every transaction belongs to Serial damage, Technical campaign, and Yearly recourse settlement categories.

It is essential to compute the recourse incomes for each recourse transaction to determine the recourse quota. The recourse income is derived from the aggregate of variables (xii)–(xvi). In the subsequent phase, the recourse and non-recourse quota are meticulously computed by correlating the recourse income with the associated warranty costs. If the recourse quota falls below 25.00%, it is deemed unsuccessful, whereas a quota exceeding 25.01% is regarded as successful (this classification is given by managerial assessment). The transformation

of the recourse quota into a categorical variable eliminates the influence of possible extreme values of the recourse quota and allows for an alternative analysis of the dependence in the contingency table using the chi-squared test, an assessment of the strength of the dependence using Cramer's coefficient and the detection of significantly different cases using Habermann residuals testing. Original recourse quota dependency on accounting years will be tested by a one-way analysis of variance followed by Tukey HSD pairwise comparisons.

3 RESULTS

First, a descriptive data analysis was provided concerning categorising recourse transactions, processing status, and accounting year. The dependence of the (un)successful recourse quota on individual years was analysed using contingency table tests. Low values were observed for 2013–2018 when checking theoretical frequencies, so these years were omitted from further analyses. Successful recourse quota percentage is statistically significantly dependent on the year ($p < 0.001$), however the dependence is rather weak (Cramer coefficient 0.025). According to the analysis of Habermann residuals, it can be concluded that significantly the highest percentage of

successful recourse quota was achieved in 2021 (62%), where the percentage of successful recourse quota was 40% in 2019, grew until 2021, and then decreased to 38% in 2024. These results are in agreement with the one-way analysis of variance, which detected a statistically significant difference in recourse quota across years ($p < 0.001$). Pairwise comparisons identified 2021 (with a mean recourse quota of 0.362) as statistically different from all other years except 2020 (mean recourse quota of 0.322) when the mean recourse quota in the other years ranged from 0.260 to 0.317.

4 CONCLUSIONS

The problem of non-recourse quota seems to be important, and the potential outcome could be interesting for the financial and accounting departments of the client as well as the contractor; the client, who wants to minimise the non-recourse and seeks a full warranty, and the contractor, who wants to maximise

the non-recourse and seeks a warranty limitation. In the framework of further analyses, we will try to identify possible associations with the level of non-recourse quota and the characteristics of specific suppliers based on firm-level indicators.

5 REFERENCES

- [1] LI, M., FU, Y.: Prediction of Supply Chain Financial Credit Risk Based on PCA-GA-SVM Model. *Sustainability* 14., 24 (2022), 16376.
- [2] MURTHY, D.N.P., BLISCHKE, W.R.: *Warranty Management and Product Manufacture*. Springer, 2006.
- [3] PECHT, M.G. (2006): Establishing a Relationship Between Warranty and Reliability. *IEEE Transactions on electronics packaging manufacturing*, 29., 3 (2006), 184–190.
- [4] VINTA, S.: Analysis of Data to Predict Warranty Cost for Various Regions. *Annual Reliability and Maintainability Symposium*, IEEE, TX, USA, 2009, 78–82.

WHICH FACTORS INFLUENCE FAIR VALUE OF INVESTMENT PROPERTY? EVIDENCE FROM REAL ESTATE COMPANIES IN GREAT BRITAIN, GERMANY AND SPAIN

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KEY WORDS

Real estate, IAS 40, Fair value measurement, Shares, Stock, Value of Firm

JEL CODES

G320, G120

1 INTRODUCTION

The real estate sector is an important part not only of the Europe, but also the worldwide economy. As was demonstrated during the Great economic crisis during the years 2007–2009, it is the real estate market itself that can significantly influence global economic development. Fair value measurements affect many aspects of a company's financial and accounting management, along with the impact on the quality of reported earnings by companies. The data on which an investor relies should have a guarantee of relevance, veracity, and comparability

when evaluating multiple investment opportunities (Correia et al. 2011). However, the accounting choice of the form of valuation brought about by IAS 40 itself may make comparability of financial statements more difficult rather than more straightforward. The aim of the paper is to identify, which variable could influence the fair value of investment property, and which inputs should be taken into account by the management or the investor. At the same time, also assess the effect of fair value accounting on market capitalisation and trade volume of stock.

2 MATERIAL AND METHODS

The analyzed sample consist from 36 companies, which were identified across the UK, Germany and Spain over a 5-year period from 1 January 2019 to 31 December 2023, specifically 180 observations. Given the nature and structure of the data, the panel data

model was found to be the most appropriate econometric method. In assessing the appropriateness and selecting a particular type of panel data model, a fixed, random or mixed effects model was considered. Finally, a fixed effects model was created.

3 RESULTS

Result of our research show that the volume of shares traded varies depending on the type of valuator that determines the fair value valuation of the company's investment portfolio. In the case of an increase in the volume of shares traded, there is a slight increase in the fair value valuation, which can be explained by the fact that the company has more financial resources due to the higher volume of shares traded. As a result, the company can undertake further real estate investment projects and increase its real estate portfolio, which will increase in market value because of the expansion. A decrease in fair value valuation may be associated with higher risk based on WACC and/or lower funding and consequently

a lower overall investment portfolio. In contrast, a decrease in the average cost of capital leads to an increase in fair value valuation.

Various methods of determining fair value (market, income or cost approach) and different inputs (Levels 1, 2 and 3 under IFRS 13) did not produce materially different results. Most companies use the income approach and internal Level 3 inputs, which can lead to a higher level of information asymmetry. However, this is consistent with common practice in the real estate sector, where internal experts are often involved in the valuation of properties and is not considered to reduce the credibility of the reported data.

4 CONCLUSIONS

The application of fair value accounting in the real estate sector, especially in the valuation of investment properties, brings many specifics. One of these is the extensive use of internal data and intercompany sources for fair value valuation estimates. Our research show, that fair value valuation is mainly influenced by the volume of shares traded and ROA. Companies with higher volume of shares traded and

higher return on their assets showed higher fair value values. Conversely, a higher WACC led to a decrease in fair value, indicating a riskier company. There were no significant differences at the level of the methodology and inputs used to measure fair value (e.g. market, income or cost approach, levels 1, 2, 3), indicating some consistency in the approaches used.

5 REFERENCES

- MULLER, KARL A.; RIEDL, EDWARD J. and SELFHORN, THORSTEN. Mandatory Fair Value Accounting and Information Asymmetry: Evidence from the European Real Estate Industry. Online. In: *Management Science*. 2015. Available from: <https://doi.org/https://doi.org/10.1287/mnsc.1110.1339>. [cit. 2024-05-19].
- SMIT, ANET, BEITSKE VAN DER NIET and MARTIN BOTHA. Evaluating The Effect of Fair Value Adjustments to Investment Property Based on Profitability Ratios. *Journal of Accounting and Investment* [online]. Vol. 23(2), 2022, [cit. 2023-05-20]. Available from: doi: 10.18196/jai.v23i2.14404
- ALVES, SANDRA. Accounting for Investment Property: Determinants of Accounting Policy Choice by Portuguese Listed Firms. In: *International Journal of Accounting and Taxation* [online]. 2019, s. 1-10 [cit. 2023-05-20]. ISSN 2372-4986. Available from: doi:10.15640/ijat.v7n2a1
- TAPLIN, ROSS, WEI YUAN and ALISTAIR BROWN. The Use of Fair Value and Historical Cost Accounting for Investment Properties in China. *Australasian Accounting: Business and Finance Journal* [online]. Vol. 8(1) [cit. 2023-05-20]. Available from: doi:10.14453/aabfj.v8i1.6
- PHILANDER, KEAGAN DOMAIN. *The usefulness of fair value measurement in financial statements of South African listed companies* [online]. [cit. 2023-05-20]. Dostupné z: <http://hdl.handle.net/10394/24936>

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PROGRAMMING NEURAL NETWORKS ON THE ESP32 PLATFORM

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KEY WORDS

ESP32, neural networks, quantization, edge computing, microcontrollers, edge data processing, inference optimization

JEL CODES

C45

1 INTRODUCTION

In recent years, the development of neural networks (NN) on the ESP32 platform has become an attractive topic, primarily due to the growing availability of computationally weak microcontrollers and their applications in the Internet of Things (IoT). The ESP32, known for its low power consumption, integrated Wi-Fi and Bluetooth connectivity, and affordable price, offers an advantageous platform for

experiments with NN implementations directly at the edge where data processing occurs (edge computing).

This paper discusses the technical challenges and approaches involved in programming NN on the ESP32, with particular emphasis on optimizing the limited resources of the platform and its potential for real-time applications such as image recognition. The research demonstrate that despite ESP32's limitations, it can still offer satisfactory performance.

2 MATERIAL AND METHODS

Deploying NN on microcontroller-based platforms like the ESP32 necessitates several optimization techniques to make them suitable for real-time operations. The limited computational power and memory of microcontrollers pose challenges compared to traditional computing platforms. This research centers on the selection, training, and optimization of small NN for the ESP32-CAM module (Zhao, C. 2021), (Pernes, P. 2024).

Key methodologies employed in this research include:

- **Network Optimization:** Given the limited computational resources, minimizing the complexity of

the NN is essential. Quantization and pruning techniques are used to reduce the model size and energy consumption without significantly impacting accuracy.

- **Model Conversion and Deployment:** NN are trained on traditional platforms and then converted into formats compatible with microcontrollers, using tools such as TensorFlow Lite for Microcontrollers or ESP-DL.
- **Performance Analysis:** The study evaluates the performance of deployed models based on accuracy, inference speed, and computational demands, assessing the feasibility of running various NN on the ESP32.

Optimization Techniques:

- **Quantization:** This technique reduces the precision of neural network weights and activations from floating-point numbers to fixed-point integers, thereby significantly shrinking the model size and computation time. Quantization methods include Dynamic Range Quantization, Full Integer Quantization, and Quantization-Aware Training.
- **Pruning:** Pruning involves removing unnecessary connections within the network, which helps reduce model complexity and computational demands. Structured pruning, magnitude-based

pruning, and sensitivity-based pruning are used in this study to ensure efficiency on the ESP32 platform.

Optimized NN are initially trained on high-performance systems before being converted into lightweight formats compatible with microcontrollers. Tools like TensorFlow Lite for Microcontrollers and ESP-DL streamline the process of deploying models on ESP32. These models are particularly effective for tasks such as image classification, utilizing networks like CIFAR-10, SqueezeNet, MobileNetV1, MobileNetV2, and Tiny-YOLO (Cheng, Y. 2018).

3 RESULTS

The experiments demonstrate that even with the limited resources of the ESP32, NN can deliver satisfactory accuracy and inference speed for simpler tasks. Optimized models running on ESP32 achieved inference times below 500 milliseconds, suitable for real-time applications such as object detection. Although ESP32 can handle basic object detection

with 85-90% accuracy, tasks involving detailed image classification would likely need a more powerful platform or further model optimization. The ESP32's low power consumption, integrated connectivity, and affordable design make it suitable for real-world applications such as: object detection, sensor data analysis, Speech Recognition, smart agriculture.

4 CONCLUSIONS

The results validate the ESP32 platform's potential for deploying simple NN, particularly in applications requiring low processing power and low-latency responses. More complex models may require significant trade-offs in accuracy and computational power, limiting the use of ESP32 for advanced tasks. However, with appropriate optimization techniques, ESP32 serves as an effective platform for edge

computing applications. Future research should focus on advanced model compression techniques and adaptive resource management to further enhance the platform's performance. Additionally, newer microcontroller architectures, such as ARM Cortex-M7, could further improve the capabilities of NN on constrained devices.

5 REFERENCES

- CHENG, Y., WANG, D., ZHOU, P., & ZHANG, T. (2018). Model compression and acceleration for deep neural networks: The principles, progress, and challenges. *IEEE Signal Processing Magazine*, 35(1), 126-136.
- PERNES, P., JAROŠ, M., PODIVÍN, J., TRENZ, O., 2024. Microcontrollers Suitable for Artificial Intelligence. In: *26th International Conference Economic Competitiveness and Sustainability: Abstracts*. Mendel university in Brno, 40. ISBN 978-80-7509-971-6, 120-126.
- ZHAO, C., & WANG, F. (2021). Internet of Things (IoT) Applications and Challenges: A Comprehensive Review. *Journal of Computer Networks and Communications*, 2021, 1-16. <https://doi.org/10.1155/2021/6658761>

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THE ROLE OF BOOKING PORTALS IN THE ACCOMMODATION OFFERINGS OF RURAL DESTINATIONS

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KEY WORDS

Rural tourism, booking portals, accommodation, tourists

JEL CODES

Z30, Z33, M31

1 INTRODUCTION

Tourism is a key economic sector that has been significantly impacted by the COVID-19 pandemic. The pandemic brought about changes in tourist preferences, with increased interest in domestic travel, especially to rural destinations [1]. Rural tourism plays an important role not only for recreation but also for the economic development of local areas [2]. In this context, booking portals are crucial, as they facilitate tourists' access to accommodation. These portals must meet specific requirements and

be tailored to different user groups to provide a personalized and efficient booking experience.

The aim of this study is to identify and analyze the weaknesses of booking portals focused on rural destinations in the Czech Republic. The study also examines the factors that influence tourists' decisions when choosing accommodation and provides recommendations for improving the quality of services offered by booking portals.

2 MATERIAL AND METHODS

Secondary data were used for the research, obtained through an online survey conducted in 2023, involving 202 respondents, 160 of whom had booked accommodation in a rural destination in the Czech Republic in 2023 [3]. The respondents were randomly selected and answered questions regarding their preferences in choosing accommodation, the booking portals they used, and the factors influencing their decision-making. In-depth interviews were conducted with six selected respondents to gather more detailed information about their experiences

with booking rural accommodations. Additionally, the accommodation offerings on booking portals such as Booking.com, Airbnb, E-chalupy.cz, and others were analyzed, as well as their impact on rural tourism. The analysis also measured how quickly and easily users were able to search for accommodations on these portals. Furthermore, the accommodation offerings on 14 regional tourism portals were analyzed, focusing on clarity, user experience, and the availability of information.

3 RESULTS

The analysis revealed that the biggest problem with booking portals is the lack of clarity and up-to-date information, particularly regarding prices and availability. Differences between the portals were identified, with Booking.com rated as the most reliable and user-friendly. Specialized portals focused on rural areas, such as E-chalupy.cz and Bez Kempu.cz, were popular among users who preferred traditional rural accommodations. The Amazingplaces.cz portal was criticized for its outdated design and lack of price information. Another significant finding was that most tourists in rural tourism preferred cottage and chalet accommodations, which were favored by 28% of respondents, followed by hotels (24%)

and guesthouses (22%). Alternative accommodation options, such as tiny houses or glamping, had minimal popularity (3%).

The analysis of regional tourism portals revealed that 13 of 14 regions promote rural tourism on their official websites, but only 10 offer accommodation listings. None of these portals allow direct bookings, which was seen as a weakness.

The factors that most influenced tourists' decisions included filtering options for accommodations, clarity of information, and accommodation photos. On the other hand, less important factors were information about pets and the sustainability of the accommodation.

4 CONCLUSIONS

The study identified key weaknesses of booking portals focused on rural destinations and provided recommendations for their improvement. The main recommendations include increasing the clarity of the websites, implementing up-to-date information on prices and availability, and introducing well-defined loyalty programs. Portals should also encourage the submission of user reviews and photos to enhance their credibility. Flexible searches that

take into account users' individual preferences would significantly improve the user experience. These changes would help increase the competitiveness of smaller accommodation providers and support the development of rural tourism in the Czech Republic. Improvements to booking portals would also contribute to better satisfaction of tourists' needs and greater interest in rural destinations.

5 REFERENCES

- [1] MUGAUNA, RAIKHAN et al. Development of Rural Tourism after the Coronavirus Pandemic. 2021. *Journal of Environmental Management and Tourism*. 11 (8), 2020-2027. ISSN 2068-7729. [https://doi.org/10.14505/jem11.8\(48\).14](https://doi.org/10.14505/jem11.8(48).14)
- [2] UNWTO: *RURAL TOURISM*. 2023. [cit. 2024-01-04]. <https://www.unwto.org/rural-tourism>
- [3] PRÁŠILOVÁ, ADÉLA. *Kvalita a nabídka ubytovacích služeb venkovských destinací na vybraných rezervačních portálech*. Brno: Mendelova univerzita v Brně, 2024.

THE DUAL IMPACT OF DEINDUSTRIALISATION: ECONOMIC AND POLITICAL SHIFTS IN EUROPEAN REGIONS

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KEY WORDS

Deindustrialisation, Political Polarisation, European Union, NUTS 2

JEL CODES

D72, P16, E61

1 INTRODUCTION

This paper examines the economic and political implications of deindustrialisation at the regional level within the European Union. Its added value lies in the detailed regional data analysis, which is uncommon in available research. The main findings show that average gross value added and productivity in the secondary sector are key indicators of the effects of deindustrialisation in both the economic and political spheres. Economic impacts are closely linked to the decline in GDP per capita. Increases in value added indicate intensity-driven

deindustrialisation, which is most visible in structurally affected regions. These areas often face job losses and rising unemployment due to technological change, which in turn increases political polarisation. The results highlight that the economic and political consequences are interlinked and need to be examined together. The paper confirms that a decline in industrial production leads to greater political polarization. The paper is based mainly on studies by Králiková (2024) and Rolník & Adamková (2024).

2 MATERIAL AND METHODS

The material builds on Králiková (2024) and further on, for example, Wen et al. (2022), dealing with globalisation and the negative economic impacts of deindustrialisation, and Di Berardino et al. (2021), where the authors emphasize the impact of economic transitions due to deindustrialisation on the intensification of social and regional disparities, which can lead to increased political polarisation. Further on, Vu et al. (2021), emphasises the loss of jobs in the secondary sector due to new technologies and the subsequent impact on the political decision-making of society.

Regarding the methodology, deindustrialisation's economic and political impacts are analysed separately. The main explanatory variable for economic impacts is GDP

polarisation was created based on Rolník & Adamková (2024) and Rolník (2023). The same explanatory variables are used for analysis of both impacts to represent the decline in the secondary sector (industry): gross fixed capital formation; gross value added (GVA); number of employees; output volume. Additional economic and socio-demographic control variables are included. For the analysis, panel data regression analysis was applied using OLS with fixed effects method. The research covers the period from 2000 to 2023 and focuses on the years when parliamentary elections took place, analysing data from NUTS 2 regions. For robustness testing, the models were also tested using the main explanatory variables separately for each variable.

3 RESULTS

The economic impacts of deindustrialisation, such as a decline in GVA and output in the secondary sector, cause a reduction in GDP per capita, leading to an overall economic weakening of the regions. Comparing with the results of polarisation models to identify the impacts of deindustrialisation, they suggest that the growth of GVA in the secondary sector leads to an increase in political polarisation, which is the opposite phenomenon of what was expected. These results may be due to differences between regions, especially those structurally affected, where deindustrialisation reduces GDP per capita growth in the secondary sector. However, new technologies may increase GVA in this sector. The impact of technological progress, while increasing labour productivity, may cause a shortage of jobs that are no longer needed in the production process as a result of the impact of technology. In the economic model, the

results for the R&D investment variable were opposite to what was expected. With the results suggesting that higher investment leads to a decline in GDP. This result may be due to a lag between investment and its impact on economic growth. As for the high-tech export variable, this variable, for the economic model of the effects of deindustrialisation, did not turn out to be significant. In contrast, for explaining the impacts on political polarisation, this variable is significant, with a positive effect on political polarisation, which is also consistent with the available literature (Stiglitz, 2017). In doing so, this sector increases economic welfare, improves living standards, and generates positive perceptions of economic growth, which helps mitigate political tensions. However, these benefits are not evenly distributed, which can create tensions in structurally affected regions.

4 CONCLUSIONS

This paper focused on the economic and political consequences of deindustrialisation at the regional level within the EU. A decrease in economic outcomes due to deindustrialisation can lead to political polarisation and deepen regional disparities, especially in structurally affected areas. While technological progress increases productivity, it can also contribute to rising unem-

ployment in the industrial sector. The emphasis is placed on investments in research and development and the retraining of workers as solutions to mitigate the negative effects and the economic and political impacts of deindustrialisation are closely linked and must be studied together.

5 REFERENCES

- [1] DI BERARDINO, C., DOGANIERI, I., ONESTI, G.: Deindustrialization in the EU between Transformation and Decline. *Eastern European Economics*, vol. 59, no. 3 (2021), 225–249.
- [2] KRÁLIKOVÁ, D.: *Ekonomické a politické dopady deindustrializácie v kontexte európskych regiónov*. Diplomová práca, FBE MENDELU, 2024.
- [3] ROLNÍK, O., ADAMKOVÁ, K.: The Mutual Influence of Labour Market Polarisation, Wage Polarisation and Political Polarisation in the European Union. *DANUBE*, vol. 15 (2024), 1–23.
- [4] STIGLITZ, J. E.: The overselling of globalization. *Business Economics*, vol. 52, no. 3 (2017), 129–137.
- [5] VU, K., HARAGUCHI, N., AMANN, J.: Deindustrialization in developed countries amid accelerated globalization: Patterns, influencers, and policy insights. *Structural Change and Economic Dynamics*, vol. 59 (2021), 454–469.
- [6] WEN, H., WEN, C., LEE, C.-C.: Impact of digitalization and environmental regulation on total factor productivity. *Information Economics and Policy*, vol. 61 (2022), 101007.

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DIGITAL MARKET TOOLS USED BY FINANCIAL INTERMEDIARIES IN SLOVAKIA

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KEY WORDS

Digital Marketing, Digital Marketing Tools, Insurance intermediaries, Social media marketing

JEL CODES

M31, G22

1 INTRODUCTION

As digitalization reshapes financial services, insurance intermediaries need to adopt digital marketing strategies to engage clients, enhance loyalty, and drive growth, especially after the accelerated shift brought on by COVID-19. Channels like social media, email, and mobile apps help intermediaries align with customer preferences, increase satisfaction, and enable targeted marketing through data analytics—

key for staying competitive. However, digitalization also brings cybersecurity and data privacy challenges, which intermediaries must address to build trust. This study examines the digital marketing tools used by Slovak insurance intermediaries, focusing on their adoption and purpose to provide insights that help insurance companies optimize intermediaries' roles within their marketing strategies.

2 MATERIAL AND METHODS

The questionnaire was administered to 209 insurance intermediaries in Slovakia, yielding a balanced sample with 110 men (52.63%) and 99 women (47.36%) selected via systematic sampling. To gauge perceptions of digital marketing tools, the study employed Wilksa's (2003) validated instrument, which captures business attitudes towards digital technologies using a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). This approach enabled a nuanced understanding of intermediaries' views on various marketing strategies.

Data collection was conducted by email, allowing efficient reach across regions, and analysis was

performed using Stata software. Descriptive statistics summarized key demographic patterns, while advanced statistical techniques, including reliability testing, correlation analysis, and hypothesis testing, were employed to establish relationships between digital marketing tools. The study builds on the framework by Basha et al. (2021), extending their research with a broader focus on digital tools specific to the insurance industry, thereby providing insights into how these tools are perceived in a distinct cultural and business setting. The primary hypothesis tested was: H1: Digital marketing tools have no significant impact on Slovak insurance intermediaries

3 RESULTS

The study confirms that digital marketing tools used by Slovak insurance intermediaries are both reliable and impactful, with Cronbach's alpha scores above 0.70 for all tools, indicating robust internal consistency. This reliability suggests the tools are effectively capturing intermediary attitudes toward digital marketing. Pearson correlation analysis highlighted specific relationships, such as the strong positive correlations between email marketing, content marketing, and webinars, indicating these tools are often employed together to enhance engagement. In contrast, SEO and PPC advertising exhibited a strong negative correlation, suggesting these tools may be considered substitutes rather than complementary strategies.

Further, while tools like Google AdWords positively correlated with social media and webinars, there was a noticeable negative correlation between online reviews and content marketing, suggesting a trade-off between focusing on reputation management versus content creation. Similar trade-

offs emerged between retargeting ads and customer engagement tools, underscoring potential alignment issues within broader strategies.

The overall model demonstrated that digital marketing tools accounted for 72% of the variance in Slovak insurance intermediaries' marketing activities ($R^2 = 0.724$), affirming the substantial influence of digital marketing on their strategies. A Z-test confirmed the statistical significance of this influence ($p = 0.00$), rejecting the null hypothesis that digital marketing tools have no impact.

These findings offer practical insights for insurance intermediaries, indicating a need for a balanced approach that combines tools effectively while addressing integration challenges. The results serve as a foundation for optimizing marketing strategies, leveraging synergies between tools like content marketing and webinars while managing potential conflicts between others, such as PPC advertising and SEO.

4 CONCLUSIONS

The study examines digital marketing tools used by Slovak insurance intermediaries, highlighting email and content marketing as key to increasing engagement and effectiveness. Conversely, tools like Google AdWords and PPC advertising face chal-

lenges in aligning with intermediaries' strategic goals, suggesting gaps in understanding. The findings indicate a need for balanced digital strategies and better training to optimize marketing performance and client trust.

5 REFERENCES

- [1] BASHA, S. M., KETHAN, M., AISHA, M. A.: A Study on Digital Marketing Tools amongst the Marketing Professionals in Bangalore City. *JAC: A Journal of Composition Theory*, 14(9) (2021), 17–23.
- [2] WILSKA, T. A.: Mobile phone use as part of young people's consumption styles. *Journal of Consumer Policy*, 26(4) (2003), 441–463.

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CZECH CONSUMERS AND RECYCLED WOOD MATERIAL

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KEY WORDS

Circular economy, composite materials, consumers, sustainability

JEL CODES

Q56, D91, C83

1 INTRODUCTION

For many people in the Czech Republic, terms like circular economy or sustainability are still just terms in the dictionary of foreign words. Yet there is a constant effort to understand and change the behaviour of market participants. Indeed, these changes affect both producers and consumers. Currently, there is a strong emphasis worldwide on balancing industrial development and economic growth on the one side and human health and the environment on the other, see for example [1].

Within the scientific literature, there is a wealth of research from different sectors. In this article we will discuss the relatively neglected area of recycling wooden materials that can be used for the production of various products (from OSB to furniture). The studies conducted so far have mainly focused on the producers' side. For example, [2] or [3] describe in detail composite materials,

recycling options and the associated development of the circular economy. However, their perspective is purely technical. [4], on the other hand, focus on the economic (accounting) side of companies that actively use composite materials in their production.

That the use of composite material is beneficial for companies with an established line has been proven in studies, but no one has yet thought in detail about the reaction of consumers. Products made from recycled material have similar (or even better) properties than conventional wood materials, but have a different colour. In the case of OSB products, this fact is virtually imperceptible to consumers, but in the case of furniture manufacturing, it could already be a significant factor influencing sales. Therefore, this article focuses on reaching out to customers and determining the level of willingness to buy products made from recycled wood materials.

2 MATERIAL AND METHODS

The necessary data was obtained through a questionnaire survey. To control for representativeness, the questionnaire included several identification questions (gender, region, age, etc.). Responses were collected online during the spring of 2024. A total of 163 respondents' answers could be included in the analyses. The results of the survey on the willingness to purchase recycled material products are tracked

against the identification questions, allowing for some segmentation of customers in the market.

It was necessary to verify the reliability of the data. Cronbach's alpha was used for this purpose as in [5] The value of this indicator should not fall below 0.5, and the closer it is to the value of 1, the greater the consistency in responses.

3 RESULTS

According to the results of the questionnaire survey, 17% of respondents buy only solid wood products. Of these, 94% are not willing to replace solid wood furniture with product made from recycled materials. This group of respondents typically includes middle-aged employed (or self-employed) people. Their reluctance to buy recycled wood products is mainly due to concerns about the quality of the material, not the appearance.

More than half of the respondents (61%) do not prefer any particular type of material and therefore this information does not influence them so much when buying. These are generally younger people

compared to the group described above. For 27% of these people, price is the most important factor influencing their purchase. For a further 38%, it is price/quality ratio. For another 24%, colour is the main factor. Unfortunately, even in this group, the majority of respondents (68%) think that products made from recycled materials are of lower quality.

Due to the relatively high values of Cronbach's alpha (0.74), the collected data can be considered reliable. Based on commonly used criteria such as gender, age, economic status and region, the responses of the respondents can be considered representative.

4 CONCLUSIONS

The focus of this article is to determine the willingness to purchase products made from recycled material. Despite the different colour, retailers should also focus on better promoting the positive technical properties of composite materials, as this is also a major purchase concern. Especially the

younger generation is not so much concerned with the type of material, but is mainly interested in colour and price. If the production prices of products made from recycled material are kept at a significantly lower level, the willingness of younger generations to buy these products will be high.

5 REFERENCES

- [1] MAREK, M., KREJZA, Z.: Circular Economy Development both in the Czech Republic and the World. *Procedia Computer Science* 219., (2023), 1678–1686.
- [2] KROMOSER, B., REICHENBACH, S., HELLMAYR, R., MYNA, R., WIMMER, R.: Circular economy in wood construction – Additive manufacturing of fully recyclable walls made from renewables: Proof of concept and preliminary data. *Construction and Building Materials* 344., (2022), 128219.
- [3] IŽDINSKÝ, J., VIDHOLDOVÁ, Z., REINPRECHT, L.: Particleboards from Recycled Wood. *Forests* 11., 11, (2020), 1166.
- [4] STAŇKOVÁ, M., PIPÍŠKA, T.: The Use of Recycled Wood as a Factor in Production Efficiency of Manufacturers in V4 Countries. *Croatian Journal of Forest Engineering* 45., 2, (2024), 433–445.
- [5] KREJČÍ, M., STAŇKOVÁ, M.: The Position of Netflix in the Czech Republic Before and During the COVID-19 Pandemic. 2022. *European journal of business science and technology* 8., 1, (2022), 72–83.

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THE IMPACT OF MARKET ORIENTATION ON INTERNATIONALIZATION PROCESS: GHANAIAN SMES IN AGRO-PROCESSING PERSPECTIVE

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KEY WORDS

Internationalization, Market orientation, international performance, Small and medium-sized enterprises (SMEs)

JEL CODES

L26, M1, M16

1 INTRODUCTION

In Ghana, the Agric sector is one of the dominant sectors with numerous SMEs operating within the industry (Ayambila, 2023). Small and medium-sized enterprises (SMEs) constitute a significant proportion of the global economy (Salamzadeh & Dana, 2022; Haddad et al., 2020), whose value has been recognized by many countries, and particularly developing nations. The sector makes up around 80% of total employment in Ghana and contributes about

60% of the country's GDP. Due to the quest to survive in a competitive global business market, SMEs in the agricultural sector have internationalized and market orientation is critical to their internalization success. Hence, this study addresses the gap in the literature on agricultural SMEs by examining the influence and effect of market orientation on the internationalization processes of SMEs in Ghana's agricultural sector.

2 MATERIAL AND METHODS

The study utilized the descriptive research design in order to gather data that accurately characterizes the export business activities of agricultural SMEs. This design also enables the researcher to identify emerging patterns, get fresh perspectives, and assess respondents' opinions on how Ghanaian agricultural SMEs are internationalizing in the context of strategic orientation. The study was quantitative in nature and applied the cross-sectional survey approach. Cross-sectional survey was utilized because data was collected at specific point in time

from a sample chosen to represent the population within a given time range. The study purposively distributed structured questionnaires electronically to 370 agricultural SMEs involved in exporting goods from agro-based activities. The respondents were mainly businesses that were members of the National Board for Small Scale Industries (NBSSI), Ghana Export Promotion Agency (GEPA) and the Ghana Chamber of Commerce. However, after data screening 341 valid responses underwent descriptive and PLS-SEM analysis.

3 RESULTS

There is a positive market orientation effect both on internationalisation processes and on international performance. The result showed that market orientation contributes to about 69% of changes in SMEs' international performance. As a market orientation variable, competition, customer, and cost positively

influence internationalization performance. The outcome is supported by the findings (Nakos, Dimitratos & Elbanna, 2019; Haddoud et al., 2019; He, Brouthers & Filatotchev, 2018; Acosta, Crespo & Agudo, 2018).

4 CONCLUSIONS

The importance of internationalization of SMEs cannot be underestimated due to the gains derived from this activity not only for the firm but also for stakeholders. Considered the backbone of the Ghanaian economy, this study explored market orientation of Ghanaian SMEs internationalization process in the Agro-Processing Sector. With the results revealing that competition, cost and customer are the key basis for which most SMEs in the Agro-processing sector of Ghana undertake internalization. It therefore means that, Ghanaian SMEs operating in the agro-sector succeed in their internalization activities through

surviving the competition by seeking information about their competitors and also responding to environmental changes in the foreign market. Also, they ensure that their costs (fixed and variables costs) related to their operation in the international market are tightly controlled through prudent and efficient use of these investments. Furthermore, they constantly provide quality customer service, communicate effectively with their customers and also handle customer complaints swiftly in order to succeed in their internalization activity.

5 REFERENCES

- ACOSTA, A., CRESPO, A. and AGUDO, J. (2018), Effect of market orientation, network capability and entrepreneurial orientation on international performance of small and medium enterprises (SMEs), *International Business Review*, Vol. 27, pp. 1128-1140.
- AYAMBILA, S. N. (2023). Determinants of micro and small enterprises financial performance in the non-farm sector of Ghana: A quantile regression approach. *Cogent Economics & Finance*, 11(2), 2225331.
- HADDAD, M. I., WILLIAMS, I. A., HAMMOUD, M. S., & DWYER, R. J. (2020). Strategies for implementing innovation in small and medium-sized enterprises. *World Journal of Entrepreneurship, Management and Sustainable Development*, 16(1), 12-29.
- HADDOUD, M. Y., NOWINSKI, W., JONES, P., & NEWBERY, R. (2019). Internal and external determinants of export performance: Insights from Algeria. *Thunderbird International Business Review*, 61(1), 43-60.
- HE, X., BROUTHERS, K. D., & FILATOTCHEV, I. (2018). Market orientation and export performance: the moderation of channel and institutional distance. *International Marketing Review*, 35(2), 258-279.
- NAKOS, G., DIMITRATOS, P., & ELBANNA, S. (2019). The mediating role of alliances in the international market orientation-performance relationship of SMEs. *International Business Review*, 28(3), 603-612.
- SALAMZADEH, A., & DANA, L. P. (2022). A systematic literature review of crisis management in and by small and medium-sized enterprises. *Small and Medium Sized Enterprises and the COVID-19 Response*, 1, 38-61.

SHORT-TERM AND LONG-TERM CONSEQUENCES OF INDEBTED DEMAND

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KEY WORDS

Debt, household, GDP growth, interest rates, income inequality

JEL CODES

D14, E21, E43

1 INTRODUCTION

The financial crisis of 2008, originating in the USA, rapidly spread worldwide due to the highly globalized financial sector. Prior to the crisis, both private and public sector debt had been steadily accumulating [1], culminating in a bursting mortgage bubble that triggered significant public financial interventions. As a result, the relationship between rising debt and future economic output has become a crucial and widely debated topic [2].

This paper focuses on the effects of increasing debt across households, non-financial corporations, and governments on economic output, taking into account various time horizons. A secondary objective is to assess the relationship between income inequality and interest rates, which can influence borrowing costs.

2 MATERIAL AND METHODS

The empirical analysis were based on an unbalanced dataset of 83 countries, derived from the Global Debt Database [3] and the World Economic Outlook. This dataset spans from 1950 to 2020 and includes roughly 1,800 observations. Debt across sectors (households, corporations, and governments) is measured relative to GDP. Additional macroeconomic data was sourced from OECD, World Development Indicators, and Ameco. Income inequality data was gathered from the World Inequality Database. A Panel VAR

and local projection model were used to assess the impact of sectoral debt across time and quantified the influence of income inequality on interest rates, while fixed effects models using three-year differences were used to quantify the impact of selected variables on the final effect of debt. The selected variables used for fixed model effects are transformed in the style $\Delta_3 d_{it-1}^{ATR}$ where ATR represents the selected variable, i is the country identifier and t is time.

3 RESULTS

The analysis highlights differing impacts of household, corporate, and government debt on future economic activity across European countries. Household debt initially boosts economic output in the short term, driven by increased consumption. However, this positive effect fades by the medium term, where the burden of repayments peaks in the seventh year, leading to a prolonged negative impact on output. Non-financial corporations debt shows no significant influence on future economic output. The lack of correlation suggests that corporate debt may not be as critical in predicting economic downturns or growth. Government debt initially has a negative effect on future output, but this impact diminishes after four years, likely due to the relatively low levels of public debt in the analyzed sample of European countries. These findings underscore the

importance of institutional frameworks, particularly in mitigating the adverse effects of household debt. Furthermore, variables affecting the final impact of debt on GDP development is also examined. For example income inequality, though significant globally, has a negligible impact on GDP related to debt in Europe, where income disparities are less pronounced compared to other continents. However, the concentration of the banking sector and employment protection are key variables affecting GDP and debt interactions. Another objective was to explore the relationship between income inequality and lower interest rates. The research confirmed that income inequality significantly influences interest rates in Anglo-Saxon countries and the US. However, in Europe, this factor does not play a major role in determining borrowing costs.

4 CONCLUSIONS

This paper confirms that sectoral debt impacts future economic output differently across various timeframes. Household debt, in particular, exhibits a stronger short-term boost but contributes to long-term economic strain. Meanwhile, non-financial corporations debt's impact remains minimal, and the negative effect of public debt dissipates over

time. Notably, institutional factors like banking concentration and labor protection significantly alter these relationships, particularly in Europe. In addition to these findings, we can confirm that income inequality in Europe does not have an impact on the final level of interest rates.

5 REFERENCES

- [1] LORENZO FORNI and BERNARDINI, MARCO, *Private and Public Debt: Are Emerging Markets at Risk?*. International Monetary Fund, 2017.
- [2] MIAN, ATIF, AMIR SUFI, and EMIL VERNER. Household debt and business cycles worldwide. *The Quarterly Journal of Economics* 132.4 (2017): 1755-1817.
- [3] MBAYE, S., MORENO-BADIA, M., and K. CHAE. 2018. *Global Debt Database: Methodology and Sources*, IMF Working Paper, International Monetary Fund, Washington, DC

EMOTION CLASSIFICATION IN DIALOGUES: SURVEY ON APPROACHES AND DATASETS

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KEY WORDS

Natural language processing, Emotions, Communication, Dialogues, Classification.

JEL CODES

C45, L86

1 INTRODUCTION

Emotion recognition in text is one of the NLP (Natural language Processing) tasks, specifically the classification task. It is the task that involves assigning predefined labels to a topic [1]. Emotion classification in dialogue is one of the very challenging tasks, mainly due to the fact that conversations are relatively short [2]. Classification in dialogue can be divided into several phases [1]. The first phase is preprocessing, in this phase is necessary data preparation. In the second phase the selected method is used for classification. The author can use two types of methods namely traditional methods which consists of two parts that are Features Extraction

and Classifier, or Deep Learning methods. Currently, Transformers-based models are most commonly used for classification, primarily because they have outperformed convolutional neural networks in model training cost and performance [3]. The question of large language models (LLM) emotion recognition area is: when it is appropriate to fine-tune the model for a particular task and when it is not. The decision criterion, if the fine-tuning gives better results than original model is dependent on how much data is determined for fine-tuning. The more data that can be used for fine-tuning, the better the model achieves.

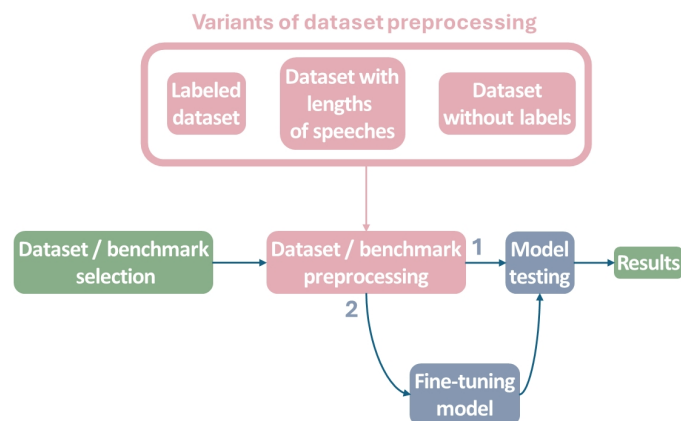


Fig. 1: Methodology for testing the ability of emotion classification models. In branch 1, the model that is only pre-trained is tested in branch 2, the model that is fine-tuned on the tested dataset is tested.

2 MATERIAL AND METHODS

In the first step, datasets or benchmarks will be selected and then preprocessed so that they can be evaluated and compared. The results of the same datasets will be compared in the first case with labels, in the second case without labels and in the third

case with the length of speech data. This will then be tested with the latest LLM models, which will be unfine-tuned in the first case and fine-tuned in the second case, and in the last step the results will be compared.

3 RESULTS

How well a model performs in emotion recognition depends not only on its architecture, but also on the data used to train it. Models perform better if they are trained on labeled datasets than if the dataset labels are not present [4]. Another improvement in the performance of the models could come from information about the length of the utterance. It is known that depending on the emotion a person has, the length of the utterance varies accordingly

[5]. The pre-trained models themselves can also be fine-tuned. However, fine-tuning the models yields better results only if the model can be fine-tuned on a large amount of data, if not, the fine-tuning may result in a degradation of the model performance, because during the fine-tuning process the weights are recalculated, which may cause a degradation of the model performance in the absence of data.

4 CONCLUSIONS

This contribution proposes a methodology for testing models on an emotion recognition task. This methodology also shows ways to improve the performance of the models for this task. It has been shown that over time, models that contain only an encoder have started to be used for emotion recognition instead of models that contain only a

decoder, however, for these models the main task of emotion recognition is not but normal dialogue. Hence, the next question to investigate is which of these models actually perform better, models that were designed mainly for classification or models that have a wide range of tasks that they handle.

5 REFERENCES

- [1] LI, Q., PENG, H., LI, J., XIA, C., YANG, R., SUN, L., YU, P. S., & HE, L. (2022). A Survey on Text Classification: From Traditional to Deep Learning. In *ACM Transactions on Intelligent Systems and Technology* (Vol. 13, Issue 2, pp. 1–41). Association for Computing Machinery (ACM).
- [2] SONG, X., ZANG, L., ZHANG, R., HU, S., & HUANG, L. (2022). Emotionflow: Capture the Dialogue Level Emotion Transitions. In *ICASSP 2022 - 2022 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*.
- [3] VASWANI, A., SHAZEER, N. & POLOSUKHIN, I. (2017). Attention is all you need. *Advances in neural information processing systems*, 30.
- [4] YANG, J., JIN, H., TANG, R., HAN, X., FENG, Q., JIANG, H., YIN, B., & HU, X. (2023). *Harnessing the Power of LLMs in Practice: A Survey on ChatGPT and Beyond (Version 2)*. arXiv.
- [5] HAMMOUDEH, A., & TEDMORI, S. (2019). Emotions and the Structure of the Language. In *2019 IEEE Jordan International Joint Conference on Electrical Engineering and Information Technology (JEEIT)*.

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ENHANCING EDUCATIONAL ADMINISTRATION THROUGH E-COMMERCE INFORMATION SYSTEMS

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KEY WORDS

Education, E-commerce, Management, Information System

JEL CODES

O32, O33, O43

1 INTRODUCTION

Managing educational institutions has become increasingly complex, requiring effective management of tasks such as enrolment, student tracking, resource allocation, and financial monitoring. Traditional methods often rely on manual processes or decentralized information systems and fail to meet the growing demands of modern education. These traditional systems often result in inefficiencies, errors, and delays that negatively impact the overall effectiveness of educational institutions [1-3]. In contrast, the

e-commerce industry effectively utilizes advanced information systems to streamline operations, increase customer satisfaction, and make data-driven decisions. E-commerce platforms use robust systems for inventory management, customer relationship management (CRM), order processing, and data analysis [4-5]. This article explores how these e-commerce information systems can be adapted to improve educational management, potentially changing the way institutions operate.

2 METHODOLOGY

This study adopts a qualitative approach and focuses on a comparative analysis of the functions of e-commerce and educational information systems. Relevant literature on e-commerce systems such as inventory management, CRM, and data analytics is reviewed, along with a review of current educational information systems, including student information systems (SIS) and learning management systems (LMS) [4]. Additionally, case studies of organizations

integrating advanced information systems inspired by e-commerce are analyzed. These case studies provide practical insights into the potential benefits and challenges of applying e-commerce technologies to educational settings. Data collected from these sources are synthesized to identify key areas where educational institutions can benefit from integrated e-commerce inspired systems [3].

3 RESULTS

The comparative analysis shows in Table 1 that educational institutions can significantly improve their operational efficiency by adopting e-commerce inspired information systems. For example, an automated registration system inspired by e-commerce order processing can streamline the application process and reduce errors and administrative burden. Likewise, predictive analytics common in e-commerce inventory management can be applied to student tracking, allowing institutions to provide personal-

ized academic support and improve retention rates. The study also shows that integrating CRM principles into education systems can improve student experience by providing personalized interactions and responsive services, much like how e-commerce platforms improve student satisfaction and customer loyalty. However, the study highlights a number of challenges, including the need for significant initial investment, staff training, and the need to overcome resistance to change within institutions.

Tab. 1: Comparative analysis

Feature	E-commerce Information System	Educational Information System	Potential Adaptation in Education
Integration & Real-time Data	High integration and real time flow across all functions.	Often fragmented; real-time data integration is limited.	Improve integration to enhance responsiveness.
Data Analytics	Advanced analytics used for predictive modeling.	Limited use of advanced analytics;	Adopt predictive analytics for resource allocation.
Process Automation	Extensive automation of order processing and inventory management.	Limited automation; many processes remain manual or semi-automated.	Automate administrative processes to reduce workload and improve accuracy.

4 CONCLUSIONS

Applying e-commerce information systems to educational management offers tremendous potential for improving efficiency, accuracy, and overall effectiveness. By automating processes, integrating real-time data analytics, and improving student support through CRM- like systems, educational

institutions can streamline operations and provide better services to students and staff. Although there are challenges associated with implementation, such as cost and resistance to change, the long-term benefits of adopting these systems may outweigh the initial barriers.

5 REFERENCES

- [1] MIAH, MUHAMMED: *Digital Inequality: The Digital Divide and Educational Outcomes*, (2024).
- [2] DANIEL OKUNBOR, et.al.: E-Commerce Solutions At Higher Education Institutions: A New Perspective, *Review of Business and Technology Research*, Vol. 3, No. 1, (2010).
- [3] IOAN-MATEI: The Importance Of Disruptive Technologies In E-Commerce For Higher Education, *Journal of Information Systems & Operations Management*, Vol. 17.1, (2023) Pag. 186 – 265.
- [4] LAUDON, K. C., & TRAVER, C. G.: *E-commerce 2018: Business, Technology, Society* (14th ed.). Pearson, 2018.
- [5] CHOPRA, S., & MEINDL, P.: *Supply Chain Management: Strategy, Planning, and Operation* (6th ed.), 2016.

INTERCULTURAL COMPETENCE AND OTHER CHALLENGING AREAS AS PART OF SUSTAINABLE RELOCATION POLICY

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KEY WORDS

intercultural competence, relocation, global mobility, assignment policy, sustainability

JEL CODES

M12, M14

1 INTRODUCTION

The multinational company offers to its employees an opportunity for long-term international assignments including the relocation of the close family members not only to ensure the international operations, but also to develop the staff and due to strategic business reasons. There must be a comprehensive global mobility strategy in place in order to attract not only the actual staff, but also the talents on the labor market outside the company. The assignment policy must be not only competitive, but also should mind various scenarios which can occur during the assignment abroad. The usual assignment scenario modification is necessary by the change in size of the family – e.g. due to childbirth, marriage etc. and/or change in the dependent status. Multinational company as the employer should be therefore prepared to support the modifications in the assignment set up.

Multinational companies offer its employees a possibility to work on a long-term basis abroad including the relocation of the closest family dependents. This can include traditionally the wife or husband, children, but often also also lifepartner, stepchildren or the children of the lifepartner and also partner of the same sex. The actual size of the family can be also changed during the assignment due to the motherhood of the assignee itself or the dependent wife. In order for the multinational companies to attract the talents and also motivate its employees to be assigned abroad, assignment policy for long-term relocations should reflect all possible scenarios and provide support in various fields, so the negative impact of the relocation on the assignee and the family is limited as much as possible and leads to no premature termination or cancellation of the assignment.

2 MATERIAL AND METHODS

The initial phase of the research required a thorough review of currently published academic papers. The search was performed via Web of Science, using the key words as „assignment“ or „assignment policy“

in the combination with the key words as „motherhood“, „maternity“, „same sex couple“, „stepchild“, „marriage“. Based on the search, we reviewed 32 academic papers.

In the second phase, we have conducted 16 semi-structured interviews with the assignees of selected multinational company as well as global mobility specialists. Based on the interviews, we were able

to cluster the most frequent challenges connected with the assignment of the assignee and the family dependents.

3 RESULTS

The non-exhaustive list of the most frequent challenges of the assignee and the family dependents connected to the assignment:

Field	Description
Social security	<ul style="list-style-type: none"> • Motherhood during assignment can interfere with the social security coverage settlement • Limitations of the maternity leave and parental leave
Immigration	<ul style="list-style-type: none"> • Marriage during assignment leads to potential change of right to reside and to work • Same sex couples or stepchildren can have no or limited options to acquire certain family reunification permits
Intercultural competence	<ul style="list-style-type: none"> • Pre-school child, which has to enroll to the first grade of the elementary school can have limited options due to lack of knowledge of the local language • Lack of governmental support for intercultural preparation of the family dependents or only limited offering (e.g. Lottery principle)

Source: based on eleven semi-structured interviews

4 CONCLUSIONS

Based on conducting 11 semi-structured interviews, we were able to identify and therefore cluster the key areas, for which support of the multinational company must be provided in order for the employee to adapt to the family-related changes on the assignment.

These key categories can be on the high level clustered as legal (with the further focus on the area of the social security and immigration) and also cultural (such as the process of acculturation).

5 REFERENCES

- [1] TZENG, R. (2006). Gender issues and family concerns for women with international careers: Female expatriates in Western multinational corporations in Taiwan. *Women in Management Review*, 21(5), 376-392.
- [2] McNULTY, Y. (2014). Women as female breadwinners in non-traditional expatriate families: Status-reversal marriages, single parents, split families, and lesbian partnerships. In *Research handbook on women in international management* (pp. 332-366). Edward Elgar Publishing.
- [3] FECHTER, A. M. (2012). From 'Incorporated Wives' to 'Expatriate Girls': A New Generation of Expatriate Women?. In *Gender and family among transnational professionals* (pp. 193-210). Routledge.

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ESG PRINCIPLES AND CHALLENGES IN FOOD PRODUCTION CHAIN: EVIDENCE ON A BENCHMARKING APPROACH

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KEY WORDS

ESG, food processing, benchmarking, sustainable business, agri-food sector

JEL CODES

M14, M29, Q18, Q56

1 INTRODUCTION

This article aims to explore the recent trend of companies being required to disclose ESG-related information, particularly in response to recently implemented Corporate Sustainability Reporting Directive (CSRD). New requirements for transparency in ESG reporting are increasing the pressure on companies across food production chain. It's important to note that ESG scores do not follow a single global standardization system, making it difficult to compare different companies or sectors. This research paper provides an overview of the upcoming CSRD timeline and the current global approach to meet these requirements. The World Benchmarking Alliance (©2023) has developed a benchmarking tool for the food and agriculture industries, ranking 350 of the most influential companies based on 4 key factors: environment, governance, nutrition and social inclusion.

Among the comparison areas making up the overall score of the given benchmarking, there is also the environment area, evaluating the specific phenomenon of food waste and loss, representing the perishable nature of foodstuff. Food losses can occur at any stage of the food chain. Food waste is then discussed mainly at the level of retail, wholesale or direct consumption (e.g. European Commission, 2023; Fourth Estate, 2021). We examine the companies using a benchmarking approach, then categorize data by region based on their ESG performance, offering insights into regional differences and sustainability levels within the industry. Can European companies be considered leaders in achieving high ESG standards? In which ESG areas are European food sector companies outperforming those in other regions?

2 MATERIAL AND METHODS

The primary goal of our analysis was to examine the relationship between ESG factors and ranking of the companies and to classify companies regionally according to their performance. We analyzed 350 selected companies in the food and agriculture sector using benchmarking dataset made by the World Benchmarking Alliance (©2023). Companies were ranked by their overall score based on mentioned four key factors, with 46 chosen indicators individually analyzed. We conducted an explorative

analysis to understand how various companies are meeting ESG standards in the following geographical regions: Europe, Asia and Pacific, America and Caribbean, and Africa. This benchmarking allowed us to compare quality of these four key aspects across geographical regions, providing a global perspective. Using correlation analysis, we explored the relationships between ESG factors and company performance. We hypothesized that European companies would outperform others in ESG performance,

primarily due to strict regulations and a well-developed sustainability infrastructure. This assumption was tested using statistical methods and verification. We subjected the data to a normality test and found that the data

were not normally distributed. Therefore, non-parametric methods were used, as they are commonly applied when the data do not meet the assumptions required for parametric tests, such as normality (Dickhaus, 2018).

3 RESULTS

The analysis revealed significant differences among the monitored companies in implementing ESG factors into their operations. Companies tend to be more successful in addressing social issues than environmental concerns. Both areas show relatively low average scores, indicating potential for improvement in both categories. Through correlation analysis, we found a relationship between the 46 indicators and company performance. The size and quality of the enterprise influence ESG scores and

the adaptation to implementing ESG factors in business operations. Significant regional differences were also uncovered, with some companies lacking improvements in certain areas, particularly in the Governance section of ESG. In addition to our results, a cluster analysis was conducted to examine which factors are important for European countries and making them leaders in the food sector. The reason we found that European companies are making significant progress in the social factors of ESG.

4 CONCLUSIONS

ESG non-financial reporting is not seen by mainly economically larger entities, resp. entities operating in global value chains, only as mandatory reporting beside the ultimate financial ones. In fact, non-financial reporting helps to create a competitive advantage towards demand that is sensitive to aspects affecting the areas of environment, social and related business governance. Food value chains are part of the globalized food market, where their production at all related levels is considered an important partial area in the framework of its contribution among others also to the effects of human activity on climate change. In the same way, it is necessary to assess social aspects in the production and distribution

of foodstuff due to the aforementioned global nature of food-value chains, specifically in emerging economic areas. Our research proves these aspects, employing a publicly available benchmarking system of World Benchmarking Alliance on agri-food complex and respective participating companies, covering the worldwide extent of those, which are considered to be the most influencing companies in the area of sustainability. Our research questions are answered regarding the partial results, we have reached the following findings. Our results confirmed that European companies are leading in ESG performance because of high rankings in social inclusion.

5 REFERENCES

European Commission: *Commission Staff Working Document Impact Assessment Report Accompanying the document Directive of the European Parliament and of the Council amending Directive 2008/98/EC on waste: SWD(2023) 421 final*. [Online]. [Cit. 2024-09-11]. Available at: <https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:52023SC0421>

Fourth Estate: *UN Calls for Action to End Food Waste Culture* (2021). [online]. [cit. 2024-10-18]. Available

at: <https://dailynewsbrief.com/2021/10/04/un-calls-for-action-to-end-food-waste-culture/>

DICKHAUS, T.: *Theory of Nonparametric Tests*. Springer, Bremen, 2018.

World Benchmarking Alliance: *Food and Agriculture Benchmark* (2023). [online]. [cit. 2024-7-25]. Available at: <https://www.worldbenchmarkingalliance.org/research/2023-food-and-agriculture-benchmark-dataset/>

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