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“Bridging the Digital Divide: Digital Innovation and Inclusion Across Borders “

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BOOK OF ABSTRACTS

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Foreword

It is with great pride and enthusiasm that I, on behalf of Universiti Teknologi MARA (UiTM), Malaysia, and as a co-organizer of this significant event, extend a warm welcome to all readers of the Book of Abstracts for the International Interdisciplinary Scientific Conference, “Bridging the Digital Divide: Digital Innovation and Inclusion Across Borders.”

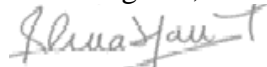
This publication serves as a testament to the collaborative spirit and intellectual rigor that the conference embodies, bringing together scholars, practitioners, and stakeholders from around the globe to address one of the most pressing challenges of our era — the digital divide. Within these pages, you will find a collection of abstracts that reflect diverse perspectives and innovative research on topics ranging from artificial intelligence and digital education to the ethical and legal aspects of digital transformation. These abstracts collectively capture the essence of the papers presented at the conference, showcasing the depth and breadth of insights shared by participants.

The conference, organized under the auspices of the Overcoming Digital Divide in Europe and Southeast Asia (ODDEA) project, funded by the European Union, underscores the importance of encouraging interdisciplinary dialogues. It is through such dialogues that we can uncover new solutions to bridge disparities and ensure that the benefits of digitalization are shared across borders and communities.

I would like to extend my heartfelt gratitude to all contributors, the organizing committee, and the scientific board for their dedication to making this conference and its outcomes impactful. Let this Book of Abstracts not only document the intellectual milestones achieved during the conference but also inspire further inquiry, collaboration, and action as we continue to steer through the complexities of the digital age.

May this publication serve as both a source of knowledge and a call to collective effort in our shared mission to overcome the digital divide.

Warm regards,



Dr. Azlina Hanif
ODDEA Management Board Member
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Digital Convergence and Divergence in EU and ASEAN Economies

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Extended Abstract

In recent years, the digital economy has become a crucial component of global development, significantly influencing how industries, governments, and societies operate. This research examines digital convergence and divergence between European Union (EU) and Association of Southeast Asian Nations (ASEAN) countries, with a focus on the period from 2010 to 2024, including the impact of the COVID-19 pandemic. The study aims to provide insights into how digital indicators including the ICT Development Index (IDI), E-Government Development Index (EGI), Online Service Index (OSI), Telecommunication Infrastructure Index (TII), and Human Capital Index (HCI) evolved during this period and how these trends reflect broader regional disparities in digitalization.

The primary objective of the study is to assess the extent of digital convergence or divergence in the EU and ASEAN regions. Specifically, the study seeks to answer two questions:

- 1. To what extent has digitalization converged or diverged in the EU and ASEAN regions from 2010 to 2024?*
- 2. How has the COVID-19 pandemic influenced digital convergence or divergence within these two regions?*

By addressing these questions, the research aims to contribute to a deeper understanding of the global digital divide, offering policy recommendations to promote more equitable digital development in both the EU and ASEAN regions.

The study uses beta convergence analysis with a robustness checked through sigma convergence analysis, along with Difference-in-Difference (DiD) analysis, to examine digital performance in the two regions. These methodologies are used to measure whether countries with lower initial levels of digitalization have caught up with more developed countries (convergence) or whether disparities have widened (divergence). The analysis covers pre-COVID (2010–2019), COVID (2020–2021), and post-COVID (2022–2024) periods.

The study finds that the EU had stronger convergence across various digital indices than ASEAN. In particular, the ICT Development Index (IDI) showed significant convergence within the EU, suggesting that countries with lower digital development are catching up with more advanced nations. In contrast, ASEAN showed mixed results, with both convergence and divergence evident, particularly in the post-pandemic period.

In addition, the COVID-19 pandemic acted as a catalyst for digital transformation, but its effects varied across the two regions. In the EU, digital convergence was sustained during the pandemic, supported by strong policy frameworks and well-developed digital infrastructure.



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ASEAN, on the other hand, experienced greater divergence in some areas due to disparities in digital infrastructure and uneven responses to the pandemic. While some ASEAN countries, such as Singapore, rapidly advanced, others struggled, leading to an increased digital divide. The analysis of the E-Government Development Index (EGI) and Online Service Index (OSI) revealed strong convergence trends in both regions. Governments in both the EU and ASEAN made significant strides in providing digital public services during the pandemic, although the pace of progress varied. The EU showed more consistent growth, while ASEAN exhibited both convergence and divergence, with countries like Laos and Myanmar lagging behind in digital government services. Telecommunication infrastructure (TII) also showed convergence in both regions, but the rate of progress was slower in ASEAN, particularly in rural areas with limited access to digital services. The Human Capital Index (HCI) presented a different picture, with significant divergence observed in both regions. This divergence points to widening gaps in digital skills and education, which are essential for full participation in the digital economy. The findings of this research offer valuable insights for policymakers in both regions. For ASEAN, the results suggest the urgent need for investments in digital infrastructure, particularly in underserved areas. Improving broadband access, promoting public-private partnerships, and expanding digital literacy programs are crucial steps toward bridging the digital divide.

For the EU, the study suggests that while digital convergence is ongoing, more attention should be given to sustaining human capital development, particularly in fostering digital skills and resilience. Strengthening lifelong learning initiatives and ensuring that all member states benefit equally from digital advancements will be key to maintaining the region's competitive edge.

This study provides a comprehensive comparative analysis of digital convergence and divergence in the EU and ASEAN regions, highlighting the varying impacts of the COVID-19 pandemic. The research concludes that while the EU has maintained stronger digital convergence across key indices, ASEAN exhibits both convergence and divergence, reflecting the region's diverse economic and digital landscapes. Policymakers in both regions must prioritize inclusive digital development strategies to ensure that the benefits of the digital economy are shared equitably, particularly in the post-pandemic era.

JEL Classification: O 33, L 96, F 02

Key Words: Digital convergence, Human Capital, ASEAN-EU, Digital divide, COVID-19

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Comparison analysis of tourism industry and digital economy in the regions of Indonesia

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Extended Abstract

The analyses was looking for the answer about the position of Indonesia, compared to its competitors, what tendencies refer to the number of tourists and which areas are appointed by the leaders of tourism to develop. The goal of the research is to analyse the touristic, and digital achievements of Indonesia using empirical experiences and sources of desk-based research. The comparison analyses the different provinces based on the demand aspect. The Indonesian travel market and the digital sector are growing rapidly. Indonesia's Travel & Tourism sector is experiencing a rise in domestic tourism, driven by the growing middle class and improved infrastructure. The top booking sites for foreign tourists in Indonesia are Traveloka and Ticket.com. According to the aim of the National Medium-Term Development Plan for 2020-2024 tourism is the highlighted sector of the country and stands on the second place of the 41 priorities. The number of tourists and the income of tourism showed a linear growth between 2019-2019. Tourism receipts reached their nadir (0.5 billion US\$) in Indonesia after Covid in 2021. After that the tourism receipts started to increase sharply reaching 14 billion US\$ in 2024. This rate almost reached the top rate of 2019, which had been before



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Covid. (16.9 US\$) The tourist arrivals followed the income which was 1.55 million in 2021 and it rose to 11.7 million in 2023.

The income in Thailand is the double of the Indonesian and the number of tourists is 16 million more than of those in Indonesia. Thailand and Malaysia are before Indonesia as for income and the number of international tourists. Indonesia is before Vietnam and the Philippines. As for the number of tourists, Vietnam is slightly better than Indonesia although Vietnam's tourism is less effective. The touristic receipts are the highest in the most developed countries, in Australia, Japan, India, Thailand, and Macao among the Asian countries. Indonesia is on the 11. place, with receipts equivalent of Malaysia and Korea (14 billion US dollar/2023). The most important tourist sending region in 2023 is the group of the nearby Southeast Asian countries (Asean), followed by Asia. Europe is followed by the nearby region of Oceania. For European tourists Indonesia is almost 4 times more popular than for the American tourists. On the top of the list is Malaysia with 16.73% which also belongs to the neighbouring benchmark countries. China and Australia have a high potential for the future developments due to their close location and their huge number of population. However, at this point attention should be paid to avoid mass tourism and the relevant task of management is, for example in small islands, to introduce visitor rules and implement them consequently.

In 2023 the biggest number of foreigners was in Bali's qualified hotels among the Indonesian islands. The tourist traffic of Bali is the double of Java's, which is on the second place (1 859 000 people). The number of tourists in Sumatra is remarkable, which is less than a half of Java's. At the end of the classification are the smaller islands and Sulawesi and Kalimantan. The priorities of the national strategy highlight the tourist attractions of Java, which means further fall into line with Bali. It is a good idea to develop the smaller islands, as well as Sulawesi and Kalimantan in the field of sustainable investments but mainly in the field of marketing. As it was mentioned before, another problem Indonesia has to face is the lack of coordination between local government agencies and tourism stakeholders. The further direction of our research is the complex digital networking analysis of tourism stakeholders of Yogyakarta.

According to domestic tourism, the number of guests (In classified hotels) in Bali is less than one-tenth of those in Java. Therefore, Java has the highest number of hotel guests. The difference of domestic tourism between Java and Sumatra, which is on the second place, is 5 times bigger than the number of international guests.

According to international comparison, the international tourism of Indonesia, referring to guest nights and receipts, has not reached the numbers of its big competitors, Thailand and the big Asian countries, but it shows an increasing tendency. The domestic tourism is big which can be the base of further development. It is an important task to increase the income and the number of foreign tourists.

Besides the nearby Asian countries (eg.twin city programmes), Europe has some potentials despite the huge distances. The region with good value for money has unique interest for the European tourists. As Java has scientific potential and only in Yogyakarta there 100 universities, the scientific and educational cooperations could be a good base for further development. The information about the eastern region must be sent to tourists with the help of internet. The touristic demand is not equivalent of Bali's, therefore the right strategy is to



distribute the international tourists in the different regions and to offer a wide range of activities.

JEL classification: L83

Keywords: Indonesia, Jawa, Yogyakarta, number of tourists, domestic tourism

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Acceptance Trends of Central Bank Digital Currencies (CBDCs) in the European Union: A Bibliometric Analysis

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Extended Abstract

This study examines the acceptance trends of Central Bank Digital Currencies (CBDCs) within the European Union (EU), utilizing a bibliometric analysis to identify research patterns, key themes, and influential works in this emerging field. With central banks globally exploring or piloting CBDCs, Europe represents a unique environment where regulatory alignment and public attitudes significantly shape CBDC research and potential implementation. Bibliometric analysis provides a systematic approach to map the scholarly landscape, evaluate publication trends, co-authorship networks, and assess the impact of CBDC research across EU countries. This research highlights key areas of focus within the EU's CBDC acceptance literature, such as public trust, security, and financial inclusion, alongside technological and regulatory challenges that are unique to the European monetary landscape.

The study's bibliometric methodology involves data collection from major academic databases, focusing on peer-reviewed journals, conference proceedings, and government reports published over the last decade. The analysis includes a co-citation and co-authorship network analysis to identify influential scholars and institutions, exploring how collaborative research networks are forming within the CBDC domain in the EU. Additionally, a thematic analysis of keywords helps to categorize the dominant topics and trends, such as the implications of CBDCs on monetary policy, privacy concerns, and the role of digital currency in promoting financial stability.

Results reveal an upward trend in CBDC-focused research in recent years, particularly in response to the European Central Bank's initiatives and public consultations on the digital euro. The findings suggest a multi-disciplinary approach, with contributions from fields such



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as economics, finance, law, and information technology, reflecting the complex, cross-cutting nature of CBDC acceptance issues. Research on the European CBDC ecosystem emphasizes the dual role of CBDCs in preserving monetary sovereignty against private digital currencies and enhancing transactional efficiency. Moreover, a subset of the literature investigates public perceptions, suggesting that the acceptance of a digital euro largely depends on the level of privacy protection, ease of use, and trust in the issuing central authority.

In conclusion, this bibliometric analysis contributes to a clearer understanding of CBDC acceptance trends within the EU, illustrating how the discourse around digital currency has evolved and pinpointing areas where further research is needed. As EU policymakers and researchers continue to explore the potential of a digital euro, insights from this analysis may inform future policies, ensuring that the adoption of CBDCs aligns with the expectations and needs of European citizens.

JEL classification: E44, G28, O33

Keywords: CBDCs, European Union, digital euro, bibliometric analysis, public acceptance

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Identifying driving forces and barriers in implementation of Industry 4.0: the case of SME in Slovakia

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Extended Abstract

Understanding the driving forces and barriers in implementation of Industry 4.0 is a fundamental step to understand the digital divide at organizational level, and to build a conceptual framework for solving it. This working paper is a piece in this ongoing investigation by describing the results of a survey filled by the employees of five companies in Slovakia. The main contribution of the research is a detailed description of the employees' perception of the implementation of digital solutions.

This study aims to contribute to the broader investigation of Industry 4.0 adoption by detailing employee perceptions, identifying key factors that influence successful implementation, and providing case studies for practical reference.

Results of research reveals Industry 4.0 as a transformative force in manufacturing, leveraging technologies such as cyber-physical systems, the Internet of Things (IoT), artificial intelligence (AI), and cloud computing. These advancements aim to increase productivity, flexibility, and sustainability in manufacturing processes, supporting innovation and competitiveness. However, the implementation of Industry 4.0 technologies poses significant challenges, including high initial costs, data security concerns, and the need for a skilled workforce. These barriers are particularly pronounced in Slovakia, where the industrial sector is a cornerstone of the national economy.

The study's methodology centers on case studies derived from survey data collected from employees at five Slovak companies. Each case provides a detailed examination of the organizational context, employee demographics, and current state of digitization, as well as employees' perceptions of digital solutions. These cases cover diverse industries, including



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manufacturing, IT services, and food production, offering a comprehensive view of Industry 4.0 adoption across different sectors.

Key findings indicate that the majority of employees perceive the implementation of digital solutions as smooth and effective, though complications and challenges are not uncommon. For instance, ERP systems and cloud solutions are widely recognized for their positive impact on operational efficiency, yet their adoption often reveals areas for improvement. Similarly, AI technologies are primarily utilized for optimizing logistics, automating administrative tasks, and demand forecasting, while applications like chatbots and personalized recommendations are less ordinary. This research also analyzes demographic factors that influence perceptions of digital transformation. In many cases, younger and mid-career professionals exhibit greater adaptability to new technologies, whereas older employees may face challenges due to limited technical skills or resistance to change. Gender disparities are also evident, with male employees often constituting the majority in technical roles. One notable case study involves a Slovak branch of an Italian manufacturing company, which has successfully implemented ERP systems and automated warehouse logistics. The majority of employees reported positive outcomes from digitization, citing enhanced process efficiency and inventory management. However, some expressed concerns about the complexity of new systems and the need for additional training. Another case highlights an IT company specializing in remote network management, where employees demonstrated a strong familiarity with digital tools. Despite this, the adoption of advanced Industry 4.0 technologies like predictive analytics and integrated AI systems faced resistance due to perceived complexity and implementation challenges. Across all case studies, the findings emphasize the importance of addressing organizational inertia, providing adequate training, and supporting a culture of innovation. The study recommends a phased approach to digital transformation, supported by clear communication, employee engagement, and continuous evaluation of technological impact. In conclusion, this working paper provides understanding of the factors influencing Industry 4.0 adoption in Slovakia. By capturing employee perspectives and analyzing case-specific challenges, it aims to provide valuable insights for policymakers, business leaders, and researchers. The findings underline the need for targeted strategies to overcome barriers, maximize the benefits of digital transformation, and ensure the equitable distribution of technological advancements across the workforce. This research contributes to the ongoing effort to bridge the digital divide and position Slovakia as a competitive player in the global industrial landscape.

JEL classification: D22, O33

Keywords: Industry 4.0, driving forces, barriers, digital transformation, implementation challenges

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Digital Transformation in ASEAN: Evaluating Socio-Economic Impacts and Digitalization Across Southeast Asia

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Extended Abstract

This study examines digitalization across ten ASEAN countries from 2017 to 2022, focusing on socio-economic impacts and the factors driving digital transformation. Leveraging data from the International Telecommunication Union (ITU), the study categorizes digital metrics into three domains: Connectivity, Markets, and Governance, Affordability, Sustainability, and Trust (CMG-GAST). Synthesized into the CMG Index, these indicators provide a comprehensive ranking of digital economy maturity and enable the identification of clusters reflecting digital progress and socio-economic development levels across ASEAN. The findings reveal wide disparities in digitalization across ASEAN, highlighting digital maturity gaps where advanced economies like Singapore, Malaysia, and Brunei benefit from high-performance ICT infrastructure, regulatory support, and market resilience. Conversely, lower-GDP countries, including Laos, Myanmar, and Cambodia, struggle with connectivity, limited ICT access, and low digital literacy rates, factors that curtail their digital and economic growth. These divides are particularly severe in rural areas, where limited ICT access perpetuates socio-economic inequality. ASEAN's digital transformation is increasingly recognized as a key driver of economic growth and social inclusion. The analysis of CMG clusters divides ASEAN countries into high, medium, and low digitalization levels. Singapore, Malaysia, and Brunei, which form



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the high digitalization cluster, are characterized by strong digital infrastructure and comprehensive ICT policies. The medium cluster, which includes Thailand, Indonesia, Vietnam, and the Philippines, shows steady but uneven digitalization progress, as challenges remain in achieving universal connectivity and regulatory adaptation. The low digitalization cluster—comprising Cambodia, Laos, and Myanmar—faces significant barriers in ICT infrastructure and investment, constraining digital and socio-economic growth. Although ASEAN shows signs of convergence in digital metrics, persistent digital divides challenge the goal of an integrated digital economy. The findings suggest targeted investments in ICT infrastructure, expanded regional cooperation, and standardization of regulations as essential to bridging these digital gaps. Given ITU’s emphasis on connectivity and infrastructure as core digital development drivers, supporting digital literacy in low-digitalization countries is critical for optimizing socio-economic benefits across ASEAN. The CMG Indicator, a central contribution of this study, aggregates ITU data across Connectivity, Markets, and GAST, creating a taxonomy of digital economy maturity across ASEAN. The Connectivity component draws on ITU metrics such as internet access, broadband penetration, and mobile network availability, emphasizing the foundational aspects of digital readiness. The Markets component assesses economic conditions such as ICT competition, affordability, and investment, while the GAST area—grounded in ITU governance and regulatory standards—focuses on cybersecurity policies, consumer protection, and sustainable digital growth. Together, these components provide a benchmark to assess and monitor ASEAN’s digital transformation, creating a framework to understand digital maturity within varied socio-economic contexts. This approach fills a critical gap in literature, offering structured insights into digitalization and its socio-economic effects across Southeast Asia. Strategic investment and coordinated policy frameworks are essential for ASEAN countries aiming to close digital divides and achieve inclusive growth. Expanding ICT infrastructure, particularly in underserved areas, promoting digital literacy, and fostering public-private partnerships are vital steps toward building resilient digital economies. As ASEAN countries expand their digital economies, collaborative policies balancing national and regional interests will be key to sustainable digital growth. This study recommends a multi-dimensional policy focus encompassing connectivity, literacy, and governance to bridge digital divides and unlock socio-economic potential across ASEAN. This assessment of ASEAN’s digitalization progress and socio-economic impacts provides actionable insights for policymakers, researchers, and development practitioners focused on equitable digitalization. With ongoing investment and regionally coordinated strategies, ASEAN can develop into a leading digital economy bloc, promoting inclusive growth and technological innovation that benefits all member nations.

JEL classification:**Keywords:** Digital transformation, socio-economic Impacts, ASEAN, ITU, Southeast Asia**Acknowledgment:** This outcome was prepared in the framework of the project Overcoming Digital Divide in Europe and Southeast Asia “ODDEA” Project No. 101086381 Call: HORIZON-MSCA-2021-SE-01-1**Co-funded by
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Online presence of community-based tourism development villages in Central Java, Indonesia

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Extended Abstract

The Central Java area is based upon the combination of rich Javanese culture and also some rich, natural phenomenon, such as waterfalls, caves and untouched shores. Tourism is a very important resource, as after Bali, it is the second most visited area with Yogyakarta city in the centre of attention. In this study we refer to this as Jogja from now on, as it is the well-known nickname of Yogyakarta city. The region has 3.7 million and the city has 468000 inhabitants and it is also a multimodal hub having a railway connecting to Jakarta, the capital, a domestic airport to the main destinations like Bali and also excellent coach connections. Having promoted the best destination in Indonesia according to Instagram survey, this study is to analyse how small Tourist Villages, which have been nominated with the title to develop and take part in tourism, get involved with other destinations around them. As they are small, they need to be connected with more well-known attractions around them, and geographically are connected to more well-known attractions. The aim is to investigate whether they are also connected to them online, by looking at their online presence and also whether they form a networking with them online. Nowadays being visible online is a challenge for those destinations have no significant capital and manpower to invest, so they rely on bigger and more known places online and offline too. The study looked at the connection between website and social media between tourism villages and also bigger tourist places. Tourism villages, as



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they are small face difficulty standing on their own, but would do well if they could benefit from more well-known attractions.

JEL classification: L83

Keywords: Indonesia, Jawa, Yogyakarta, tourism villages, online presence

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Assessing Student Sustainable Learning Engagement in Mobile Learning through Social Cognitive Theory and Social Learning Theory

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Extended Abstract

The advent of mobile learning has revolutionized various facets of human life, including education. Mobile learning allows students to study anywhere and anytime which gives big opportunities to students access good education. However, sustaining students' learning engagement is challenging. In particular, this research identified the factors that can influence students' learning engagement in mobile learning from a social cognitive and social learning perspective. This research also investigated the effectiveness of mobile learning tools in promoting sustainable learning engagement. This research collected questionnaires from 290 students who had experienced using a mobile learning platform and used Smart PLS 4.0 to test the hypothesis. The results indicate that the online learning environment and observational learning are the key variables that positively impact students' sustainable learning engagement. In summary, the result from this research suggests that students should have positive emotions to be willing to engage with the course then they will start to manage their behaviour to be suitable for an academic setting to start the process of learning and sustaining their engagement.

Mobile technology has significantly impacted various aspects of life, including education, through mobile learning (m-learning). M-learning leverages portable devices to enable learning anytime and anywhere, offering flexibility and accessibility in diverse environments. However, sustaining student engagement over time remains challenging. This research explores enhancing sustainable student learning engagement through m-learning by applying Social Cognitive Theory (SCT) and Social Learning Theory (SLT).



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M-learning utilizes devices such as smartphones and tablets to provide flexible access to educational content, enhancing engagement with its interactive nature. Yet, maintaining long-term student engagement remains difficult. To address this, the study employs two main theories: Social Cognitive Theory (SCT) and Social Learning Theory (SLT). Developed by Albert Bandura, SCT focuses on observational learning, imitation, and modeling within a social context, emphasizing the reciprocal interaction of person, environment, and behavior. SCT highlights the importance of self-efficacy—students' belief in their ability to succeed—which plays a crucial role in their engagement and persistence (Bandura, 1986). SLT, also developed by Bandura, emphasizes learning through observation, imitation, and modeling. It underscores the role of reinforcement and punishment in behavior formation and stresses the importance of social interactions in learning processes (Bandura, 1977).

The research objectives of this study can be broken down into three folds: to incorporate SCT and SLT principles to enhance student engagement in mobile learning environments, to assess the effectiveness of mobile learning tools in promoting sustainable student engagement, and to identify factors influencing sustained engagement in mobile learning from social-cognitive and social learning perspectives. M-learning can boost motivation and engagement through its interactive, flexible nature. However, the long-term sustainability of this engagement is less understood. SCT's focus on self-efficacy and reciprocal determinism provides a framework for understanding sustained student engagement, while SLT's emphasis on social interactions has been effective in traditional and online learning, promoting engagement and retention.

M-learning's interactive platforms offer multimedia content, instant feedback, and collaborative tools, enhancing engagement. According to SCT, students' confidence in mobile devices and their belief in m-learning's effectiveness significantly influence engagement and outcomes (Wang et al., 2009). SLT underscores the importance of peer interactions and collaborative learning, which m-learning environments facilitate through features like discussion forums and group projects (Schunk & Zimmerman, 1997). Sustainable learning engagement is the ability to maintain interest, motivation, and active participation over time. Factors influencing this include content relevance, instructional design quality, and educator support (Reeve, 2012).

Integrating SCT and SLT in m-learning provides a comprehensive framework for enhancing engagement, with SCT focusing on self-efficacy and environmental factors, and SLT on social interactions and observational learning. M-learning can support SCT principles through personalized learning and adaptive technologies, and SLT principles through social features that facilitate peer interactions and collaborative learning (Hwang & Chang, 2011; Chen et al., 2015). The literature suggests that combining SCT and SLT in m-learning can significantly enhance sustainable student engagement, fostering both immediate and long-term academic success. By leveraging the strengths of both theories, educators can create m-learning environments that not only foster immediate engagement but also support long-term academic success.

Sustainable student engagement is a critical factor in achieving long-term educational success. It encompasses maintaining students' interest, motivation, and active participation in learning activities over an extended period (Fredricks, Blumenfeld, & Paris, 2004). Research indicates that engaged students are more likely to persevere through academic challenges, retain



information, and achieve higher academic outcomes (Kuh, 2009). Several factors influence sustainable engagement, including the relevance of the content, the quality of instructional design, and the support provided by educators (Reeve, 2012).

JEL Classification: I23, O33, Q01

Keywords: education, sustainable, mobile learning, innovation, digitalisation

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Towards the Development of a Human Capital Index: Structure, Methodology, and Comparative Insights with the Human Development Index

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Extended Abstract

*This study introduces the conceptual framework and initial structure of the newly formed **Human Capital Index (HCI)**, which was developed to address the limitations of traditional measures such as the Human Development Index (HDI). While the HDI aggregates basic dimensions of development (education, health, and income) into a single measure, it often overlooks critical qualitative aspects of human capital. By contrast, the HCI provides a multidimensional assessment, integrating variables such as education quality, healthcare access, economic productivity, and technological readiness. This focus aligns with the increasing recognition of human capital's pivotal role in socioeconomic progress, as highlighted in Kraay's (2018) and Prados de la Escosura (2021) works.*

The methodology underlying the HCI involves four core sub-indices—Education, Health, Economic Productivity, and Education Quality—each reflecting specific components of human capital. These sub-indices draw on international World Bank, UNESCO, and OECD datasets, ensuring robustness and comparability. Key variables include years of schooling, life expectancy, internet usage, scientific publications, and labour market participation. Principal Component Analysis (PCA) and Ridge regression were applied to determine these variables'



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weights, addressing multicollinearity issues and ensuring statistical validity. For instance, PCA helps prioritise variables with the highest variance contribution, while Ridge regression fine-tunes sub-index weights to maintain balance.

Assumptions behind the index's construction include normalising data to a 0-1 range, using global extremes for benchmarking, and emphasising indicators relevant to developed and developing nations. For example, sanitation and mortality rates serve as proxies for health outcomes, reflecting their foundational role in workforce productivity. Including internet access and scientific output highlights the growing importance of both digital and knowledge economies.

Preliminary findings reveal the HCI's potential for nuanced cross-country comparisons. Unlike the HDI, which aggregates data into broad categories, the HCI disaggregates components to identify specific strengths and weaknesses. This granularity enables policymakers to target interventions effectively. For example, countries excelling in education quality but lagging in health metrics can use the HCI to prioritise healthcare reforms. Comparative analysis also demonstrates the index's adaptability, with the flexibility to incorporate emerging indicators as global conditions evolve.

This study situates HCI within the broader academic discourse on human capital measurement, referencing foundational work on indices such as the Inequality-Adjusted HDI (UNDP, 2010) and the World Bank's Human Capital Index (2018). By addressing the critiques of these measures—such as the HDI's reliance on aggregated metrics or the narrow scope of the World Bank's HCI—this research offers a more comprehensive tool for assessing human capital in diverse socioeconomic contexts.

Future research will focus on empirically validating the HCI, refining sub-index weights using real-world data, and applying causal analysis techniques to explore the relationships between human capital indicators and broader developmental outcomes. By bridging gaps in existing methodologies, the HCI aims to guide sustainable policy interventions aligned with the United Nations' Sustainable Development Goals, particularly those targeting education, health, and economic equity.

This work contributes to advancing the theoretical and practical understanding of human capital. It offers an innovative approach to measuring its multidimensional nature and critical role in fostering long-term economic resilience and growth.

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JEL classification: E 66, O 15, I 25

Keywords: Socioeconomic Indicators, Human Capital Index, Human Development Index

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A Comparative Analysis of Human Capital and Human Development Metrics

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Extended Abstract (500 - 800 words)

Human development metrics are fundamental tools for assessing the socio-economic progress of nations. This paper delves into two key frameworks: Human Capital (HC) and Human Development (HD), exploring their methodologies, applications, and the evolving landscape of associated indices. Specifically, the study critically evaluates the Human Development Index (HDI), Inequality-adjusted HDI (IHDI), Multidimensional Poverty Index (MPI), and gender-related metrics, providing a comparative analysis of their application to Malaysia and Montenegro. The Human Development Index (HDI) has been a cornerstone of socio-economic assessment since its introduction by the United Nations Development Programme (UNDP) in 1990. HDI measures development through three dimensions: health (life expectancy), education (literacy and school enrollment), and standard of living (GDP per capita adjusted for purchasing power parity). However, critiques regarding its reductionist approach, which excludes broader socio-economic and cultural dimensions, led to significant revisions in 2010. These revisions aimed to improve the index's responsiveness to changes in data and methodology, enhancing its accuracy as a development indicator. Despite its utility, HDI has limitations simplifying human development into a single composite value, which may not



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capture inequalities or the full range of human choices. This critique gave rise to additional indices, such as the Inequality-adjusted HDI (IHDI). The IHDI adjusts the HDI by accounting for inequality in health, education, and income. This adjustment highlights disparities within countries, showing how inequality diminishes the potential for achieving maximum human development.

Case Study: Malaysia and Montenegro both rank in the "high human development" category, yet they exhibit notable differences in HDI and IHDI scores. Malaysia's HDI indicates strong education and life expectancy outcomes but faces challenges related to regional disparities and inequality. Montenegro, while achieving similar HDI rankings, suffers greater losses in its IHDI due to more pronounced inequalities in health, education, and income distribution. These disparities underscore the importance of examining inequality-adjusted metrics alongside traditional indices. The Multidimensional Poverty Index (MPI) broadens the scope of development assessment by capturing deprivations across health, education, and living standards. Introduced in 2010, the MPI identifies individuals experiencing poverty in multiple dimensions simultaneously. For instance, Malaysia and Montenegro both face multidimensional poverty challenges, albeit with different emphases. Malaysia's MPI reflects significant progress in reducing poverty, though inequalities persist, particularly in rural and underserved regions. Montenegro, on the other hand, demonstrates progress in poverty reduction but continues to face structural challenges related to economic diversification. Gender equality is another critical dimension of human development. The Gender Inequality Index (GII) and Gender Development Index (GDI) measure disparities in health, education, and economic participation between genders. Malaysia's GII indicates moderate inequality, with progress in education and labor force participation but persistent biases in political representation and leadership roles. Montenegro achieves a slightly better GII score due to higher gender parity in education and political representation, despite ongoing challenges in labor market inclusion. In response to the limitations of traditional metrics, new indices have been proposed. The Augmented Human Development Index (AHDI) incorporates dimensions like environmental sustainability, civil and political freedoms, and social and cultural factors. This expanded framework provides a more holistic view of development, emphasizing the interplay between traditional socio-economic metrics and broader societal goals. For instance, the AHDI adds a fourth dimension—civil and political freedom—measured using the Liberal Democracy Index.

This paper highlights the significance of evolving development metrics in capturing the complexities of socio-economic progress. While traditional indices like HDI remain essential, their limitations necessitate complementary measures that address inequality, multidimensional poverty, and gender disparities. The comparative analysis of Malaysia and Montenegro illustrates the importance of context-specific approaches to development. Malaysia demonstrates stronger economic infrastructure and private sector growth, while Montenegro excels in gender equality and social cohesion.

Ultimately, the study underscores the need for comprehensive metrics that reflect the diverse dimensions of human development, fostering more equitable and inclusive policies worldwide. Future research should focus on integrating emerging indices like the AHDI into policy frameworks, enabling nations to address development challenges holistically.



JEL classification: three, JEL codes, maximum, example: E 44

Keywords: Human Development Index (HDI), Inequality-adjusted HDI (IHDI), Human Capital, Multidimensional Poverty Index (MPI), Gender Inequality Index (GII), Augmented Human Development Index (AHDI), Socio-economic Development, Malaysia, Montenegro, Development Metrics

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Educating of Ageing Workforce in Digitalization and the Use of Digital Tools

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Extended Abstract (500 - 800 words)

The paper is focused on the analysis of the digital skills gaps of ageing workforce and factors considering by the ageing workforce as the most important factors affecting their level of knowledge, education and improvement in the use of new digital technologies. As the ageing workforce is struggling to adopt to new fast changing environment, especially in the use of digital technologies, the education of the ageing population is crucial to increase their competitiveness at the labour market by supporting and enhancing digital knowledge and skills and by improving their digital competencies. The workforce in the age of 50 – 64 is 18.70 % of the workforce in the Slovakia and have great potential due to combining of an obtained experiences and potentially increased digital competencies enhanced by appropriate training in this field. However, the ageing workforce is lacking the appropriate training in the use of digital technologies and tools and is even lacking in some basic digital knowledge and their practical application such as digital tools for office use, cybersecurity, using of video and teleconference tools, using of visualization and analytical tools, managing digital files effectively or having the knowledge about the AI and to use it for the simplification of the work. Such result might be observed also in the DESI with the low rank of the Slovakia (23rd among 27 EU members in 2022). Except from the Human capital, Slovakia is lacking behind in all other three dimensions as Connectivity, Integration of digital technology and Digital public services. The digital skills need to be improved so Slovakia would successfully react to challenges of the digital transformation and will create presumptions for future digital



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improvement. At the first place, Slovakia needs to enhance basic digital skills, while the peculiar focus would be on the disadvantage group of population as the ageing workforce is. The data for the analysis were obtained by the survey among ageing workforce in age between 50 to 64 within all regions in Slovakia and includes areas as digital skills, cybersecurity and data protection, specific digital skills competencies, motivation and training needs or continuous improvement and learning.

The data clearly evince that ageing workforce is lacking behind in using and having knowledge about digital technologies, even most of the ageing workforce is using digital tools often or very often. Surprisingly videoconferencing tools are not used by many of the workforce, which means the preference of onsite meeting or sessions. The same might be stated for the using of cloud services and online storage of data when major part of ageing workforce is using it only sometimes, rarely, or never used it due to relatively high non-comfortability to store the personal data or distrust for online storage service. Ageing workforce is lacking behind in the use of the AI with the majority of ageing workforce not familiar with the AI. In this manner, the use of the AI needs to be improved and enhanced as this aspect of the digitalization would become the most important to keep the competitiveness of ageing workforce at the labour market. The use of the digital tools is also associated with the cybersecurity and data protection. The survey revealed that ageing workforce is not familiar with cybersecurity and not using methods for protection against cyber threats regularly. The reason of not using all features of software that it offers is the confidence with the use of software and the efficiency in using software as many of ageing workforce is struggling to use the software with the lack of skills mainly in the use of software for data analysis and visualization. Relating to confidence, most of the ageing workforce is afraid of making mistakes when using new digital technologies and being dismissed for not being capable of using digital technology. To overcome the lack of confidence, the appropriate training is needed. The ageing workforce is preferring practical examples, onsite trainings and online video tutorials / trainings. Positively, the survey discovered that most of the ageing workforce is motivated to use digital technologies and tools by their interest. However, most of the ageing workforce does not actively participate in continuous improvement initiatives in workplace. This means that the appropriate training of ageing workforce is insufficient and needs to be improved to increase the level of competence in digitalization and in the use of digital tools by the ageing workforce. This would result in increasing the competitiveness of ageing workforce at the labour market and taking the advantage of experiences and skills of the ageing workforce.

JEL classification: J 14, I 20, D 83

Keywords: digitalization, ageing workforce, digital tools

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Leading the digital (r)evolution: The case of Finland, Denmark, and Singapore

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Extended Abstract

Digital development has become an essential indicator of national progress in the contemporary era. Analyzing Finland, Denmark, and Singapore — often recognized for their advanced digital development— can provide information on the factors contributing to their success.

The analysis of these benchmark countries reveals common themes in their approaches to digital development. ICT infrastructure is a fundamental precondition, as evidenced by the high levels of connectivity and broadband access. This infrastructure supports the seamless operation of digital services and applications, promoting widespread digital engagement.

Education and skills development are also crucial components. These countries have integrated digital literacy into their education systems, ensuring that their populations are equipped with the necessary skills to thrive in a digital economy. Continuous professional development programs further enhance digital competencies, making the workforce adaptable to technological changes.

Supportive policies and regulatory frameworks play a significant role in fostering digital innovation. Finland, Denmark, and Singapore have implemented policies that encourage research and development, innovation, and entrepreneurship in the digital sector. These policies include funding for digital projects, tax incentives for tech companies, and regulatory frameworks that supports the testing and deployment of new technologies.

Efficient e-government services are another critical factor. They have developed comprehensive digital public services that improve the efficiency of public administration and



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enhance user convenience. These services build trust in digital platforms, encouraging their widespread use among citizens and businesses.

Collaboration between the public sector, private companies, and research institutions is also instrumental in driving digital advancement. Such partnerships ensure that digital initiatives are well-coordinated and resources are optimally utilized, fostering a culture of innovation and technological progress.

In addition, these countries have actively promoted digital inclusivity, ensuring that all segments of society benefit from digital advancements. Initiatives aimed at bridging the digital divide, such as providing affordable internet access and digital skills training to underserved communities, have been crucial. This focus on inclusivity not only enhances overall digital engagement but also ensures equitable access to the benefits of digitalization.. The role of national digital strategies, like Denmark's Digital Strategy 2025 and Singapore's Digital Economy Framework for Action, highlights the importance of long-term planning and vision in achieving sustained digital growth.

Socio-economic conditions in these countries also contribute to their high digital development. High levels of education, income, and employment create a conducive environment for digital adoption and innovation. Educated and affluent populations are more likely to adopt new technologies and invest in digital tools and services. Furthermore, the relatively high standard of living in these countries supports a vibrant digital economy, with consumers and businesses willing to spend on digital products and services. Additionally, the social safety nets and inclusive policies in these countries ensure that the benefits of digitalization are widely distributed, reducing the digital divide and promoting inclusive growth.

Finland, Denmark, and Singapore demonstrate that a strategic approach to digital development involves a combination of a powerful ICT infrastructure, education and skills development, supportive policies, and strong public-private collaboration. Their future digital strategies reflect a commitment to innovation, inclusivity, and sustainability, aiming to harness the full potential of digital technologies to enhance economic growth and societal well-being. Over the next decade, these countries plan to integrate advanced technologies into public services, promote sustainable development through digital solutions, and ensure digital inclusivity for all citizens.

JEL classification: O33

Keywords: DESI, digital development, case study, digital transformation, digital divide

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Incorporating Social Media to Cope with Educational Inequalities in Southeast Asia A Five-Year Systematic Literature Review from 2019 to 2023

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Extended Abstract

Most Internet users, particularly students, utilize social media to connect with friends, coworkers, peers, and family. This study examines the potential benefits of networking tools in modern schooling. Instructors can use social media platforms to respond to student inquiries, publish homework assignments and lesson plans, and facilitate in-class conversations. As well as, send updates, organize events, and notify learners about special lectures, panel discussions, or guest speakers. Interaction between teachers and students can help students grasp and solve learning challenges more quickly. Students who seldom engage in class might actively engage in co-constructing their learning experience with their instructors and collaborate. Students may feel more at ease sharing information and ideas on social media platforms like Facebook, Twitter, or YouTube with friends and instructors. Providing students with supplementary learning resources in regular classrooms may be costly and difficult to organize. However, adopting social media can improve the learning process. Indeed, allowing students to participate in the many learning activities accessible on social learning platforms would serve to boost academic engagement by increasing the amount of time a student spends completing their homework or related school tasks. Furthermore, considering that many students frequently complain about being bored or frightened at school, many social media sites'



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dynamic and participative character might be utilized to engage or re-engage bored or shy students.

This systematic literature review provides an overview of the current standpoints of incorporating social media towards educational inequalities, where the focus is in Southeast Asia. This review presents the latest update, current situations, challenges, and upcoming opportunities within a five years period.

The research identifies the effects, the challenges, and how to overcome the digital divide in education. The effects of digital divides on education are the following, (1) limited access to technology and the Internet, (2) lower academic achievement, (3) social and economic disparities, (4) reduced ability to collaborate and communicate, (5) limited exposure to digital content and (6) reduced access to online assessments.

Closing the digital gap is essential for guaranteeing equitable academic success for all students. To overcome the digital divide in education, we should (1) increase access to technology and the Internet, (2) ensure digital literacy, (3) provide support for at-home learning, (4) encourage collaboration and peer support, (5) address the underlying social and economic inequalities, (6) implement flexible and equitable assessment, (7) provide funding for schools in low-income areas, (8) foster partnerships between schools and the community, (9) ensure instructors training and (10) conduct research and evaluation.

Overcoming the digital divide in education is challenging where its challenges are (1) lack of access to technology, (2) inadequate infrastructure, (3) unequal distribution of resources, (4) digital literacy skills, (5) instructors training, (6) language and cultural barriers, (7) lack of support for special needs students, (8) privacy and security concerns, (9) limited connectivity in remote areas, (10) limited technical support, (11) technological obsolescence and (12) limited parental involvement.

The digital gap has a major influence on educational performance. Without access to digital tools and technology, students may fall behind their classmates and lead to achievement disparities. Collaboration across schools, governments, and community groups is necessary to provide all students with access to digital resources, technology, and digital literacy instruction and assistance. Despite the obstacles presented by the digital divide, there are reasons to be optimistic. Innovative solutions, including blended and remote learning, can help bridge the digital divide and give all students access to resources and technology. Collaboration and problem-solving may assure equitable success for all students.

JEL classification: O15, O33, O53

Keywords: Social Media, Digital Divide, Educational Inequalities, Southeast Asia, Technological Change

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The Role of Artificial Intelligence in The Architectural Design Process

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Extended Abstract

Artificial Intelligence (AI) has become increasingly prevalent in architectural design, revolutionizing how designers approach their craft. According to a RIBA report, 41% of architects in UK now utilize AI in their design processes. Most of them believe that AI makes their design process more efficient, and this number is predicted to continue to grow, with 54% planning to use AI in their practice (RIBA AI Report 2024, n.d.). Architects could describe their ideal building using everyday language by utilizing text-to-image creation, and the system would generate a 3D model. Integrating AI into the design process is not without its challenges. As the industry continues to evolve, it is crucial to examine AI's role in shaping the design process and its potential implications for the future of the built environment. Architectural design thinking is inherently a complex and multifaceted process involving not only technical considerations but also subjective, creative, and emotional aspects. As such, the effective implementation of AI in this field requires a delicate balance, ensuring that the technology enhances rather than replaces the designer's intuition and expertise. This delicate balance underscores the importance of maintaining the human touch in architectural design, a factor architects have honed since their training in architecture education as students. Along with the rapid development of AI, several architecture schools have placed AI in their learning curricula. However, Basarir wrote that placing AI in architectural learning is quite complex and challenging, so a definitive purpose for using AI in the learning process is needed (Basarir,2022). The potential of AI to revolutionize the design process for architecture students is immense. The creative process is essential in developing AI products, especially in the design phase, where creativity has significant potential to create something novel and valuable (Krmpylis & Valtanen, 2010). In the creative process, AI can be used as a tool for preparation because it allows for the discovery, analysis, and visualization of more data, which can then influence the subsequent stages of the process: incubation, inspiration, and verification (Borglund, 2022). However, integrating AI into the architectural design process raises issues, such as ethical concerns, particularly regarding the potential substitution of creative design work and possible intellectual property dilemmas. Architects need to be creative in filtering between design alternatives and must adhere to complex problems. This requires them to be divergent thinkers, possess a robust imagination, be open to new experiences, and be willing to take risks to produce the best possible designs (Borglund, 2022).



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This prompts the question of whether architecture students have comprehended the complex and evolving relationship between human intelligence and artificial intelligence within architectural design in their training to become professional architects. Dellermann's concept of Hybrid Intelligence offers an intriguing perspective on the relationship between artificial intelligence and human intelligence. It is based on the idea that humans and computers possess different but complementary abilities. By combining these abilities, we can enhance their overall performance. AI is intertwined with human intelligence, enhancing decisions through predictions, while human intelligence is integrated with AI, commonly used for training machine learning models (Dellermann et al., 2019). In settings where AI provides input to be evaluated for decision-making, humans act as teachers training AI, creating a mutually continuous relationship.

This research will explore the potential of AI-based design processes through two questions: (1) What the patterns of student tendencies are in using AI in design thinking and its process, and (2) How much involvement does AI have in the student design process in achieving learning outcomes? Furthermore, the research explores how the technology can be integrated into the architecture pedagogy to better prepare students for the industry's evolving landscape. This research is based on the design process results of students involved in a third-year undergraduate architecture program course, Architectural Design Studio 2, with the theme "Architecture For Human Survival" (Maharika, 2024). This course requires students to use digital approaches such as architectural parametrics and AI. The data collected were 40 design reports produced from March to July 2024. AI was used throughout the first half semester, and then students continued the design process in the next half semester, using the same topics and issues they had developed with AI. The method used in this research is Quantitative Content Analysis (QCA). Krippendorff explains that the components in QCA include: (1) Unitizing, data collection by categorization of observable things such as text segments and design images and built works, then sampling design elements, and reducing data; (2) Inferring, abductively concluding contextual phenomena; (3) Narrating answers to the research questions (Krippendorff, n.d.). The type of QCA applied is relational analysis because this study requires analyzing the relationship between concepts in the course material, AI process reports, and final design results.

The stages in this research are as follows:

- 1. Collecting data in the form of Architecture Design Studio 2 course products;*
- 2. Determining the concept category unit in the course substance;*
- 3. Determining the category of variables to be investigated from the design process report with AI;*
- 4. Exploring the relationship between identified variables with the process and final design results;*
- 5. Conducting representative mapping;*
- 6. Graphic Concluding.*



Categories by Theme of Course

Categorizing key points from the topics raised in this course, researchers use AI and manual review to check the course brief and guidelines. AI is used to provide the most frequently occurring words, and a manual review is carried out to check. The results of the phrase check are architectural design, framework, design studio, future architecture, design proposal, critical thinking, human survival, conceptual design, climate change, learning process, and parametric design. Then, to focus on the intention of the theme of this course, the key points need to be reduced to the following categories: Framework Usage, Future Testament, Critical Thinking, Human Survival, Climate Change, and Parametric Design.

Categories by Course Learning Outcome

The next category required is the key points of the course learning outcomes. This category is needed to find the relationship between the process and product and the course achievement indicators that have been set. Based on the course learning outcome, the categories that can be set are Computational Thinking, Architectural Problem Solving, and Design Solutions. The expected results of this research are (1) The tendency of design thinking patterns used by most students to solve design cases in courses using AI, (2) The influence and involvement of AI on students' design decisions and final results to answer design cases in courses on architecture for human survival.

JEL classification: O33, L86, R31

Keywords: Artificial Intelligence, Design Process, AI-Driven Design

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The Low Financial Literacy in Slovakia

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Extended Abstract

In the past, and as well as today, we can see the low financial literacy on the population in Slovakia. Its purpose is to explore the microeconomic link between limited financial knowledge among Slovaks and the increasing household indebtedness observed in the Slovak financial market. Using data from my own survey, I analyze the factors driving household debt in Slovakia and the resulting consequences. Findings indicate a positive correlation between financial literacy and educational attainment, with those who are debt-free generally exhibiting higher financial literacy. Inefficient and impulsive spending practices often contribute to debt accumulation among individuals. The level of financial literacy is associated with several determinants. The most common are gender, age, education, region, marital status, professional status, level of income, knowledge of economics, or of finance, experience and knowledge of financial products, employment, and profession. Some studies worked on a study consisting of twenty financial questions describing the frequency of conducting the best practices of effective financial management, which assessed the financial behavior of individuals in relation to the family budget, the financial management of personal loans, expenses, investments, and savings before and after the global financial crisis in of 2008.

The survey consisted of 17 questions designed to assess respondents' decision-making in areas such as risk tolerance, investment attitudes, and core financial concepts that influence decisions across various economic environments. The sample included only residents of Slovakia, aligning with the bachelor thesis's focus on the Slovak population, with a total of 194 participants taking part. The analysis employed a deductive approach to establish hypotheses, which were tested in the practical section using the chi-square test to assess the probability distribution. This method allowed us to identify relationships between variables based on survey data. Hypotheses were accepted if the calculated chi-square value exceeded the critical value; conversely, they were rejected if it did not. Additionally, a t-test was used to explore gender differences in financial literacy levels among respondents. The hypotheses tested include:

H1: Women exhibit higher risk aversion than men.

H2: A significant relationship exists between financial literacy and education level.



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The study confirmed a positive correlation between financial literacy and the highest level of education attained. By comparing absolute and relative values, it was evident that university graduates achieved a higher rate of correct answers, a finding consistent with previous research. Education fosters critical thinking and problem-solving skills, which likely contribute to this result. Overall, fewer than 50% of respondents answered all five questions correctly. Demographic factors such as education, occupation, gender, and age also showed differences in financial literacy. Men, for instance, had a higher average of correct answers than women, with median scores of 5 for men and 4 for women. Using a t-test, we confirmed a gender difference at a significance level of 10.5%. Age differences also emerged: individuals aged 21 to 35 scored the highest on average (4.2), likely due to recent university completion and early career experience, which help build relevant skills. As shown by average and median values, financial literacy tends to decrease with age, as older age groups had lower success rates. Questionnaire surveys are widely used to measure financial literacy levels and provide effective quantitative data on respondents' financial understanding. Financial literacy influences individual financial behaviors and choices and is not fixed; it evolves with education and experience. Thus, it is essential for individuals to continually develop their financial knowledge and improve decision-making skills.

JEL classification: D19, G51, G53

Keywords: Financial literacy, financial illiteracy, indebtedness, households' behavior



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Perception of risks associated with digital transformation: Evidence from Poland and Southeast Asia

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Extended Abstract

The article examines concerns related to digitalization among young people, focusing on the risks they perceive in connection with the development of new technologies and digital transformation in both Europe and Southeast Asia. The literature review includes studies on the impact of digitalization on mental health, privacy, data security, access to diverse information sources, as well as the risks of misinformation and threats related to automation and the job market. Cited data indicate that young people around the world, especially in Europe and Malaysia, have diverse perspectives on digitalization—while they appreciate its benefits, they also express strong concerns about its negative consequences.

Eurostat data show that in European countries, a significant portion of young people (especially those aged 15–24) worry about the safety of their private data online. These concerns are linked to a high awareness of the risks of cyberattacks and identity theft, as well as threats related to data monitoring and control by companies and government institutions. Research also indicates that many young people in Europe are concerned about the impact of social media on their mental health, particularly in terms of addiction, social pressure, and the effects of excessive exposure to negative content, which is reflected in rising rates of depression and anxiety.

Malaysia is one of the leading countries in Southeast Asia in terms of digital transformation. Government efforts aim to accelerate the adoption of digital technologies across all economic sectors and to improve citizens' digital competencies. Government initiatives, such as the National Digitalization Agenda and the Malaysian Digital Plan, focus on increasing access to 5G networks, promoting digital entrepreneurship, and developing education in information technology. Malaysia seeks to create a knowledge-based economy that will attract investment and enable stronger international competition. However, challenges such as the lack of infrastructure in less developed regions and the need to enhance digital competencies still pose barriers to digitalization. In Malaysia and Indonesia, the rapid pace of digitalization is associated with cultural and economic challenges, such as limited access to new technologies in certain regions, insufficient personal data protection, and a growing problem of internet addiction.



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The study also included a survey conducted among students from Poland, Malaysia, and Indonesia, aiming to explore respondents' opinions and experiences related to digitalization. The survey covered topics such as online privacy, personal data security, and issues of internet addiction. The research also sought to identify factors influencing concerns about digitalization in the studied regions.

Preliminary conclusions from the pilot study indicate that although young people from different countries may have different priorities and problems related to digitalization, their concerns largely overlap, particularly in terms of privacy and mental health. The research suggests the need for a more balanced approach to digitalization, where young people can benefit from technology without excessive exposure to its negative effects. The survey also highlighted the importance of digital education, which would allow young people to use technology more safely and consciously, regardless of geographic location.

In conclusion, the article emphasizes that digitalization brings both opportunities and risks, and young people, particularly in Europe and Southeast Asia, are consciously expressing their concerns about mental health, privacy, and online safety.

JEL classification: O33, O39

Keywords: digitalization, digital transformation, survey

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AI-driven approaches to bridging the digital divide and advancing smart circular enterprises

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Extended Abstract

In response to the growing negative effects of industrial development and economic growth, which began in the second half of the 20th century, the concept of sustainable development and a sustainable future emerged and continues to evolve. Modern economic systems face the limitations of the traditional linear model ("take-make-dispose"), which leads to resource depletion and environmental degradation. In response to these challenges, the concept of a circular economy, which emphasizes waste reduction and resource reuse, is gaining traction. Circular enterprises operate on principles that reduce waste, enhance resource efficiency, and support sustainable economic growth by extending product lifecycles and promoting reuse,



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remanufacturing, and recycling. However, successfully implementing circular principles requires substantial technological support, particularly through Artificial Intelligence (AI). While AI can enhance these processes, the digital divide limits the accessibility of advanced technologies for small and medium-sized enterprises (SMEs), especially in regions with lower digital penetration. Addressing this issue is critical for achieving global sustainable development goals.

Objective of the Research.

The goal of this research is to analyze the role of AI in supporting circular enterprises and bridging the digital divide, which restricts access to digital tools for diverse economic actors. The study aims to assess how AI can optimize resource use, automate processes, and enhance decision-making within circular business models, as well as to develop strategies to address the digital divide through access to cloud-based solutions and educational initiatives.

Research Methodology.

The research methodology is based on literature analysis, evaluation of current practices, and surveys among enterprises and Polish city councils to identify their needs and limitations. The study employs the following approaches:

- *Literature analysis. Conducting a comprehensive review to identify key AI approaches for circular economy implementation.*
- *Evaluation of successful practices. Analyzing case studies on successful AI integrations within circular models, such as the Circular Water Systems in Singapore and Caterpillar's Remanufacturing Services.*
- *Surveys of SMEs and Polish city councils: Distributing surveys to Polish city councils to gather data on the level of digitalization, adoption of AI technologies, and the main challenges they face regarding sustainable development. This survey-based approach provides insights into the regional digital divide and highlights practical barriers to implementing AI in circular processes.*

Research Results.

The findings indicate that AI can significantly improve circular processes through automation, predictive analytics, and supply chain optimization. Key results include:

- *Predictive analytics. Enables forecasting of resource needs and optimization of material use.*
- *Process automation. Reduces errors and improves the precision of operational processes in manufacturing and logistics.*
- *Supply chain transparency. Enhances visibility of resource flows, helping to reduce waste and improve compliance with environmental standards.*

Cloud platforms that offer AI capabilities allow SMEs to implement digital solutions without significant capital investment. Educational initiatives focusing on digital literacy further reduce barriers to AI adoption.

Conclusions.

The integration of AI within circular enterprises has the potential to transform resource management approaches and support a sustainable economy. To achieve this, expanding access to AI through cloud services, promoting digital literacy, and fostering collaboration among enterprises are essential. AI is a crucial tool for enhancing the resilience and



competitiveness of circular enterprises, overcome the digital divide, enabling them to adapt to the demands of the modern market.

JEL classification: Q57, O33, Q01

Keywords: digital divide, AI-driven solutions, smart enterprises, circular economy.

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Assessing AI Literacy and Readiness in the Thailand's Workforce: Challenges and Opportunities for Digital Transformation

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Extended Abstract

As the rapid advancement of Artificial Intelligence (AI) has recently been proved as a critical component of our digital transformation which impacts multiple dimensions of human's life like economic, social, and cultural aspects etc. Since AI technologies keep evolving, it provides opportunities for human to enhance productivity efficiency, and innovation across multiple sectors while it also denotes the challenges that required to discuss to employ their benefits and mitigate potential risks in the future. The comprehends of these opportunities and challenges is crucial to leveraging AI. It is imperative to understand both in how AI could be further implemented to Thailand's workforce to improve capabilities and readiness. Hence, this research aims to assess the present state of AI literacy and readiness in Thailand's workforce and fine recommendations in proposals for policymakers to enhance AI skills development initiatives by focusing on the workforce's awareness to integrate AI into their operational job. This study could highlight the importance of equipping individuals' necessary skills until to thrive to be AI-driven economy country. The research employs a modified Unified Theory of Acceptance and Use of Technology (UTAUT) framework in evaluation of factors influencing AI adoption, proficiency and the workforce's intention to use AI systems. In order to gather relevant data, the researcher has conducted online questionnaire surveys, targeting Thailand's workforce across industries, with the target of 318 respondents from various demographical workforce. This questionnaire aims to focus on important variables such as the perceived usefulness of AI, perceived ease of use AI, social influence, facilitating conditions, AI literacy and behavioral intention to use AI. In addition, this research also aims to examine the potential fears that could hinder AI skills development. It is essential to identify these barriers for developing strategies to encourage AI adoption and could be benefit for policymakers to create environment to embrace AI technology advancement. The findings from this research aims to directly support both the private and public sector to adopt AI skills effectively and bridging the gap between digital literacy skills and the necessary skills to enhance the workforce's readiness for the future of AI-driven economic development, not only enhancing technical skills should be involved but fostering mindset open to continuous learning and adaptation as part of policies. Fostering an open mindset is proved to be necessitating to a more AI-integrated workforce. Not only is it beneficial to this cause of integrating AI into the workforce but also



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for overall workforce readiness to the new workforce landscape where many technologies and skillsets are being integrated into workplace. Therefore, a comprehensive strategy that includes updating educational curricula, promoting intersectoral collaborations, and investing in lifelong learning platforms will prove to be beneficial to the long-term advancement of the workforce in general. This research aims to find solutions that ensure all segments of the population are equipped with the tools needed for upcoming changes and disruption, thus preventing a divide between different socio-economic groups. Ultimately, this research aims to support Thailand's transition towards an AI-driven economy by ensuring that its workforce is well-prepared for upcoming development and changes. By equipping workforce with the AI-related necessary skills and knowledge, Thailand can harness the full potential of AI technologies to drive innovation and economic growth while mitigating potential risks associated with technological disruption. With strategic planning and implementation of effective policies, Thailand can position itself as a leader by shifting into the next level and embracing digital transformation in the region.

JEL classification: O33, J24, L86

Keywords: three to five, keywords AI literacy, workforce readiness, digital transformation, technology adoption

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Digital Financial Inclusion in Indonesia

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Extended Abstract

Digital financial inclusion is considered the use of digital platforms to make financial services accessible to everyone. Recently, it has become the focus of academic research as a key strategy for economic development and poverty alleviation in Indonesia. The current study examines the developments regarding digital financial inclusion in Indonesia. We have chosen the Southeast Asian countries for comparison, including Malaysia, Thailand, and Vietnam. The research adopts statistical, graphical, and comparative analysis methods to evaluate the current state of digital financial inclusion in Indonesia.

The massive use of smartphones and internet connectivity has accelerated the need to digitise financial services in Indonesia, boosting the development of mobile banking and activities supported by the state. The development and expansion of mobile banking allowed the provision of services for unbanked areas. This has significantly contributed to developing rural areas with limited or nonexistent traditional banking infrastructure. On the other hand, the introduction of digital payment systems such as mobile wallets like GoPay, OVO, DANA and ShopeePay has transformed the way that Indonesians make their daily transactions. Such a competitive digital landscape has encouraged the further development of innovations in digital financial services that facilitate daily transactions. Our results show that a significant milestone in Indonesia's digitalisation of financial services was the introduction of the Quick Response Code Indonesian Standard (QRIS) by Bank Indonesia in 2019. The latter unifies the digital payments under a single QR code that works across multiple providers. This allows consumers and companies to make transactions easily and not worry about platform compatibility, reducing the time spent on each transaction. By 2023, QRIS adoption extended to over 30 million MSMEs, allowing them to reduce transaction costs and ease doing business. Despite these advancements, some challenges make digital financial inclusion a crucial task for Indonesia, including limited digital and financial literacy levels and underdeveloped digital infrastructure. While the digital literacy index improved in 2022, reaching 3.54 out of 5 points, research shows that 53% of Indonesians still lack fundamental knowledge of digital tools, and 40% have difficulties fact-checking online information. On the other hand, Indonesia's unique geographical landscape is a crucial challenge for successfully developing the digital infrastructure. These factors disproportionately affect rural areas, significantly harming the financial inclusion of unbanked areas. According to the World Bank's Global Findex Database, bank account ownership in Indonesia increased from 20% in 2011 to 52% in 2021. While this



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progress is significant, it still lags behind Malaysia and Vietnam, where banking access exceeds 80%.

Government support has a crucial role in addressing these challenges. Indonesia launched its National Strategy for Financial Inclusion in 2016, prioritising financial access for marginalised groups, including low-income families and small entrepreneurs. In the framework of this strategy, the government has promoted digital literacy, financial literacy and access to banking services. As a result, financial inclusion has improved in 2024, reaching 75% compared to 69% in 2019, while financial literacy reached 65% compared to 38% in 2019. However, we should highlight the gap between urban and rural areas, which remains high – 10% and 8%, respectively.

Comparative analysis with neighbouring Southeast Asian countries shows that Malaysia and Thailand have higher rates of banking access and digital payment adoption, reflecting their more advanced financial ecosystems and stronger public trust in financial institutions. In contrast, Vietnam has lower adoption rates of digital payment systems and a higher reliance on borrowing from relatives. Digital payment adoption further reflects these disparities. While Malaysia and Thailand have rapidly increased digital payment usage over the past five years, Indonesia's adoption rates remain relatively low. This disparity underscores the importance of scaling up digital literacy initiatives and improving digital infrastructure to accelerate financial inclusion.

In conclusion, Indonesia has made notable progress in digitising financial services through digital platforms, mobile banking and supportive government policies. However, the country should continue to focus on digital literacy programs, infrastructure development, and fostering trust in digital platforms to make its vision of comprehensive digital financial inclusion a reality.

JEL classification: G 21, O 33

Keywords: digitalization, financial inclusion, rural areas, mobile banking.

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Digitalisation of financial services in Slovakia

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Extended Abstract (500 - 800 words)

Empirical research proves that countries that digitize their financial services experience higher economic growth than those that hesitate to digitize. Digital innovation depends on investment in innovation, development and research. Support from regulatory authorities is also essential. The purpose of this contribution is to evaluate the degree of digitization of the financial sector in Slovakia. Licensed entities operating in the territory of the Slovak Republic according to the NBS register were assessed. The subjects represented the field of banking and payment services, insurance and pension savings, securities market and collective investment and financial intermediation. According to the latest measurements of the European Commission, the level of digital skills in Slovakia is at the level of the EU average, which is also reflected in the demand for digital services. Subjects of the financial sector in Slovakia, when introducing digital innovations, collaborate mainly with domestic fintechs, while the most digitized area is the area of payment services. From digital technologies, DLT, work with big data and cloud solutions are used to a significant extent. Even though the offer of digital services in Slovakia is gradually expanding, the subjects in the survey consider cyber security and the related trust in service providers to be the biggest problem, in addition to the weaker digital skills of clients. Insufficient financial inclusion in financial innovation and low financial literacy can be a huge risk factor for maintaining economic integrity and stability. Regulation should also be flexible and adapt to rapidly changing technological innovations often, as this may be one of the reasons why financial institutions refuse to offer some digital solutions. Cooperation between traditional banks and fintechs involved in the development of new products and services is also important. This cooperation could increase the innovation potential of the sector while improving quality and service quality for customers. However, as this paper shows, in Slovakia, the digitalisation of financial services has to face numerous challenges. Slovak financial institutions operate within the Eurozone and its regulations, including strict GDPR policies, or anti-money laundering measures. Meeting all of the requirements can slow down the adoption of new digital solutions. Some less developed areas of Slovakia have to face insufficient digital infrastructure and internet connectivity. Slovak customers are often cautious when dealing with new technologies, due to cybersecurity concerns. There is also low level of financial literacy in Slovakia. Although the problem has been identified years ago, and numerous measures, on the national as well as regional level have been adopted, the level of financial literacy has not



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experienced a major improvement yet. People with lower level of financial literacy tend to be more reluctant to innovations in financial services. Moreover, factors such as economic issues or political instability can disturb the digitalisation processes as well. As this paper concludes, to overcome all the abovementioned challenges, an efficient collaboration of financial institutions, fintechs, educational institutions and government agencies and regulatory bodies will be needed.

JEL classification: G20, O30

Keywords: financial services, digitalization, innovations



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Overcoming the Digital Divide

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Extended Abstract

Digitalization is transforming our everyday lives. There are many opportunities for digital transformation, but not everyone, not every company, region or country can develop at the same pace. This leads to a digital divide, the question is how to overcome it? Therefore, following the methodology of Shapira, the paper seeks to develop a coherent and meaningful conceptual framework that help to better understand the digital divide phenomenon and how to overcome it.

Digitalization is a major challenge in all parts of the world, but the European Union (EU) and the Association of Southeast Asian Nations (ASEAN) are much more fragmented than the United States (US) and China, making digital investments that require significant commitment more difficult. As these regions are not homogeneous, coordination between the countries requires considerable effort, and this affects the speed of digital transformation.

The EU lags in the digital race, therefore, a sustained and coordinated effort is essential to strengthen the EU's digital technological leadership, as a key factor in enhancing its competitiveness. Supporting EU-wide digital ecosystems and scaling up innovative enterprises, and strengthening cybersecurity are crucial actions. Besides, putting people at the center of the digital transformation of the EU's societies and economies is at the core of the Digital Decade. Furthermore, digital transformation is a tool for smart greening, too. However, EU policies overlook many factors, processes and opportunities.

In order to be successful in overcoming the digital divide at EU level, it is necessary to understand what factors (individual, organizational/company and regional/country level) are driving it and what inequalities are at the root of it.

The digital divide can be attributed to a number of factors, and its scientific definition is constantly evolving. It was first attributed more to technological factors, such as internet speed. Today, economic and social factors, such as the ability to use technology, are increasingly important, both at the individual, organizational and governmental levels. The causes and opportunities of digital divide are explored through this theoretical paper. A novelty of the study that it gives a comprehensive conceptual framework to understand the digital divide. The study identified both macro (global and regional economic, technological, social, educational, political/legal) and micro (corporate/organizational, individual) inequalities. They can lead to (1) structural, (2) cognitive, and (3) motivational digital divide, which is a new approach in examining the causes of digital divide.



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Different indicator systems have been developed over the last decades to measure digital divide, and their logic can be used to identify the factors of digital divide and to propose a way to bridge the gap. Both the EU and ASEAN countries have made economic development through digital development an important policy objective, and therefore the Digital Economy and Society Index (DESI) and ASEAN Digital Integration Index (ADII) indicators are used for a more detailed analysis. DESI focuses more on the EU context, while ADII is specific to ASEAN. Besides, the two regional indicators Digital Intelligence Index (DII) and Digital Index (DiGiX) have been selected because of their broad geographical and thematic coverage of digitalization.

The detailed analyses of the dimensions of the indicators (DESI, ADII, DII, and DiGiX) reveals how each dimension of the indicators measures structural, cognitive and motivational barriers. In addition, while the structural and cognitive elements are measured directly, motivation is measured indirectly: the indicators measure the uptake and use of certain digital solutions, which can be interpreted as a measure of motivation. Along these three dimensions, proposals can also be made to overcome the digital divide at individual, organizational/company and regional/country level.

Eliminating structural barriers can be solved by (1) improving access (2) reducing costs, (3) government and civil society actions (4) private sector partnerships, (5) innovative technological solutions, (6) developing workplace digital infrastructure, (7) ensuring access to digital platforms, (8) providing digital workplace tools, and (9) rethinking organizational processes.

Addressing cognitive barriers may consist of (1) developing digital culture, (2) enhancing digital skills, (3) social innovation and grassroots initiatives, (4) developing smarter digital tools and solutions, and (5) promoting the use of collaborative digital tools.

Overcoming motivational barriers may include (1) developing content and applications tailored to local segments, (2) breaking down cultural barriers, (3) data protection and security, (4) leadership support and cultural shift, (5) cross-supply chain collaboration, and (6) strengthening digital governance.

Furthermore, the study points to the need to improve the measurement scales currently used to identify digital divide. There are a number of opportunities to extend the research. For one, a number of additional indicators have been identified to measure the phenomenon and further empirical studies are expected to complement the results.

JEL classification: M15, O33

Keywords: digital transformation, Fourth Industrial Revolution, inequalities, skill gap, technology management

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Bridging the Digital Divide through Cybersecurity in Indonesia and Montenegro: From Awareness to Action

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Extended Abstract

This study investigates the critical role of cybersecurity awareness in bridging the digital divide, with case studies in Indonesia and Montenegro. The main objectives of the study are to (1) identify and compare the level of cybersecurity awareness in the two countries and its impact on the digital divide, (2) analyze related policies and programs to assess their effectiveness, and (3) provide strategic recommendations for improving cybersecurity awareness as a pathway towards digital inclusivity. Using a comparative approach, the study integrates qualitative and quantitative data to evaluate the uncertainty of the current state of cybersecurity awareness. In addition, a comprehensive policy analysis is conducted to assess the relevance and impact of existing cybersecurity initiatives in each country. The study highlights concrete steps in moving cybersecurity awareness into action by examining how strategic policies and initiatives can inspire proactive digital behavioral change. By evaluating best practices and areas for improvement, the study identifies effective pathways to move individuals, organizations, and governments towards increased cybersecurity capacity. This “from awareness to action” approach is designed to develop a digital ecosystem that is not only safer but also more inclusive, with equitable access to cybersecurity knowledge and skills. Awareness translated into collective action is expected to support communities to deal with cyber threats individually, while encouraging continuous capacity building in the face of the ever-evolving digital landscape. The results of this study are expected to provide a more detailed picture of the comparison of cybersecurity awareness levels, highlighting significant similarities and differences between Indonesia, which represents the Southeast Asian region, and Montenegro, which represents the Southeast European region. An important focus of attention in this study is how increasing cybersecurity awareness can help reduce the digital divide by empowering individuals to interact with digital technologies more safely and



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confidently. Furthermore, by assessing the effectiveness of existing policies and identifying their key strengths and weaknesses, this study also explores the social, economic, and cultural factors that influence perceptions and actions related to cybersecurity. Ultimately, this work will be a valuable resource for policymakers, researchers, and cybersecurity professionals, providing practical insights to improve cybersecurity awareness and, more broadly, promote a more inclusive digital society.

JEL classification: O33, L86, I28

Keywords: Digital Divide, Cybersecurity, Awareness, Action

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Income Disparities Among Small-Scale Enterprises: The Digital Divide In Indonesia

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Extended Abstract

Micro and small enterprises (MSEs) are the backbone of the Indonesian economy, accounting for 95% of the total number of businesses. They represent a large portion of employment or 97% of total employment and 60% of the total economic activity. Unfortunately, many MSEs operate in informal sectors (around 60%) with lower productivity, minimal working capital, and difficulty accessing technology, financial services, and business networks, hindering their business growth. Moreover, internet adoption is uneven among MSEs, with only 32% of total SMEs in 2024. The digital divide widens income gaps as some MSEs cannot compete effectively without digital tools. The advantage of digital technology adoption is to reach broader markets, enhance marketing, and offer products globally. It also allows them to utilize e-commerce platforms and online payments and streamline operations to achieve higher sales, customer engagement, and brand recognition. As a result, they experience increased revenue and growth potential. Inversely the consequence of not adopting digital tools is limited to local markets with fewer customers, less efficient operations, slower growth, and lower incomes. Missing out on partnerships and cost-effective digital marketing results in business remaining stagnant or facing a decline. At the macro level, the digital divide contributes to persistent income inequality in Indonesia, where many MSEs remain in a low-income trap while a few grow. The Gini Ratio of Indonesia is 0.381 in 2023, which is relatively higher. Empowering more MSEs with digital tools is key to bridging the digital divide and reducing income inequality. Improving access to technology, financial services, and business networks promotes equal growth opportunities. This research analyzes how the digital divide contributes to income disparities among SMEs in Indonesia. Policymakers must understand digitalization's impact on income inequality and develop strategies to bridge this divide. The methods and activities to reach those goals are a comprehensive review of existing literature on the digital divide, income disparities, and the impact of digital technology adoption on SMEs. In addition, the statistical method is used to explore the relationship between digital exposure and income levels among SMEs. Specifically, decomposition analysis of threefold Heckman selection-biased corrected Blinder–Oaxaca decomposition technique ([Jann 2008](#)) allows us to break down the sources of income disparities and identify how much digital engagement contributes to the observed gaps.



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The secondary data sources are from the Indonesian Labor Force Survey Year 2023 from the Indonesian Statistical Bureau, consisting of 139.547 SMEs (self-employed and employer with unpaid/family workers). The interim estimation results show that the digital divide causes a large and significant gap among SMEs' income. The income of SMEs that adopt digital tools such as the internet, tablets, and smartphones is about 15 – 20 percent higher than that of SMEs that do not adopt. Moreover, the gap will increase when they use these digital tools to sell their products through the marketplace. The income gap between the two becomes even higher, about 28 percent. The next step of this study is to decompose the income gap to identify the factors that cause the gap.

JEL classification: O 15, O 17, O 30

Keywords: digital divide, income disparities, small-scale enterprise, decomposition analysis

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The Influence Of Institutions and Governance On Digitalisation: Evidence From ASEAN Countries.

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Extended Abstract

This study explores how institutions and governance influence digitalization and how economic growth can amplify these effects. This study focuses on macroeconomic factors and the institutional quality dimension at the country's level. Factors such as institutional quality, income levels, infrastructure differences, and geographic settings significantly differentiate the advantages of digitalization. Individuals having access to digital information frequently represent empowered segments of society. Despite the substantial benefits of digitalization, less developed economies are still lagging behind in terms of maturity. This study uses the percentage of internet users as the primary dependent variable for digitalization and fixed broadband subscriptions as a secondary indicator. This study views institutions as a framework or structure and governance as the method of managing that framework or structure. This study employs panel data analysis, utilizing data from 2000–2023. Eight countries of ASEAN are under consideration: Brunei Darussalam, Cambodia, Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam. The study obtained the data from the World Bank database, a comprehensive database that measures the extent of digitalization and the quality of institutions and governance at the country-level. This study employs a sequential procedure to identify the most suitable approach, taking into account the characteristics of the variables under consideration. The sample represents countries in ASEAN that possess significant interdependence and have common characteristics resulting from trade liberalization within the economic union. As a result, there is a tendency for certain factors, such as the level of



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technology and knowledge, to share common characteristics. Given the expected substantial degree of integration among the countries with ASEAN, the study first examines the variables for possible common correlations using the cross-sectional dependence (CD) approach, developed by Pesaran et al. (2008). The CD test reveals statistical significance in the coefficients of all variables, suggesting a strong correlation through economic integrations. The study uses the fully modified ordinary least squares (FMOLS) estimation method because it considers two important econometric issues in panel data: (i) cross-sectional dependence and (ii) slope heterogeneity. The study also employs dynamic ordinary least squares estimate for robustness analysis. The findings suggests that substantial institutional quality fosters a structured environment that contributes to the digitalization transformation. When interacting with economic growth, high-quality institutions and governance are likely to have greater effects, while low-quality institutions and governance are likely to have less. The finding shows the significance of institutional quality in mitigating informalities in economic activities and accelerating the digitalization transformation among ASEAN countries.

JEL classification: O33; D02; H11; F15

Keywords: Digitalization, Institutions, Governance, ASEAN

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Exploring the determinants of ESG ratings: country-level analysis

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Extended Abstract

The increasing demand for and supply of sustainability-compliant assets is one of the major trends in banking and finance in the recent years. Investors are constantly looking for ways to maximise their portfolio returns while investing in projects that contribute to sustainable development and environmental protection. In this context, ESG (Environmental-Social-Governance) ratings, which assess the environmental, social and governance practices of companies and countries, are gaining in importance as interest in sustainable investments continues to grow. Investors are interested in information regarding the environmental impact of companies, their social responsibilities and governance practices. Other factors such as political and economic stability, technological developments, changes in regulations and many others can also be decisive in investment and financing decisions.

The aim of this paper is to analyse the ESG rating of countries and the potential supply of and demand for ESG assets. The empirical part of the paper focuses on estimating the main factors influencing the ESG rating of countries using correlation and regression analysis and also classifying the ESG rating of countries using cluster analysis. Our analyses are based on various country-level data including Global Risk Profile database (<https://risk-indexes.com/esg-index/>) and the World Bank database.

The results of cluster analysis (based on Euclidean distance) suggest that Nordic European countries such as Finland or Sweden can be classified as countries with the highest ESG scores. On the other hand, cluster analysis reveals a group of countries (e.g. Sudan, Niger or Haiti) with the lowest ESG scores.

Furthermore, the estimated regression results suggest that the ESG ratings of countries depend on a number of factors. For example, our results show that ESG ratings are positively affected by higher internet penetration and higher financial literacy in a country. On the other hand, ESG ratings are negatively affected by higher corruption rates and higher levels of income and wealth inequality (as measured by the Gini index).



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The results of our work can be a valuable input for policy makers in designing measures to improve countries' environmental, social and governance practices, as well as for financial institutions offering sustainable and green financial assets, and can serve as a starting point for the design of their marketing strategies. It should be noted that the work has only worked with publicly available aggregated data and further research could focus on ESG analysis at the micro level. It should also be noted that the relationships analysed should not be interpreted causally, as they represent at most conditional correlations.

JEL classification: M14, Q01.

Keywords: Green economy, ESG, ESG rating, regression analysis.



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Evaluating the Current State of Digital Era Governance Application in Local Government Units in the Malopolska Region

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Extended Abstract

The study aims to determine the implementation degree of Digital Era Governance (DEG) in selected local government units (LGU) of Malopolskie Voivodeship and to show differences in the effectiveness of digitalisation in LGUs depending on the level of local government, i.e., the county and the municipality.

The study employs a model of digital maturity intended specifically for public administration. This model assesses six dimensions of digital maturity, namely, digitalisation-focused management, openness to stakeholders' (partners') needs, digital competencies of employees, digitalisation of processes, digital technologies, and e-innovativeness.

The study results indicate that the examined local government units in the Malopolska region suffer from a low level of digital maturity. In particular, the results show that the implementation of digital technologies and the digital competencies of staff are the most developed dimensions of digitalisation in the examined local government units. In turn, e-innovation and process digitalisation are the least developed areas and require further improvement. Additionally, digital maturity is lower at the municipal than county level. These findings confirm the thesis that New Public Management affects the development of local government and highlights the increasing role played by Digital Era Governance.



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In contrast to most studies on public administrations, this study focuses on the local government level. It employs the original model of digital maturity in the field of public administration. This study intends to contribute to the concept of Digital Era Governance by focusing on the digitalisation of LGUs.

JEL classification: H 75, L 86 M 1,

Keywords: digitalisation, local government unit, public sector, the Digital Era Governance concept

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Regional Disparities in AI Awareness: The case of UK

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Extended Abstract

Recently, artificial intelligence (AI) has become an important issue in business and regional growth and development. Many studies have investigated the relationship between technology and regional diversity and highlighted factors that influence inequality of economic outcomes across regions, however the effects of AI on business and regional development are still ambiguous.

Several researchers stated that regions with higher levels of automation experience greater job polarization and income inequality. Acemoglu and Restrepo (2020) found that automation led to fewer jobs for minority workers in some regions, leading to regional inequality in income and employment. Capello and Lenzi (2024) investigated the effects of industry 4.0 technologies on regional development, and they found that they have heterogeneous effects on regional growth. Some technological “islands” raises while others’ declining. Arntz, M. et al. (2017) found that the impacts of new technologies are negative for regions that experiencing unemployment, while positive for others where employment increases.

To understand the relationship between regional development and state-of-the-art technologies, this article explores regional differences in AI awareness in the United Kingdom (UK). As AI technology continues to transform business and improve the business environment, understanding the level of AI awareness in different fields is important for policymaking, development, and economic growth.

The study examines three hypotheses about the effects of AI; whether residents expect AI to have a positive impact in regions where (H1) the financial sector is more important, (H2) the regions are more economically developed, and (H3) the regions have higher employment.



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The representative data for United Kingdom (Szabó & Ahmadova, 2024) was collected from regional economic indicators and the AI awareness survey done by the Office for National Statistics (ONS) in 2023. The regional economic indicators examined included the absolute number and relative share of financial sector employees in total employment in September 2023 and 5 years and 10 years earlier, the Regional Innovation Index 2023 and the region's GDP in 2021, the employment rate and unemployment rate in September 2023, and employment growth over 5 and 10 years. The AI awareness survey includes questions about the benefits of AI in a variety of areas, including education, work, convenience, working at home, job opportunities, healthcare, working hours, income, personal security, and general AI sentiment. The sample consists of 12.480 individuals aged 16 years and over living in Great Britain collected between 26 July to 1 October 2023.

The perceived benefits of AI was reduced using principal component analysis and the overall benefit variable was examined later. Regional economic variables were used as independent variables, while perception of the impact of AI was used as a dependent variable in the linear regression model. The significant model found no significant relationship between perceived benefits of AI and (H1) financial sector importance and (H3) employment, but the regression analysis revealed a significant positive relationship between regional development and perceived benefits of AI (H2), which means that more developed regions have a more positive attitude towards artificial intelligence. The results suggest that digitalization is further widening the digital divide.

JEL classification: O15, O33, O53

Keywords: artificial intelligence, regional studies, digital transformation, regional development

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Sentiment towards Digitalization in Indonesia

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Extended Abstract

The purpose of digitalization is to enhance the convenience of people's lives and work. However, using the Internet comes with various risks, including data theft and identity fraud. Additionally, there is growing concern that the advancement of artificial intelligence could lead to job losses and increased social and economic inequalities, with only a small group of highly skilled individuals remaining prominent in the labor market.

Some individuals may feel excluded from society due to low digital literacy or fear of digitalization. To address this, we have constructed a survey to explore people's feelings regarding their fears and satisfaction with digital transformation. Our questionnaire is divided into four parts.

In the first part, respondents provide demographic information, including age, gender, religion, education, region of residence, and monthly income. The second part focuses on the positive aspects of digitalization. Respondents answer a series of questions regarding various daily life aspects affected by digitalization, such as online work, gaming, streaming services, social media, online shopping, and digital payments, as well as digital solutions for the public service sector. They rate these aspects on a scale of 1 (never / very unsatisfactory / not important) to 5 (very often / very satisfactory / very important).

The third part addresses the negative aspects of digitalization. Respondents are asked thematic questions about concerns such as:

- *Job loss due to digitalization*
- *Decline in the quality of education and mental health of students from online education*
- *Addiction to video games, social media, or streaming services*
- *Impact of fake news and misinformation*
- *Loss of private data, surveillance, and spyware*
- *Exposure to dangerous individuals online (e.g., predators, terrorists)*
- *Hate speech*



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- *Deterioration of social relationships and mental health due to social media*
- *Online scams and theft*
- *Development of artificial intelligence*

Respondents rate their fears on a scale from 1 (not afraid) to 5 (very afraid) and also assess public institutions' actions (e.g., government, police) against cyber threats.

This survey aims to identify factors influencing the levels of satisfaction and fear related to digital transformation. Finally, respondents answer two key questions regarding their subjective assessment of satisfaction and fear:

- *Please rate your level of fear of digital transformation (1 - no fear, 5 - high fear).*
- *Please rate your level of satisfaction with digitalization (1 - not satisfied, 5 - completely satisfied).*

The goal of these last two questions is to create a sentiment factor based on levels of fear and satisfaction regarding digital transformation.

The empirical sample consists of Indonesian citizens. They differ in age, education, religion, monthly income and place of residence. With this random sample, we use statistical tools to verify the sentiment of Indonesian people. The empirical study was conducted in two phases. Initially, we investigated which factors influence satisfaction and which influence fear of digitalization. We employed correlation tests and the Kruskal-Wallis test, followed by regression models and machine learning approaches, including logistic regression and decision trees. The latter methods help identify the factors with the greatest impact on satisfaction and fear.

JEL classification: A10, A14,

Keywords: survey, sentiment, digitalization

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Endogenous Growth and the Influence of Information and Communication Technology on Poland's Economic Trajectory

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Extended Abstract

Poland has seen a dramatic digital revolution spurred by technological breakthroughs and supportive government initiatives. The growing use and incorporation of information and communication technology have been vital to this shift. The transformations that have taken place require investigation to gauge the impacts towards the country's economic growth. This research provides a comprehensive understanding of the economic impact of ICT in Poland by looking at essential indicators like gross fixed capital formation, labour force dynamics, human capital and education, technology/innovation, foreign direct investment, and ICT infrastructure. For this purpose, we used data from 33 years from 1990 to 2022, and the Autoregressive Distributed Lag (ARDL) bounds testing methodology is applied to compile empirical results. The empirical results reveal that ICT, labour, and FDI positively and significantly impact Poland's economic growth, with labour having the most decisive influence.



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However, capital investment negatively affects economic growth, likely due to inefficient allocation and diminishing returns in specific sectors. These findings provide critical insights for policymakers, suggesting that enhancing ICT infrastructure, improving labour skills, and addressing inefficiencies in capital allocation are vital to sustaining Poland's economic growth over time. Based on the findings, several key policy recommendations are essential to enhance Poland's economic growth by using Information and Communication Technologies (ICT), labour, and Foreign Direct Investment (FDI). First, labour force development and upskilling should be prioritised, as labour (LNLAB) strongly impacts GDP. Increasing investments in education, vocational training, and promoting STEM fields will equip the workforce with the necessary skills for the digital economy. Additionally, attracting FDI is crucial, given its role in transferring technology and managerial expertise. Policymakers should offer fiscal incentives and ease regulatory barriers to encourage foreign investments in critical sectors like ICT and innovation. The study also highlights inefficiencies in capital allocation (LNCAP), negatively impacting economic growth. Policymakers should reform capital allocation to direct investments toward high-growth sectors, such as digital services, rather than capital-intensive industries. Reducing debt-driven capital investments will also ensure long-term financial sustainability. Strengthening ICT infrastructure is another priority, as a 1% increase in ICT adoption leads to a 0.21% rise in GDP. Expanding broadband access, particularly in rural areas, and fostering public-private partnerships for digital innovation will help drive further economic gains. Furthermore, promoting technological advancement through increased R&D spending and better intellectual property protection will accelerate innovation in Poland. Offering tax credits for patents and innovation will also incentivise technological progress. Efforts should be made to ensure inclusive digital transformation by bridging the digital divide through nationwide digital literacy programs, with particular attention to marginalised groups and regions. Supporting small and medium-sized enterprises (SMEs) in adopting digital technologies is essential for enhancing competitiveness. Finally, stabilising short-run economic adjustments is necessary to manage volatility. Countercyclical fiscal policies, such as increasing public spending during downturns and a flexible monetary policy, will support the economy's short-term needs while sustaining long-term growth. In conclusion, these policies will enable Poland to capitalise on its digital transformation, ensuring sustainable and inclusive economic growth.

JEL classification: C130, O140, O300

Keywords: Information and communication technology, Poland, Innovation, Endogenous economic growth, Economic growth.

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A Fine-Scale Longue Durée Investigation on Regional Inequalities in the Kingdom of Hungary (1330–1910)

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Extended Abstract

Though the possibilities of comparative spatial analysis in historical research have significantly broadened, there are still several difficulties challenging longue durée investigations. Long durée analysis focuses on events that occur nearly imperceptibly over a long period of time. The changes originate from the uneven availability of development indicators for the different time horizons, which makes temporal comparisons difficult; the changing explanatory power of available indicators over time; the changing administrative boundaries; and the problems of data harmonization when the analysis involves many countries. The research is based on digitalizing of archival documents and their subsequent classifying and linguistic as well as statistical analysis. The evaluation includes visualisation of data. In this study we demonstrate a possible solution to these problems using a municipal level database containing more than 12,000 territorial entities and over 100 variables for the historical Kingdom of Hungary tracing cores and peripheries for several time horizons, namely the 1330, 1500, 1786, 1880 and 1910. Besides illustrating the spatial and temporal shift of backward zones between 1330 and 1910, the Williamson-hypothesis showing the extent of inequalities was also tested in the investigation.

JEL classification: N93

Keywords: regional inequalities, peripheries, longue durée comparison, Kingdom of Hungary

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The Digital Divide: Unequal Access to the Internet

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Extended Abstract

In recent decades, Internet access has opened up new job markets, including remote work and the gig economy. Yet, Internet access varies drastically around the world. While developed countries have high access rates, many developing countries struggle. As South Korea enjoys 99% Internet access, in rural Africa, less than 30% of people have consistent access. Workers with reliable Internet in India and the Philippines can access freelance platforms like Upwork, while those in rural regions are excluded from these opportunities. Thus, there is a divide because without Internet, many people are left out of these opportunities. The digital divide refers to the gap between individuals and communities that have access to digital technology and those that do not. Urban centres have better access to 5G while rural areas are often left with slow connections or none at all. The digital divide refers to such disparities in access to devices, high-speed Internet, and the ability to use digital tools. Relevant dimensions include access to devices, broadband infrastructure, digital skills, and affordability. Why is this important? Places and people with widespread Internet access see faster economic growth and innovation. Those without fall behind. This gap affects education, work, healthcare, and social inclusion, limiting opportunities for those without access. For example, online education during COVID-19 left millions behind. Remote work opportunities expanded globally but many were excluded due to lack of connectivity. This presentation examines the digital divide and provokes thought.

JEL Classification: O33, D63, I24

Keywords: digital divide, Internet, web, connectivity, wifi



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The Central Bank Digital Currency in the EÚ

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Extended Abstract

The European Union is actively developing its own digital currency, with the European Central Bank (ECB) and national banks within the eurozone launching the research phase for a digital euro in 2021. This phase focuses on critical aspects such as the creation, distribution, and regulatory framework of the digital euro. Collaboration is essential to ensure the project's viability and includes input from various stakeholders, including the European Commission, the European Parliament, and eurozone finance ministers. The ECB regularly consults the Euro Retail Payments Board (ERPB), involving market participants such as banks, payment service providers, consumers, and merchants, to gather feedback on the digital euro's design and potential distribution strategies.

China is expected to be the first major economy to launch a central bank digital currency (CBDC), after five years of focused development. The digital yuan, or e-CNY, has already been tested in key metropolitan and economic areas. Its main goals are to offer a secure, accessible retail payment system, increase financial inclusion, and reinforce monetary sovereignty. Sweden is also advancing with its digital currency, the e-krona, which has been in the pilot phase since 2021. Sveriges Riksbank, Sweden's central bank, envisions the e-krona as a complement to cash. Built on Distributed Ledger Technology (DLT), the project aims to create a simulated digital currency environment to help citizens understand and adapt to its use. Both the network and oversight remain under the control of Sveriges Riksbank. In the United States, there is an active push to explore a digital dollar, led by the Federal Reserve (FED). Federal Reserve banks are developing prototypes for wholesale and retail use, collaborating with entities like the Bank for International Settlements (BIS) and tech institutes to track emerging trends and technologies. The ECB's research phase is segmented into multiple stages to thoroughly address the complexities surrounding the digital euro's rollout. Initially, a dedicated team was established to manage the project, with an emphasis on governance. Subsequent stages examined potential use cases for different demographic groups, including online and offline payment capabilities, data privacy, design, and distribution mechanisms. By the end of 2022, the ECB had also focused on intermediary roles, circulation volumes, and the development of a digital euro prototype. Since 2023, the ECB has continued refining access frameworks, user requirements, and decision-making documents that would outline the digital



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euro's issuance, design, and implementation. By autumn 2023, the ECB's Governing Council is expected to make a formal decision on whether to proceed to the next project phase.

According to the ECB's 2023 report, initial versions of the digital euro would be accessible primarily to eurozone residents, merchants, and government entities. However, non-eurozone citizens with payment service providers in the eurozone may also access it. Subsequent releases may expand accessibility to clients within the broader European Economic Area (EEA) and certain third countries. Users would be subject to limits on digital euro holdings, tailored to reflect typical daily transactions in each eurozone country. Access to the digital euro system would mirror account-opening procedures with intermediaries, ensuring a straightforward process.

End-users could access the digital euro via existing online banking and payment applications provided by payment service providers or through an ECB-developed app. Initial payment options are expected to include contactless technology, QR codes, and simplified online payment methods. This approach implies that payment service providers, such as banks, would handle the distribution of the digital euro. Providers would be required to offer basic services like account setup, closure, and recruitment, as well as ensure account funding. They would also follow identity verification processes, such as Know Your Customer (KYC), to comply with regulatory standards. For a more user-friendly experience, providers could opt to offer additional services like split payments among multiple users, enhancing the digital euro's appeal.

The ECB has also examined the potential for cross-border transactions, considering how these might be conducted effectively. To support cross-border payments, the ECB is exploring interoperability between the digital euro and other central bank digital currencies (CBDCs), potentially through contractual, technical, and operational frameworks. Alternatively, a unified technical infrastructure could be developed to support multiple CBDCs, facilitating a broader range of cross-border payments.

Despite the push towards digital transactions, cash remains universally accepted in the eurozone, as euro notes and coins hold the status of legal tender. Citizens expect that a digital euro, if issued, would hold the same status. If granted legal tender status by lawmakers, the digital euro could be used across the eurozone, obligating merchants who accept digital payments to accept digital euro transactions as well.

However, the timeline for launching the digital euro remains uncertain, dependent on public acceptance and adaptability. Given the ongoing discussions among EU regulatory bodies, the exact structure and functioning of the digital euro system are still under deliberation and refinement.

JEL classification: E52, E58, F33

Keywords: Central bank digital currency, Digital euro, ECB



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Sustainability Preferences in Investment Advisory: Client Priority or Regulatory Requirement? ¹

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Extended Abstract

Sustainable investments help mitigate risks linked to climate change, social instability, and poor corporate governance, promoting greater long-term company stability and profitability. As a result, investment assessments increasingly consider not only financial return and risk but it involves also evaluation of company's environmental impact, social responsibility, and governance practices (ESG). On client side, the assessment of suitability is the key pillar for investor protection. Since August 2022, investment advisory firms are required to evaluate clients' sustainability preferences as part of their profiling process. Investors can decide about their preferences for SFDR, Taxonomy or PAI products. In case of portfolio approach, they can define their ambition for the share of ESG products in their portfolio. This paper investigates whether the integration of sustainability criteria into investment advisory practices is driven by regulatory requirements or by evolving investor preferences. We systematically analyze client responses to investment questionnaires, focusing on the extent to which clients require sustainability when determining suitable financial instruments. We also search how detailed ESG information are investors willing to provide. We also compare our results to the findings from CSA (Common Supervisory Action) conducted by national competent authorities (NCAs) in 2024. Although MiFID sustainability requirements contribute to a more responsible and sustainable financial system, we hypothesize, that sustainability remains a secondary consideration for most investors during suitability assessments. Our paper helps to understand how financial markets are adopting to sustainability principles and how investors are interested for more informed decisions while promoting sustainability and ethical practices.

JEL classification: D14, G51, Q56

Keywords: Sustainability, Investment advisory, MiFID

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Bridging the digital divide: the impact of generative artificial intelligence on income inequality

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Extended Abstract

The digital divide, which denotes unequal access to technology and its impact on individuals and communities, is a pressing issue. Addressing this divide is crucial for promoting social and economic equality and reducing income inequality. Previous research has shown that access to technology can significantly impact income inequality, but the role of generative AI in this process needs urgent attention and understanding.

There is a lack of research on the specific impact of generative AI on income inequality and how it may contribute to or mitigate the digital divide. Understanding the relationship between generative AI and income inequality is essential for developing effective policies and interventions to address the digital divide. How does generative AI impact income inequality and contribute to or mitigate the digital divide? The aim of this study is to investigate the relationship between generative AI and income inequality and identify potential strategies for bridging the digital divide. Generative AI, if managed properly, has the potential to be a powerful tool for promoting social and economic equality. It is crucial that we manage the use of generative AI in a way that ensures it contributes to social and economic equality, rather than exacerbating income inequality. By examining the adoption and impact of generative AI across different socioeconomic groups, we aim to identify patterns and trends in its effects on income inequality.

Additionally, this study will employ a comprehensive mixed-methods approach, integrating rigorous quantitative analysis of financial data with in-depth qualitative research and detailed case studies. By meticulously examining the adoption patterns and multifaceted impact of generative AI across diverse socioeconomic groups, we aim to identify and elucidate significant patterns and emerging trends in its effects on income inequality. The quantitative component will analyze large-scale datasets on income distribution, employment rates, and AI adoption across various industries and regions. This will be complemented by econometric modeling to establish correlations and potential causal relationships between AI implementation and changes in income disparities. The qualitative aspect of the research will encompass semi-structured interviews with key stakeholders, including industry leaders, policymakers, AI developers, and representatives from different socioeconomic backgrounds. These interviews will provide nuanced insights into the lived experiences and perceptions surrounding generative AI's impact on economic opportunities and challenges.



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Additionally, we will conduct multiple case studies focusing on organizations and communities that have implemented generative AI technologies, allowing for an in-depth exploration of the contextual factors influencing outcomes. Furthermore, we will explore and evaluate successful initiatives and innovative policies that leverage generative AI to bridge the digital divide and promote equitable economic opportunities for disadvantaged communities. This will involve a comparative analysis of various programs and interventions across different geographical and cultural contexts, assessing their scalability and potential for broader implementation. By synthesizing these diverse data sources and methodologies, we aim to provide a holistic understanding of the complex relationship between generative AI and income inequality, ultimately informing evidence-based policy recommendations and strategies for harnessing AI's potential to create a more inclusive and equitable economic landscape.

JEL classification: O33, O15, J24, D63,

Keywords: Digital divide, Income inequality, Generative artificial intelligence, Panel study, Technology adoption



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How Does Digitalization Impact Traditional Business Practices and Values in Migrant Family Owned Enterprises (Working paper)

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Extended Abstract

Global business environments have changed due to the quick development of digital technology, but research into how these changes affect conventional business practices and values—especially in family migrant-owned businesses is still crucial. Family businesses run by immigrants can have strong roots in social and cultural customs, representing a set of principles and behaviors that have been handed down through the ages. These businesses must balance innovation and preservation as they traverse the digital transformation, which presents both special opportunities and problems. By recognizing both transformative and reinforcing implications of digital tools on the core values and structures, this study seeks to understand how digitalization changes traditional business processes, customer connections, and familial roles inside these organizations.

The research will explore:

RQ1 – Identification of specific digital tools and their influence on maintaining cultural heritage while adopting contemporary business practices?

RQ2 – Exploration of the digital intersection with customer retention strategies and the evolution of the communication channels?

Methodology

The theoretical methodology for this study is based on an adapted procedure of a systematic literature review, drawing inspiration from the approach proposed by Xiao and Watson, 2019. The process begins with the formulation of research questions, which guides the subsequent stages of the review. A set of keywords is then carefully selected, and a corresponding search code is developed to ensure precision and relevance in retrieving scholarly articles. Using the Web of Science database, a meta-search is conducted, resulting in an initial pool of articles. These articles undergo screening and filtering to refine the collection based on predetermined inclusion and exclusion criteria.

Search Formula:

This search query is tailored to locate articles indexed in the SSCI (Social Sciences Citation Index) within the Web of Science Core Collection database, focusing on topics related to migration entrepreneurship, digital development, or family entrepreneurship, published in English between 2015 and 2024.

A total of 128 records were identified through the Web of Science database.



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After screening, 102 records were retained, while 26 records were excluded as the search term was only mentioned without relevant context.

Of the remaining records, 98 full-text articles were assessed for eligibility. Subsequently, 14 irrelevant full-text articles were excluded.

Ultimately, 84 studies were included in the systematic literature review, but since it is still a working paper only 21 were reviewed until now.

Findings (from 21 reviewed articles until now)

Facilitation of Knowledge Sharing:

Digital tools like project management software and communication platforms enable family members residing in different countries to share expertise and collaborate effectively. This fosters the integration of modern business strategies while ensuring traditional practices are retained in the business's core operations (Ferraro & Cristiano, 2021; Anwar, 2024; Sachdeva et al., 2024; Simeonova et al., 2019)

Support for Segregation of Roles:

Digital tools streamline operational tasks (e.g., accounting software, inventory management systems), allowing family businesses to allocate roles that blend traditional family values with professionalization. For instance, older generations focus on preserving traditions, while younger members lead digital initiatives (García Alvarez, 2024; Duckstein, 2023; Campbell, 2008; Reinking et al., 2020)

Preservation of Cultural Identity Through Digital Storytelling:

Social media platforms and websites allow businesses to showcase their cultural heritage through storytelling, photos, and videos. This strengthens the traditional brand identity while reaching modern audiences, blending innovation with cultural preservation. (Liang et al., 2021; Ibrahim Hassanein Ibrahim, 2022)

Enhanced Direct Communication Channels:

The adoption of digital platforms (e.g., WhatsApp Business, Facebook) enables businesses to maintain direct, personalized communication with customers, fostering stronger relationships and building loyalty. Regular updates and promotional messages on these platforms also encourage repeat interactions (Aziz et al., 2024; Kaufmann & Peil, 2019; Tucker, 2022)

Strengthened Community Ties Through Social Media:

Digital platforms allow family businesses to engage with both local and diaspora communities by highlighting shared values, traditions, and product offerings. This dual approach cultivates loyalty among culturally aligned customers. (Lisun, 2020; Kasemsap, 2017; Waluyo & Hendrayati, 2020; Jemiard Mmasomwayera Sinkula, 2024)

Data-Driven Customer Insights:

Utilizing analytics tools on platforms like Instagram or Google My Business provides insights into customer behavior, preferences, and feedback. These insights help businesses tailor their offerings and enhance the customer experience, leading to higher engagement and retention rates. (Pan & Montreuil, 2024; Soroka et al., 2017; Elorza & Castellano, 2022; Andersen & Ritter, 2021)

JEL classification: E44, F15, F21,

Keywords: innovation, migrant entrepreneurship, family entrepreneurship, digitalization



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Modern Technologies in Communications and Investment in Human Resources

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Extended Abstract

Modern communication technologies have drastically transformed the way people connect and exchange information. The digital revolution, which was initiated by the development of the Internet and mobile technologies, enabled faster, easier and more efficient interaction between individuals, organizations and wider social groups. Modern technologies have significantly improved the ways in which we communicate, enabling faster, personalized and interactive exchange of information. Given the growing influence of artificial intelligence (AI) and machine learning in data analysis, the future of communication is likely to bring even more sophisticated and customized ways of connecting, while also posing new challenges in terms of ethics and privacy.

Nowadays, digitization has become a key factor in all aspects of communication, enabling faster, more efficient and more accessible ways of interacting. Digitization in education has significantly transformed the way it is learned and taught. It enabled flexibility in learning, access to various resources, personalized teaching methods, use of online platforms, interactive tools and multimedia materials. This made it possible for young people to work while studying. Digitization in education has also made it possible for education to be available to employees who spend most of their time at work. The possibility of online education makes it possible to improve without physically having to attend.



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Modern technologies in communications have influenced changes in the education system of the Republic of Serbia in the last few years. They relate to the digitization of education, the introduction of new technologies and methods, short study programs, dual education and the improvement of the quality of education. Digitization in education has become a key topic and is implemented through three basic activities: building human and institutional capacities; equipping schools with ICT infrastructure and connecting them to the Internet; creation and establishment of electronic services (such as JISP, E-Gradebook, digital textbooks and the like). The introduction of digital technologies into educational processes improves learning outcomes, raises the quality of young people's digital competences and enables them to be more competitive on the labor market.

Changes in education are also moving in the direction of increasing connection between companies and higher education institutions thanks to new technologies in education. New technologies, innovations, digitization of education have contributed to the fact that employees can get the necessary knowledge in a simpler way. Thanks to new technologies, employees are not obliged to be present at classes, but have the opportunity to follow everything on the platform, as well as various types of online classes. Thanks to this, companies invest more and more in human resources to educate themselves further through various courses, trainings, specializations or educate further themselves through continuing education (short study programs, undergraduate, master's or doctoral studies).

The aim of this paper is to show the importance of modern technologies in communication in education. On the other hand, there is also a trend of increased investment by companies in human resources to further educate and train them.

The research conducted on the territory of the Republic of Serbia in the period from October 2023 to April 2024 is presented. It includes a presentation of cooperation between companies and higher education institutions in various ways. The research results show the amount of investment in human resources to further educate or train them, and the dynamics of those investments in the last ten years, from 2014 to 2024. On the other hand, the motivations of the employees for additional education or training are also mentioned. It is shown that new technologies in communications have influenced greater cooperation between organizations and educational institutions, as well as the importance of digitization in education for easier education of employees.

JEL Classification: J24, O15, O31, O33

Keywords: modern technologies, digitization, communication, human resources, investment.



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The Role of Commercial Banks in Supporting the ESG Agenda

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Extended Abstract

The integration of Environmental, Social, and Governance (ESG) standards in the banking industry represents one of the main challenges of the whole industry nowadays. It impacts not only the way the commercial banks assess various kinds of risks, it also affects the nature of their common day-to-day operations. This conference paper explores not only the way the commercial banks are adopting ESG principles in order to align with global sustainability targets and evolving stakeholder interests. It also analyses how commercial banks are supporting the whole ESG agenda by influencing their clients via various direct and indirect channels. It investigates how commercial banks are implementing ESG standards across their operations, from adoption of comprehensive ESG reporting frameworks to support of ESG-compliant financial products. Here, the commercial banks play a strategic role, as they channel capital towards environmentally and socially responsible projects. For this purpose, ESG funds, targeted lending policies, green financing and renewable energy initiatives are highly important.

However, as the praxis shows, adopting the ESG standards in banking industry presents also some significant challenges. The institutions must navigate complex regulatory environments, and the implementation costs are often very high. A major challenge is also the lack of standardization of the ESG metrics and reporting frameworks. There is no universally accepted methodology right now, which may lead to inconsistencies and biases in evaluation of individual entities and projects. Another challenge is to develop new databases, collect new data and find a way for their efficient processing. This means that banks need to invest in new technologies and information systems which means additional costs as well. The integration of ESG standards in existing internal processes may cause disruption of these processes which may cause some indirect costs as well. Moreover, as the banks try to align with the ESG criteria, the range of their investment opportunities may shrink quite notably, negatively affecting their profitability and stock prices. This may turn into dissatisfaction of a significant portion of their shareholders who may fight against further implementation of ESG standards. Therefore, the bank management often must be prepared for finding a compromise solution to satisfy the general ESG movement, and the interests of its own shareholders.

By incorporating ESG criteria into credit evaluation standards and risk management, commercial banks are adapting to modern trends and demands of the broader society. The



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adoption of ESG agenda is related not only to the environmental protection initiatives and the fight against climate changes, but also to the fight against social inequality and bad governance practices often present in publicly traded corporations. The findings presented in this paper confirm the important role of the banking sector in facilitating the transition to a sustainable global economy.

JEL classification: G21, M14

Keywords: ESG, commercial banks, green investments, ESG funds



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