

**THE INTERNATIONAL
INTERDISCIPLINARY SCIENTIFIC CONFERENCE**

Book of Abstracts

**Bridging Digital Divides:
Skills, Inclusion and Socio-Economic Transformation**

20-21 May 2026
Bratislava, Slovakia | Hybrid Format

Faculty of Economics and Finance
Bratislava University of Economics and Business

ODDEA • EDSAW • STICS • SEMEQ • S4F

Edited by:
Anetta Čaplánová, Ľubomír Darmo & Harshani Amanda Karunathilake



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Welcome Address

Bridging Digital Divides: Skills, Inclusion and Socio-Economic Transformation

Prof. Anetta Čaplánová, PhD.

Conference Chair

Distinguished keynote speakers, dear colleagues, honoured guests, ladies and gentlemen,

It is my great pleasure to welcome you to Bratislava, to the Bratislava University of Economics and Business, Faculty of Economics and Finance and to this international conference on digital transformation, inclusion, skills and socio-economic change. We meet at a time when digital transformation is no longer a technical topic. It has become one of the defining economic and social challenges of our time. It affects how we work, how we learn, how institutions function, how public policies are designed, and how different groups in society are included or excluded from future opportunities.

This is why the central question of this conference is not simply how to develop digital skills. The more important question is how to turn digital transformation into real impact. Impact for people, Impact for institutions., Impact for regions. And impact for society.

This conference brings together several projects that approach this challenge from different perspectives but share one common ambition: to move beyond isolated outputs and contribute to sustainable change.

Through **ODDEA**, we look at digital transformation in a broader international context, comparing experiences across Europe and Southeast Asia, asking how digital change affects institutions, policies and societies.

Through **EDSAW**, we focus on the ageing workforce and on a critical European reality: people aged 50+ are not a marginal group. They are a vital part of our labour markets, institutions and communities. The issue is not their age. The issue is whether our systems are designed well enough to support their learning, digital confidence and active participation.

Through **STICS**, we address smart transformation, innovation capacity and regional resilience, with a strong focus on how knowledge can be translated into practical solutions for Slovakia and beyond.

Through **SEMEQ**, we bring in the perspective of socio-economic measurement, policy effects and governance, particularly in areas where evidence-based decision-making is essential for improving health, social and regional outcomes.

And finally, through **Sustain4Future**, we extend this agenda towards sustainable entrepreneurship, student ventures, start-up support and ecosystem building. This is important



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because the future will not be shaped only by technologies and policies, but also by people who are able to create responsible, sustainable and innovative solutions.

Taken together, these projects remind us of one important point: Europe does not suffer from a lack of ideas, reports or pilot activities. What we often lack is the capacity to transform good ideas into sustainable institutional practice.

That is why this conference should not be only about presenting what has been done. It should also be about asking more difficult questions.

What works? What does not work? Why do many promising initiatives disappear after project funding ends? How can universities, public institutions, employers, NGOs and local communities work together more effectively?

And how can we make sure that digital transformation reduces inequalities instead of creating new ones?

Over the next two days, we will discuss digital divides, lifelong learning, workforce transformation, public policy, social inclusion, sustainable entrepreneurship and regional innovation.

I hope this conference will be more than a sequence of presentations. I hope it will be a space for honest discussion, critical reflection and new partnerships.

Let me warmly thank all keynote speakers, presenters, moderators, project partners and participants who have joined us here in Bratislava. I would also like to thank our organising team at EUBA for their work and commitment in preparing this event.

I wish us all a productive, open and inspiring conference.

And most importantly, I hope that what we discuss here will not remain only in conference materials but will contribute to our broader effort to turn digital transformation into real impact.

Thank you, and welcome to the conference.

Bratislava, May 2026

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About the Conference

Bridging Digital Divides: Skills, Inclusion and Socio-Economic Transformation
20-21 May 2026
Bratislava, Slovakia | Hybrid Format (Onsite and Online via Microsoft Teams)

The International Scientific Conference "**Bridging Digital Divides: Skills, Inclusion and Socio-Economic Transformation**" is organised by the **Faculty of Economics and Finance, Bratislava University of Economics and Business**, Bratislava, Slovakia, under the framework of the **ODDEA, EDSAW, STICS, and Sustain4Future projects**, which are co-funded by the European Union; and project **SEMEQ** funded by the Slovak Research and Development Agency (APVV).

The conference provides an international interdisciplinary platform for researchers, academics, policymakers, practitioners, doctoral candidates and other stakeholders to exchange knowledge, present research findings and discuss current developments related to digital transformation, digital inclusion, digital skills development and the broader socio-economic impacts of digitalisation and innovation.

Digital transformation is reshaping economies, labour markets, public institutions and societies across the world. While digital technologies create new opportunities for economic growth, innovation and improved public services, they also generate new forms of inequality between countries, regions, organisations and individuals. Understanding the drivers of digital divides and identifying effective strategies to promote inclusive digital development have therefore become major challenges for researchers, policymakers and practitioners.

The conference aims to foster interdisciplinary dialogue by bringing together experts from different academic disciplines and professional backgrounds to discuss new research and policy insights on digital transformation, digital inclusion, skills development and socio-economic transformation. It serves as a forum for presenting empirical research, theoretical contributions and policy-oriented studies that address contemporary challenges and contribute to evidence-based policymaking.

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The scientific programme is organised around four thematic tracks:

- **Digital Divide and Inclusive Digital Development (ODDEA Track)**
- **Digital Skills, Education and Workforce Transformation (EDSAW Track)**
- **Digital Governance, Public Policy and Societal Impacts, Governance for Regional Transformation (STICS and SEMEQ Track)**
- **Sustainable Business Initiatives, Partnerships, Support Mechanisms and Start-up Development (Sustain4Future Ecosystem Workshop)**

These themes encourage discussion on digital infrastructure, digital skills, education, labour market transformation, e-government, public policy, digital governance, sustainable entrepreneurship, innovation ecosystems, partnerships, start-up development, welfare systems, and strategies for reducing digital inequalities while supporting inclusive and sustainable socio-economic development.

In addition to the presentation of current research, the conference promotes international scientific cooperation, interdisciplinary networking, knowledge exchange, and collaboration among academia, government, industry, civil society, and international organisations. It also supports the development of sustainable innovation ecosystems through stronger partnerships between universities, policymakers, businesses, and regional stakeholders.

Selected conference contributions are published in peer-reviewed conference proceedings with an ISBN, contributing to the dissemination of high-quality research on digital transformation, inclusive digital development, sustainable innovation, and socio-economic transformation.

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Conference Themes

1. Digital Divide and Inclusive Digital Development (ODDEA track)

- determinants of digital development gaps
- regional and global digital divides
- access to digital infrastructure and digital services
- digitalization and economic development
- measurement of digital readiness and digital development
- comparative studies of digital transformation

2. Digital Skills, Education and Workforce Transformation (EDSAW track)

- digital skills and labour market transformation
- reskilling and upskilling for the digital economy
- lifelong learning and digital competencies
- digital education and training systems
- digitalization in social economy organizations
- organizational capabilities for digital transformation

3. Digital Governance, Public Policy and Societal Impacts, Governance for Regional Transformation (STICS and SEMEQ track)

- digital governance and regulatory frameworks
- evaluation of digital policies and programmes
- digital public services and e-government
- digitalization and welfare systems
- policy responses to digital inequalities
- comparative digital policy strategies

4. Sustainable Business, Innovation and Regional Development (Sustain4Future Ecosystem Workshop)

- sustainable entrepreneurship and business development
- innovation ecosystems and regional collaboration
- partnerships between academia, industry and public institutions
- start-up creation, incubation and business support mechanisms
- sustainable business models and green innovation
- regional competitiveness and sustainable economic development
- knowledge transfer and innovation networks
- policies supporting entrepreneurship, sustainability and ecosystem development

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We gratefully acknowledge the members of the Scientific Committee for their time, commitment and professional support in reviewing the submitted abstracts and ensuring the scientific quality of the conference programme.

Our sincere thanks also go to all keynote speakers, session chairs, reviewers, participants and collaborating institutions whose support and active involvement have contributed to the successful organisation of the conference.

We also acknowledge the support of the **Faculty of Economics and Finance, Bratislava University of Economics and Business**, and all partner institutions and project teams whose collaboration made this international scientific event possible.

Finally, we thank all members of the Organising Committee, and everyone involved in the preparation and delivery of the conference for their dedication, professionalism and commitment throughout the organisation of this event.

The International Interdisciplinary Scientific Conference "**Bridging Digital Divides: Skills, Inclusion and Socio-Economic Transformation**" is organised by the **Faculty of Economics and Finance, Bratislava University of Economics and Business**, Bratislava, Slovakia, under the framework of the following projects:

- ODDEA
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**Exploring the Digital Transformation Ecosystem of Islamic Insurance
Sector in Malaysia**

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Extended Abstract

The financial services landscape has since embarked rapidly on digital evolution through innovation and customer-centric solutions. This research aims to determine whether the digitalisation initiatives undertaken by local and multinational Islamic insurance companies (takaful operators) have significantly impacted the business and influenced governance, collaboration, customer experience and operation resilience. The takaful operators face mounting pressure to revolutionise a traditional business model and making the digital transformation is a new challenge for these sectors. Qualitative research was adopted with an interview of three senior managers of the takaful operators.

Respondents were also encouraged to share additional insights to strengthen the key points and understanding of the digital transformation initiative. Secondary data sources including annual reports or financial statements were triangulated to support the interview findings. Four thematic areas have been chosen: governance and growth, global and group collaboration, market demand and forces and end-to-end processes and solutions. Research findings reveal that takaful operators, regardless of their local and international company setup, invest in digital technologies to remain competitive and relevant within the industry to meet the local market expectations. This study contributes to the knowledge on the digital transformation



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within the Islamic finance ecosystem of the role played by the takaful operators in Malaysia. Future research should examine a quantitative research approach to relate the performance metrics to digitalisation transformation results and how digitalisation has reshaped these sectors.

JEL classification: O31, M15, L25

Keywords: insurance, takaful, automation, innovation, digital technology



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**Digital Catch-Up in Central Europe and ASEAN: A Dynamic Panel Study
of Distance to the Digital Frontier (2002–2025)**

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Extended Abstract

This study investigates whether countries in Central Europe and the Association of Southeast Asian Nations (ASEAN) are converging toward a feasible digital frontier and identifies the structural drivers that accelerate or hinder digital catch-up over the period 2002–2025. While digital transformation has become a central component of national development strategies, substantial disparities persist across regions. Most empirical research evaluates digital performance in static terms, focusing on levels of digital indicators. However, from a policy perspective, improvements in absolute scores are insufficient if relative gaps vis-à-vis leading performers remain unchanged. This study reframes digital inequality as a dynamic convergence process and examines whether countries are reducing their distance from the best-performing peer within a comparable regional sample.

Digital development is measured using the United Nations E-Government Development Index (EGDI), which combines online service provision, telecommunication infrastructure, and human capital dimensions. For each year, a pooled digital frontier is defined as the highest observed EGDI score among the eighteen countries in the sample. The digital gap is constructed as the difference between this frontier and each country's EGDI score, thereby capturing the shortfall from the best feasible performance achieved under similar institutional and economic conditions. Convergence is assessed using a dynamic panel specification in



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which the persistence of the digital gap determines the implied speed of adjustment toward the frontier.

The empirical strategy integrates multiple methodological approaches appropriate for a small-country panel. The baseline estimator is the bias-corrected least squares dummy variable (LSDVC) model, which addresses dynamic panel bias in fixed-effects settings when the cross-sectional dimension is limited. System GMM is implemented cautiously as a robustness check with strict instrument discipline to avoid instrument proliferation. To address model uncertainty arising from correlated structural determinants, Bayesian Model Averaging (BMA) is applied under a restricted model space, allowing identification of robust drivers of digital catch-up through posterior inclusion probabilities. The dataset combines EGDI data from the United Nations with structural covariates from the ZENODO database, World Development Indicators, and Worldwide Governance Indicators, covering eighteen countries in Central Europe and ASEAN over 2002–2025.

The findings will provide evidence of conditional digital convergence across the pooled sample and show if convergence speeds differ between regions or not. It will further examine whether institutional quality, human capital formation, ICT infrastructure, and economic conditions consistently emerge as robust determinants of digital gap reduction. The results will suggest whether digital catch-up is automatic or depends on governance capacity, skill accumulation, and infrastructural readiness. Regional heterogeneity will indicate whether ASEAN economies exhibit more uneven convergence patterns compared to Central Europe, reflecting differences in institutional maturity and digital policy coordination.

This study contributes to convergence theory by extending the distance-to-frontier framework to digital development and by interpreting digital inequality as a dynamic process rather than a static disparity. Methodologically, it demonstrates the value of disciplined model averaging in small panels, enhancing robustness and credibility of policy inference. For practice, the findings will highlight whether sustained improvements in governance effectiveness and human capital are critical for narrowing digital gaps and supporting inclusive digital transformation. Future research may expand the frontier framework to additional regions, explore subnational digital convergence, or examine micro-level mechanisms linking digital catch-up to productivity, innovation, and inequality outcomes.

JEL classification: O33, O47, C23

Keywords: Digital convergence; Distance to frontier; E-government development; Bayesian model averaging; EU–ASEAN comparison

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**Bridging the Digital Divide in Leisure Organizations: A Comparative
Analysis of Five Case Studies**

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Extended Abstract

INTRODUCTION The study, conducted the Horizon 2020 ODDEA project, focuses on strengthening digitization across Europe and Southeast Asia to address the persistent digital divide—the gap between those who can effectively use digital technologies and those who cannot. In leisure and sport sectors, digital transformation has accelerated due to competition, customer expectations, and COVID-19, but adoption remains uneven financial, workforce, and cultural barriers. *AIMS* To analyse 5 Hungarian and Thai leisure and educational organizations. To identify shared challenges, effective strategies, and insights to help bridge the digital divide, with relevance to issues of access, equity, workforce development, and organizational change in leisure contexts. *METHODS* Data were collected through semi-structured interviews with leaders and managers from five organizations. The interview protocol (HORIZON-MSCA-2021-SE-01-1) addressed organizational background, digital transformation processes, technology adoption, employee experiences, financial factors, and future plans. Conducted in 2026, interviews lasted 90–180 minutes. The study used a comparative case study approach, examining each organization's digital maturity, technology adoption, workforce, barriers, strategies, and outcomes. Thematic analysis identified shared patterns and unique insights across cases. *RESULTS* Across five organizations in sport, hospitality, and education (Hungary and Thailand), most operate at a “Technology Navigator” level of digital maturity, with only AYCM reaching “Digital Accelerator” status. Digital transformation is driven by customer expectations, efficiency needs, competitive pressure, and regulatory requirements, with sectoral differences—hospitality prioritizes customer-facing systems, while sport and education balance internal and external functions. Commonly adopted technologies include cloud systems, booking and payment platforms, CRM/ERP solutions, and emerging AI tools, though depth of integration varies. Workforces are generally well-educated but differ in age composition, influencing adoption: multigenerational teams require structured support, while younger teams adapt faster but may lack experience. Key barriers include financial constraints, resistance to change, system immaturity, and initial learning stress. Organizations address these through training (often vendor-led), peer support, and gradual



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implementation strategies, frequently maintaining parallel systems during transition. Most rely on internal funding, limiting the pace of innovation. Organizationally, digital responsibilities are embedded within existing leadership, with no dedicated digital roles. Despite constraints, all cases report improved efficiency, communication, and user experience, and plan further digital expansion, particularly in system integration and data management.

CONCLUSION Intergenerational workforce dynamics played a dual role in digital transformation: younger employees often supported older colleagues, but success depended on structured measures such as mentoring, training, and flexible work arrangements. Many organizations managed transitions by running digital and paper-based systems in parallel, easing adaptation but increasing workload. Vendor-provided training proved essential, particularly where internal IT capacity was limited, highlighting that access to support—not just technology—shapes adoption outcomes. CONTRIBUTION TO THE THEORY AND PRACTICE The results of the study highlight the importance of structured workforce support, showing that intergenerational collaboration is most effective when combined with mentoring, continuous training, and flexible work arrangements. Managers should plan for transition phases, including the temporary use of parallel systems, to reduce disruption while building employee confidence.

Keywords: digital transformation, digital divide, leisure and sport sector technology adoption

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**The relationship between of the rule of law and digital development:
comparative analysis of Central and Eastern Europe and South-Eastern
Asia**

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Extended Abstract

The paper is looking into the relationship between the rule of law and digital development by comparing Central and Eastern Europe countries and South-Eastern Asia. Understanding interaction between the two is important due to increasing importance of digital technologies in shaping governance, economic activity and civic engagement. There is an increased interest in grasping the level and the shape of the interconnection between the two areas as the institutional quality depends on them. The paper will use Network Readiness (NRI) data on digitalisation and rule of law data from the Varieties of Democracy (V-Dem) to present the relationship between digital transformation and the basic principles of democracy enshrined in the rule of law. Although both digitalisation and the rule of law can be understood broadly and the literature does not provide exact definitions, the paper will focus on basic pillars of NRI data set, technology, governance and impact, while looking at judicial independence, accountability and fundamental rights protection as basic principles of the rule of law. The two regions have different history, as well as interregional histories among countries, but comparison between Central and Eastern Europe and South-Eastern Asia will show if the expected outcomes of a strong positive relationship between digitalisation and the rule of law actually is the case. In other words, do the two go hand in hand in context that show visible differences in not only political but also cultural milieus. On the other hand, the aim is to show the actual level of digital transformation in these countries, knowing that some studies show that certain states use digital tools to increase courts efficiency, transparency of institutions and to improve public access to the information, which reinforce the rule of law. In other cases, despite higher levels of digital development, there is stagnation or even a decline in judicial independence due to political interference, weak institutional protection mechanism or uneven development of reforms, including digitalisation. Asian countries are recognised as digitally developed, although with differences, while the majority of Central and Eastern Europe states show strong rule of law principles protection, so the paper aims to compare the two in order to show if investment in digital infrastructure reinforces and strengthens democracy. It is expected to see a positive relationship between the two, but the one that shows that digital development



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cannot be a sufficient predictor of the quality of the rule of law. Overall, the study should present a conditional complementarity interpretation, which implies that digitalisation may strengthen the rule of law, but when it is embedded in robust democratic institutions. However, it does not automatically produce improvement in the rule of law. The findings suggest an existing importance of aligning strategies of digital transformation with institutional reforms to ensure that technological progress can be translated into sufficient gains in judicial autonomy and legal accountability. The paper aims at filling the obvious gap at studies like this and should be a starting point in this type of research, especially for studies that aim at taking into account broader institutional, cultural and political factors.

JEL classification: P37, P48

Keywords: rule of law, digitalisation, development, democracy



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**Beyond Symbolic Adoption: A Multiple-Case Analysis of
Institutional Decoupling and Socio-Technical Change**

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Extended Abstract

*Across Southeast Asia, public universities often face a striking contradiction: they possess high end digital infrastructure, such as cloud platforms and high-speed networks, yet their daily operations remain anchored in paper-based workflows and a culture of risk-avoidance. This gap is particularly pronounced in Thailand, where rigid hierarchies and the face-saving tradition of *kreng jai* create invisible barriers to actual technology adoption. Unlike the private sector, which evolves through market incentives, Thai public institutions typically require a "systemic shock" to trigger real change. Accordingly, this research examines how specific Critical Incidents—namely the global pandemic and the enforcement of the Personal Data Protection Act (PDPA) functioned as the catalysts that finally forced these institutions to re-evaluate and reconfigure their traditional administrative practices.*

A fundamental puzzle in institutional transformation is why organizations with equivalent technological resources reach vastly different levels of digital maturity. While the Technology Acceptance Model (TAM) suggests a linear, attitude-driven path, it often overlooks the "stop-and-start" nature of bureaucratic change. This process is more accurately described as punctuated equilibrium, where long periods of stagnation are broken only by forced pivots or critical incidents. Central to this friction is the "Digital Footprint Dilemma", the deep-seated anxiety that digital records create an unforgiving, permanent audit trail. When systems are perceived as surveillance tools rather than efficiency aids, employees often adopt defensive "survival behaviours" including credential sharing, reverting to paper, or omitting data to distance themselves from personal accountability. These actions ultimately degrade data into



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"Digital Dust," leaving it too fragmented and unreliable to support institutional growth or AI readiness.

Drawing on the theory of Punctuated Equilibrium and institutional decoupling perspectives, this research proposes an Event-Driven Framework where critical incidents, such as PDPA enforcement and COVID-19 act as catalysts to disrupt organizational inertia. These shocks force a managerial pivot "decisive management" leverages firm deadlines and psychological safety to drive authentic transformation, while "compromising management" defaults to symbolic compliance and inefficient dual systems. Ultimately, this leadership choice determines whether an institution develops Digital Trust or remains stalled by Digital Dust, fragmented, unreliable records that fundamentally block AI readiness.

This qualitative multiple-case study examines six Thai higher education institutions, including four autonomous universities and two traditional bureaucratic entities. Data collection utilized the Critical Incident Technique (CIT) through semi-structured interviews with IT directors and staff, triangulated with deep document observation. Manual thematic coding was applied to identify structural, cognitive, and motivational patterns while maintaining participant anonymity.

Analysis revealed four core themes. First, a Digital Footprint Dilemma creates pervasive surveillance anxiety, leading staff to avoid digital interaction to escape perceived accountability. Second, a Literacy-Compliance Gap generates "Digital Dust" fragmented data that is unusable for strategic planning, exemplified by millions of corrupted historical records at LAU. Third, leadership style determines outcomes: "compromising" managers remain trapped in a bureaucratic "E-Loop," whereas "decisive" leaders achieve rapid deployment by enforcing deadlines and protecting technical teams. Finally, an AI Paradox exists where staff exhibit "blind trust" in AI outputs to distance themselves from personal responsibility, despite their fear of basic digital traces.

Theoretically, the study demonstrates that institutional decoupling serves as an active survival strategy against accountability risks. Practically, it suggests that administrators prioritize legacy data cleansing and multi-generational peer mentoring over generic software training. IT departments must focus on "opening hearts" and process re-engineering before system deployment to ensure lasting success. Future research should utilize Structural Equation Modelling (SEM) to quantitatively test surveillance anxiety as a mediator for digital adoption.

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

Keywords: Digital Transformation, Institutional Theory, PDPA (Personal Data Protection Act), Digital Trust

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**Beyond Basic Access: Advanced Indicators as Discriminators of Digital
Maturity. A Cross-Regional Hierarchical Clustering Analysis**

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Extended Abstract

In the context of discussions on digital divide, the issue arises of how to measure it and to what extent it can be compared across regions. Initially, the digital divide was seen as a question of access, that is, the divide between those who have access to information and communication technologies (ICT) and those who do not. Subsequently, the issue began to be linked to broader social inequalities. Hence, the first level of the digital divide encompasses differences in basic physical and material access. Until around 2010, the main objective was to ensure universal access to computers and internet connectivity. Later, however, it was recognised that digital competences, skills and their effective use were of greater importance. This stage is referred to as the second level. The third level relates to outcomes, that is, the use of access and skills to achieve specific goals.

This study examines the effectiveness of existing digitalisation measures in capturing cross-country differences in digital maturity. We analyse a broad set of measures from the ITU database, including digital skills, internet use, fixed broadband and mobile subscriptions, mobile traffic, internet affordability, investments, infrastructure and government policies. Using hierarchical clustering and statistical tests, we show that traditional indicators, such as basic digital skills or household internet access, often fail to distinguish countries at moderate or high levels of digital development. In contrast, advanced digital skills, 5G coverage, mobile broadband penetration, ICT affordability, and mobile data traffic emerge as strong differentiators. Our findings support the hypothesis that harmonised, multidimensional indicators are necessary for accurate cross-regional assessment. This study contributes to the theoretical literature on digitalisation measurement by highlighting the need to integrate both established and forward-looking metrics to reflect the evolving landscape of digital transformation across Europe and Asia. Furthermore, we show that clusters based on digitalisation metrics do not align with geographical regions, meaning that every region has its internal digital gap between front-runners of digital development and the economies less advanced in this aspect. However, with no surprise, the digital development goes hand in hand with the economic one, represented by the GDP per capita.

The construction of digital development indicators is difficult because of the rapid advancement of technological development, which makes the once set milestones quickly obsolete. Our study, based on data for years 2022-2024, points to 5G, advanced digital skills and the intensity of mobile internet use as the characteristics that differentiate advanced digital economies from the emerging ones. However, both composite indicators and databases may not capture the most recent advances in digital technology (such as the use of generative AI), and what is considered an important or advanced digital skills is constantly changing. For example, fixed broadband internet does not differentiate the most advanced digital economies, despite being low in all of them. If the society switched to mobile broadband before being saturated with the previous technology, the improvement in this regard may not be needed to achieve higher digital development. Interestingly, the cluster of the most digitally advanced countries has lower average fixed broadband subscription measure than the second most advanced cluster, confirming this point.

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JEL classification: O33

Keywords: Composite indicators, Digital divide, Digitalisation measurement, ICT policy benchmarking, Ward method

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Strategies for Bridging the Digital and Soft Skills Gap

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Extended Abstract

Population ageing and rapid technological change are reshaping labour markets across the world, creating an urgent need for lifelong learning strategies that enable experienced employees to remain productive and competitive. As automation, artificial intelligence, cloud technologies, and digital collaboration become standard features of modern workplaces, workers aged 50 and above face increasing pressure to continuously update both their technical and interpersonal competencies. At the same time, this demographic represents a valuable source of organisational knowledge, professional judgement, leadership, and industry experience. The challenge is therefore not the capability of older workers to learn, but the creation of learning environments that recognise their specific needs and remove barriers to participation.

Currently, there is a paradox of the experienced workforce. Employees aged 50+ possess significant strengths, including deep professional expertise, organisational memory, complex problem-solving abilities, and mature decision-making skills. However, they also face different obstacles such as age discrimination, unequal access to professional development opportunities, knowledge about emerging technologies and reduced self-confidence when confronted with digital transformation. If these challenges remain unaddressed, they may lead to declining employability, underemployment, financial insecurity, and social exclusion, despite the continuing demand for experienced professionals. To respond effectively to these developments, it is needed to develop an integrated competency framework that combines digital and soft skills. Digital competencies include artificial intelligence literacy, cybersecurity awareness, cloud-based services, office productivity applications, and digital communication tools. Equally important are soft competencies such as adaptability, communication, leadership, problem-solving, and effective time management. These competencies should not be developed independently but simultaneously and supported each other. Technical expertise without communication and adaptability limits workplace performance, while strong interpersonal skills without digital competence reduce employability in increasingly technology-driven organisations. Sustainable career development therefore requires simultaneous investment in both competency domains.



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We have identified several common competence gaps among workers aged over 50. Frequently observed digital challenges include limited familiarity with AI tools, insufficient confidence in cloud computing, difficulties with digital file management, advanced cybersecurity concepts, and complex virtual collaboration platforms. Soft skill gaps primarily relate to adapting to continuous organisational change, communicating effectively in remote working environments, delivering online presentations, maintaining self-confidence, and collaborating within distributed teams. These findings demonstrate that effective training programmes must address both technical and behavioural aspects of workplace performance. To achieve this, we need to distinct between upskilling and reskilling. Upskilling focuses on strengthening competencies within an individual's existing occupation, while reskilling prepares workers for entirely new professional roles. Both approaches are presented as complementary strategies for extending working lives, maintaining labour market relevance, and supporting organisational resilience. Successful implementation requires flexible learning pathways that reflect the diverse educational backgrounds, learning speeds, and career aspirations of adult learners. Special attention must be devoted to digital learning environments designed for adult learners. Online platforms provide flexibility, self-paced study, repeatable learning materials, and recognised certifications that increase motivation and accessibility. However, successful participation depends on appropriate instructional design. Learning platforms should provide intuitive navigation, large and readable interfaces, clear instructions, technical assistance, and learning materials available in the learners' native language. These factors reduce anxiety, increase confidence, and encourage sustained engagement among older participants.

The core contribution of the paper is a strategic framework for developing digital and soft skills among experienced employees. The framework consists of four interconnected phases: diagnosing current competencies and personalising learning pathways; designing modular programmes that integrate digital and soft skills; contextualising learning through real workplace applications while providing meaningful incentives; and supporting learners through psychological safety, mentoring, coaching, and systematic impact measurement. Particular emphasis is placed on reverse mentoring, peer learning, micro-credentials, workplace relevance, and continuous evaluation of programme outcomes through indicators such as productivity, retention, completion rates, and employee satisfaction. Finally, the paper emphasises that successful lifelong learning requires coordinated action among employers, governments, and educational institutions. Employers should identify organisational skill needs, allocate learning time, and foster inclusive workplace cultures. Governments should provide policy incentives, financial support, and accessible educational infrastructure. Educational providers should design flexible, practice-oriented curricula tailored to adult learners and recognised by employers. The main message of the paper is that age should never be viewed as a barrier to learning. Rather, investing in the continuous development of experienced employees represents both a strategic necessity for organisations and an essential component of sustainable economic development in increasingly digital societies.

JEL classification: J 24, I 25

Keywords: ageing workforce, digital skills, lifelong learning



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**Digital Transformation, Institutional Quality, and Market Conditions:
Comparative Analysis of ASEAN and EU Countries**

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Extended Abstract

Digital transformation is increasingly treated as a key dimension of economic competitiveness. However, the capacity of countries to benefit from digital technologies depends not only on technological infrastructure or digital adoption, but also on broader institutional, structural, and market conditions. This presentation examines the relationship between digital competitiveness, institutional quality, competition intensity, and innovation capacity in ASEAN and European Union countries covered by the IMD World Digital Competitiveness Ranking.

The main research question asks how institutional quality and market conditions shape the environment for digital transformation in ASEAN and EU economies. The analysis uses the IMD World Digital Competitiveness Ranking score as the outcome variable. Three groups of explanatory factors are considered. The first is competition intensity, represented by a synthetic index based on Ease of Doing Business, trade openness, and foreign direct investment. The second group refers to entry barriers and structural factors, measured by R&D spending as a percentage of GDP. The third group is institutional quality, measured through an IQ5 index calculated as the average of five governance indicators: rule of law, government effectiveness, regulatory quality, control of corruption, and political stability.

The empirical approach follows several steps. First, descriptive statistics are used to compare EU and ASEAN countries included in the IMD ranking. Second, Pearson correlations are calculated to identify simple relationships between digital competitiveness and the three predictor blocks. Third, regression models are estimated with predictors entered jointly. Year fixed effects are included to control for common annual shocks and global trends. Additional lagged models test whether the observed relationships remain stable when predictors are

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measured one, two, or three years before the IMD WDCR score. Separate models are also estimated for EU and ASEAN samples.

The descriptive results show that the average IMD WDCR score is relatively similar in the EU and ASEAN samples. However, the two groups differ more clearly in institutional quality and R&D intensity. EU countries show stronger institutional environments and higher average R&D spending. ASEAN countries covered by the ranking show greater internal diversity, partly because the sample includes economies with very different institutional and innovation profiles.

The correlation results indicate positive associations between digital competitiveness and all three predictor blocks. Institutional quality has the strongest bivariate relationship with the IMD WDCR score, followed by R&D spending. Competition intensity is also positively correlated with digital competitiveness, although the relationship is weaker. In regional analysis, the EU pattern is more differentiated, while ASEAN correlations are very high but based on a small number of complete observations.

The regression model with year fixed effects shows that institutional quality remains the strongest predictor of digital competitiveness after controlling for year effects and regional differences. R&D spending is also positively associated with IMD WDCR. Competition intensity becomes weakly negative in controlled models, which suggests that market openness indicators should be interpreted together with institutional and structural conditions rather than as independent direct drivers.

The results support a conditional interpretation of digital transformation. Digital competitiveness is associated with institutional capacity, innovation investment, and market conditions, but institutional quality appears as the most stable predictor across model specifications. The findings also indicate that ASEAN–EU comparisons should account for regional heterogeneity, unequal sample coverage, and different baseline conditions.

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Universities as capability institutions: institutional complementarities and the productivity payoff of digitalization in Slovakia and Indonesia

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Extended Abstract

Digitalisation is often treated as a technological process driven by infrastructure, connectivity, and the diffusion of digital tools. Yet the uneven productivity payoff of digitalisation across countries suggests that technology alone does not explain why some institutions are able to convert digital adoption into organisational efficiency, innovation, and wider socio-economic transformation, while others experience fragmented or shallow implementation. Existing research increasingly shows that digital transformation is institutionally mediated rather than technologically predetermined, as digital diffusion depends not only on infrastructure and connectivity but also on governance arrangements, political institutions, organisational capacity, and capability-building environments (Milner, 2006; Privara & Caplanova, 2025). This study examines this problem by positioning universities as capability institutions within broader configurations of institutional complementarities. It asks how universities mediate the relationship between digitalisation and productivity-relevant outcomes through governance coordination, implementation capacity, skills formation, research and development capacity, and university–industry linkages.

Drawing on institutional complementarities literature, the study treats digitalisation outcomes as shaped by the interaction between governance coordination, incentives, organisational readiness, skills formation, and innovation systems, rather than by isolated policy variables (Hall & Gingerich, 2009; Amable, 2016). However, universities are still often treated either as sectors affected by digital inequality or as providers of human capital, rather than as meso-level institutions that actively shape the conditions under which digitalisation generates productivity payoff. This paper addresses that gap by conceptualising universities as capability institutions: organisations that produce skills, research capacity, innovation linkages, and administrative routines that can either strengthen or weaken the translation of digitalisation into productivity-relevant outcomes. In doing so, it extends higher-education scholarship that understands universities as institutions with broader societal, developmental, and public-good functions beyond narrow instructional outcomes (Brennan et al., 2014; Marginson, 2026).

Methodologically, the study employs a qualitative, channel-oriented comparative design focusing on Slovakia and Indonesia. It combines document analysis, semi-structured



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interviews, and an institutional mapping matrix developed as Deliverable 1 (D1). The comparative document analysis examines higher-education and digitalisation policy materials in both countries, while the interview component focuses at this stage on Slovak higher education institutions. The Slovak interview component currently consists of five semi-structured interviews with senior and professional stakeholders from higher education institutions, covering university governance, digital transformation, research and innovation, and institutional implementation. Indonesian interviews are currently ongoing. Therefore, the paper presents preliminary findings based on Slovak interview evidence and comparative document analysis, while the Indonesian interview data will be used in the next stage to validate, refine, or challenge the emerging mechanisms identified in this paper. This positioning is consistent with the research design, which treats Slovakia as the primary interview context and Indonesia as a structured comparative supplement.

The document analysis suggests that both Slovakia and Indonesia have developed formal policy architectures that recognise the importance of coordination, quality assurance, incentives, research capacity, skills formation, university–industry linkages, implementation systems, and data infrastructure. In Slovakia, higher-education digitalisation is framed through system-wide education informatization, RIS3 strategy, performance contracts, research evaluation, AI-related capability building, and implementation-oriented policy instruments. In Indonesia, the policy framework similarly emphasises ministerial coordination, quality assurance, outcome-oriented indicators, the Higher Education Database, industry collaboration, digital competence, and research commercialisation. These similarities indicate that both systems formally acknowledge universities as important actors in digital transformation. However, the comparison also suggests potentially different institutional pathways: Slovakia's framework is shaped by EU-linked governance architectures, performance-based reforms, and smart-specialisation logics, while Indonesia's framework is shaped by national coordination, quality assurance, integrated higher-education data systems, and policy efforts to connect universities with industry and socio-economic impact.

Preliminary interview findings from Slovakia indicate that the productivity payoff of digitalisation is not automatic. It depends on whether digital strategies are translated into usable systems, aligned workflows, credible governance arrangements, and organisational capabilities. Coordination appears as a layered rather than fully centralised process. Universities operate across EU-provided tools, ministry-linked systems, shared academic platforms, internally developed systems, and faculty-level autonomy. This suggests that coordination is not simply a matter of top-down control, but of managed alignment across differentiated institutional units. Implementation and data infrastructure emerge as particularly important channels. Several interviews show that digitalisation produces visible organisational gains when it reduces paperwork, improves reporting, supports accreditation workflows, streamlines communication, enables digital home-office requests, or improves internal administrative processes. At the same time, implementation failures occur when platforms are poorly aligned with user behaviour, data are incomplete, or staff lack readiness to change established routines.

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The Slovak evidence also refines the role of universities as capability institutions. Skills formation does not occur only through formal training programmes, but also through applied development, student participation, AI-related experimentation, digital learning, and institutional profile. University–industry linkages appear more uneven. In some cases, collaboration is constrained by firm absorptive capacity, limited local decision-making authority of multinational firms, salary competition from IT companies, or weak incentives for small and medium-sized enterprises to engage with universities. This challenges the assumption that stronger university effort alone is sufficient to generate productive digital collaboration. Market structure and competition also matter platform costs, procurement rules, dependence on major technology providers, public–private funding asymmetries, and competition for IT talent shape what universities can realistically do.

The study contributes theoretically by specifying how universities function as meso-level institutional complements in digital transformation. Rather than treating digitalisation as a linear process of technological adoption, it shows that productivity payoff depends on the interaction between governance coordination, implementation capacity, incentives, skills, data infrastructure, market structure, and university-based capability formation. Practically, the study offers policy-relevant insights for ODDEA WP3 by identifying mechanisms and candidate proxies through which institutions and market structures condition the growth impact of digital goods and ICT. Future research will incorporate Indonesian interview data to deepen the comparative analysis and assess whether the mechanisms identified in Slovakia travel across different higher-education governance settings in Southeast Asia.

JEL classification: I23; O33; O38

Keywords: digitalisation; institutional complementarities; higher education; productivity payoff; Slovakia and Indonesia

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Managing digital transformation through Human Resource: organizational adaptation, employee resistance and intergenerational learning in a manufacturing case

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Extended Abstract

This study examines how human resource management mediates digital transformation in a manufacturing company embedded in an international corporate group. More specifically, it explores how HR contributes to organizational adaptation when digital change disrupts established routines, requires new competencies, and generates uneven responses across employee groups. The study focuses in particular on five interrelated dimensions: organizational adaptation, employee resistance, change agency, intergenerational learning, and the reconfiguration of routines and roles. By doing so, it seeks to move beyond a purely technological reading of digital transformation and instead conceptualize it as a socially embedded and organizationally negotiated change process.

The research was conducted within the framework of the Overcoming Digital Divide in Europe and Southeast Asia (ODDEA) project, which investigates disparities in digital adoption among organizations and their implications for business performance. Within the project, SMEs were examined, and this article presents an in-depth case study of KACO Hungary Ltd., a Hungarian automotive supplier under international ownership. The empirical material is based on a semi-structured in-depth interview conducted in March 2026 with the company's HR manager. The study adopts a qualitative, theory-elaborating single-case design: rather than seeking statistical generalization, it aims to refine existing conceptual perspectives by examining digital transformation in the manufacturing context.

The focal case is KACO Hungary Ltd., whose Hungarian site operates as a single business unit with 243 employees in the automotive industry, specializing in the development and production of sealing systems. The company is particularly suitable for examining digital transformation because it combines several analytically relevant conditions: a manufacturing setting, international corporate integration, labour shortages, substantial investment in automation, and an aging workforce. The case is further strengthened by the centrality of HR reflexivity: the interview material indicates that the company recognized the importance of addressing generational differences, supporting older workers, and developing learning mechanisms that make digital change organizationally viable.



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The findings show that digital transformation in the examined company did not produce radical structural reorganization; instead, it triggered a gradual adaptation to a new operating logic. The process reinforced centralized and more data-driven decision-making and strengthened coordination across sites within the corporate group. In this sense, digital transformation appeared less as a discrete implementation project and more as a prolonged process of organizational learning and adjustment.

At the same time, the case reveals that digital transformation generated friction, particularly among older employees whose established work habits were tied to paper-based documentation, familiar routines, and accumulated experiential knowledge. Resistance emerged not simply as opposition to technology, but as a response to uncertainty, the disruption of routine, and the perceived burden of continuous learning. The company did not interpret this resistance merely as an obstacle to overcome; rather, it addressed it through training, repeated learning opportunities, visual support materials, and practical forms of assistance. Especially important was the emergence of intergenerational learning arrangements in which younger, digitally confident employees supported older colleagues, while older workers continued to contribute valuable process knowledge and organizational memory.

Theoretically, the study contributes to the literature by framing digital transformation as an HR-mediated process of organizational adaptation rather than as a narrowly technological intervention. It suggests that employee resistance should be understood as a diagnostic feature of change rather than as mere obstruction, and that intergenerational learning can be theorized as a key mechanism through which organizations stabilize digital change. Most importantly, the case demonstrates that HR may act not only as a support function but also as a change agent, translating technological change into practices that become organizationally legitimate and workable.

From a practical perspective, the study indicates that digital transformation cannot be managed successfully through technological logic alone. Managers should invest in HR-led change processes that make digitalization learnable, acceptable, and experientially meaningful for employees. This includes designing inclusive training systems, recognizing different learning needs across age groups, and building mechanisms for cross-generational knowledge exchange.

As this article is based on a single case and a key-informant interview, future studies should extend the analysis through comparative case studies across industries, countries, or ownership structures. Additional research could also include multiple respondents within the same firm to compare managerial, HR, and employee interpretations of the same transformation process. Finally, longitudinal studies would be especially valuable for tracing how resistance, learning, and HR-mediated adaptation evolve over time as digital transformation becomes institutionalized in organizational practice.

JEL classification: M12; J24; L22; L60; M14

Keywords: digital transformation; human resource management; organizational adaptation; employee resistance; intergenerational learning



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**Digital Transformation Without Transformation: Why Organizations
Settle for ‘Good Enough’**

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Extended Abstract

This study examines how managerial decision-making under conditions of technological uncertainty shapes the trajectories of digital transformation in highly regulated organizational environments. While digital transformation is commonly framed as a pathway toward innovation, efficiency, and socio-economic advancement, the study challenges this techno-optimistic perspective by focusing on how organizations adopt and implement digital technologies in practice. The primary aim of the research is to explore why digital transformation initiatives frequently result in incremental and conservative outcomes rather than disruptive change, and how these patterns relate to decision-making processes under bounded rationality. The study adopts an interpretive qualitative research design grounded in organizational sociology and behavioural economics. Empirical data were collected through five in-depth, semi-structured interviews with senior managers responsible for digitalization-related decisions in large and upper-medium enterprises operating in a Central and Eastern European context. The organizations represent multiple industries but share similar institutional characteristics, including strong regulatory exposure, formalized structures, and hierarchical governance systems. Data analysis followed a thematic, Gioia-inspired approach, moving from informant-centric expressions toward higher-order theoretical dimensions, with particular attention to patterns of sensemaking, framing, and decision rationalities.

The findings reveal that digital transformation is predominantly framed and enacted as a mechanism for risk mitigation, organizational control, and regulatory compliance rather than as a driver of innovation. Managers consistently emphasize stability, continuity, and predictability, treating digital technologies as tools that must be integrated without disrupting existing operations. Decision-making is characterized by bounded rationality, limited information, and uncertainty regarding technological outcomes. As a result, organizations rely on incremental implementation strategies, such as pilot projects and phased rollouts, and show a strong preference for proven, reliable technologies. Satisficing behaviour emerges as a dominant decision logic, with organizations selecting solutions that are “good enough” within existing constraints rather than optimizing for long-term transformation potential.



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These dynamics produce conservative and path-dependent technological trajectories. Digital transformation unfolds gradually, often reinforcing existing organizational structures and increasing managerial visibility and control rather than enabling radical change or decentralization. From the perspective of digital divides and socio-economic transformation, these findings suggest that the impact of digitalization may be slower, more uneven, and more institutionally constrained than commonly assumed, particularly in regulated environments. The study contributes to theory by integrating perspectives from bounded rationality, behavioural economics, and organizational sensemaking into the analysis of digital transformation. It advances existing literature by reframing incremental digitalization not as a transitional phase, but as a stable and analytically meaningful outcome shaped by decision-making processes and institutional pressures. By emphasizing the role of managerial interpretation and legitimizing narratives, the research provides a process-oriented understanding of how digital technologies are translated into organizational practice. From a practical perspective, the findings highlight that incrementalism, and satisficing should not necessarily be interpreted as organizational shortcomings, but rather as rational responses to uncertainty, regulatory constraints, and risk exposure. Managers may achieve greater internal legitimacy and implementation success by framing digital initiatives in terms of risk reduction, compliance, and stability, rather than solely emphasizing innovation. However, the results also suggest that overly conservative approaches may limit long-term adaptability and the broader socio-economic potential of digital transformation. Future research should extend this analysis by examining digital transformation in less regulated or more innovation-driven contexts, where alternative decision-making logics may emerge. Longitudinal studies would be particularly valuable in capturing how framing processes and technological trajectories evolve over time. Additionally, combining qualitative insights with quantitative approaches could help assess the generalizability of bounded rationality and satisficing behaviour across industries and regions, contributing to a more nuanced understanding of digital transformation and its societal implications.

JEL classification: D81

Keywords: Digital transformation; Bounded rationality; Satisficing; Institutional constraints; Socio-economic transformation



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**Exploring Firm-Level Digital Divide in Malaysia: A Pilot Assessment of
Digital Maturity, Drivers, and Barriers**

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Extended Abstract

This study provides preliminary evidence on the firm-level digital divide in Malaysia by examining digital maturity, digitalisation drivers, and digitalisation barriers among five Malaysian firms. Digital divide research has moved beyond technology access to include differences in skills, usage quality, capability development, and value creation. In line with this broader view, this study uses five completed organisational questionnaires collected under the ODDEA project. The participating firms operate in telecommunications, ICT, takaful, and insurance-related sectors. A descriptive comparative approach was used to examine nine dimensions of digital maturity, perceived maturity stage, drivers, barriers, and systems used. The findings suggest that the digital divide among these Malaysian firms is not mainly an access divide. Instead, it appears as an uneven maturity divide shaped by workforce development, innovation capability, strategic alignment, leadership, and customer-facing digitalisation. The weakest shared dimensions were workforce development and innovation, while stronger areas included leadership, customer orientation, technology, digital readiness, and data-driven decision-making. The study proposes five preliminary firm-level profiles: foundational digital adopter, operational digital accelerator with innovation gap, transformation builder with alignment and people gaps, strategically aligned but cautious navigator, and advanced customer-facing digital accelerator. The study contributes Malaysia-only pilot evidence and provides a baseline for future cross-country comparison.

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JEL classification: O33; M15; L25

Keywords: Firm-level digital divide; digital maturity; digital transformation; Malaysia; organisational digitalisation



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**Bridging Digital and AI Divides in Thai Enterprises: Insights from Digital
Divide Framework**

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Extended Abstract

This study examines how digital divides emerge within Thai enterprises and how organizations attempt to bridge them by using the Digital Divide Framework as the analytical lens. The study aims to explain the organizational conditions that produce unequal readiness for digital transformation and early AI adoption, with particular attention to structural, cognitive, and motivational barriers that shape technology use in practice. The research adopts a qualitative comparative case study design based on semi-structured interviews with seven Thai organizations from retail, manufacturing, banking, real estate, and higher education. Participants were senior leaders and managers directly involved in digital transformation initiatives, including IT executives, transformation leaders, and department heads with organization-wide visibility. The interviews explored each organization's digital journey, barriers to digital and AI adoption, strategies used to address those barriers, and perceived outcomes of those efforts. Data was analysed through a multi-stage coding process, interpretation through the Digital Divide Framework, which categorizes barriers into structural, cognitive, and motivational dimensions. The findings show that digital divides in Thai organizations do not arise from a single weakness but from the interaction of several constraints across all three dimensions of the framework. Structural barriers include legacy systems, incompatible infrastructure, limited budgets, centralized decision-making, and regulatory uncertainty that slow or block implementation. Cognitive barriers include uneven digital literacy across generations, limited understanding of AI capabilities, and weak transfer from training to real work applications. Motivational barriers include fear of job loss, resistance to changing familiar routines, limited recognition for digital specialists, and change fatigue caused by repeated transformation efforts. The evidence also shows that these barriers often compound one another, so organizations with poor infrastructure also struggle to build skills, and employees facing uncertainty become less willing to experiment with new technologies. The study further finds that successful organizations bridge digital divides not through isolated technical fixes but through coordinated interventions across the three dimensions. Practical responses include building secure and stable digital foundations, using peer champions to support learning across age groups, calibrating expectations about what AI can realistically do, and maintaining visible executive support during implementation. These



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approaches appear effective because they address material access, learning capacity, and employee motivation at the same time rather than in sequence. In the Thai culture context, this integrated approach is especially important because hierarchical structures, collective work norms, and caution toward uncertain technologies can intensify the consequences of organizational divides. The study contributes to theory by showing that the Digital Divide Framework is not only useful for explaining individual inequality in access and use, but also highly relevant for understanding organizational digital transformation in emerging economic settings. It demonstrates that structural, cognitive, and motivational divides are deeply intertwined in enterprises and should be analysed as mutually reinforcing conditions rather than separate categories. For practice, the study offers managers a clear diagnostic framework for identifying why transformation stalls and where intervention is needed. Future studies should extend this research through longitudinal designs, larger cross-sector samples, and cross-country comparisons to examine how organizational digital divides evolve over time and how cultural context shapes the effectiveness of bridging strategies.

JEL classification: O33, M15, L20

Keywords: Digital Divide Framework, AI adoption, organizational barriers, Thai enterprises, digital transformation



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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



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significantly impact Poland's economic growth, with labour having the most decisive influence. 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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**How Persistent Is the Digital Gap? Distance-to-Frontier Evidence from the
EU, Montenegro, Malaysia, Thailand, and Indonesia**

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Extended Abstract

Digitalization is increasingly recognized as a key driver of competitiveness, innovation, service delivery, and structural transformation [1], [2]. At the same time, the digital divide remains a major barrier to inclusive development, since it reflects unequal access to, use of, and effective benefit from digital technologies [3], [4]. This study examines whether the digital gap is persistent over time in a comparative panel covering Poland, Slovakia, Hungary, Montenegro, Malaysia, Thailand, and Indonesia over 2000–2025. The paper develops a composite Digital Performance Score (DPS) from four dimensions: Digital Access, Innovation Capacity, Human Capital Readiness, and Economic and Structural Capacity. The score is built from World Bank World Development Indicators and uses a hybrid weighting strategy that combines equal weighting and principal component analysis [5], [6]. A yearly digital frontier is then defined as the 90th percentile of the cross-country DPS distribution, and the main dependent variable is the relative distance-to-frontier gap. To estimate persistence, the study applies a dynamic fixed-effects benchmark and a core System Generalized Method of Moments (Sys-GMM) specification [7], [8]. The results show that the digital gap is strongly persistent over time, with



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the preferred Sys-GMM model yielding a lagged-gap coefficient of about 0.91. Comparative evidence indicates that the EU sample remains systematically closer to the frontier than Montenegro, Malaysia, Thailand, and especially Indonesia. The paper contributes by combining a multidimensional digital-performance framework with a dynamic distance-to-frontier perspective. Future work will extend the analysis through fuller robustness checks, richer comparative visualizations, and expanded decomposition models.

This study is motivated by the observation that digitalization is no longer limited to infrastructure or connectivity alone. It shapes economic growth, social inclusion, public services, innovation systems, and long-run structural resilience [1], [2]. Recent research has shown that the digital divide is not simply a binary issue of access, but a multidimensional phenomenon involving skills, usage, performance, and broader socio-economic conditions [4]. In the European context, digital transformation is embedded in the Digital Decade policy logic [11]. At the same time, comparative bibliometric evidence has shown that digitalization is discussed differently across Europe, the Western Balkans, and Southeast Asia, with differences in thematic focus, institutional conditions, and development priorities [9], [10]. These regional contrasts suggest that simple level comparisons are insufficient and that a relative benchmarking framework is needed.

The empirical analysis is based on annual country-level data from the World Bank World Development Indicators database [12]. The final indicator set covers research and development expenditure, scientific output, mobile subscriptions, broadband subscriptions, secure servers, internet use, gross capital formation, trade openness, GDP growth, GDP per capita, school enrolment, sanitation, health expenditure, unemployment, life expectancy, and urban population share. Missing values were completed using a log-linear interpolation and extrapolation approach suited to nonnegative developmental time series. The completed series were then normalized using pooled min-max transformation so that all observations lie on a common 0–1 scale [5], [6].

DPS is constructed as a multidimensional composite index. The four subindices are: Digital Access, Innovation Capacity, Human Capital Readiness, and Economic and Structural Capacity. Within each subindex, final variable weights are defined by a hybrid rule that combines equal weights and PCA-based weights. Across the four subindices, equal weights are retained. The final DPS is therefore defined as a balanced average of the four dimensions. This design follows the broader methodological literature on composite indicators, which emphasizes the need for interpretability, comparability, and robustness in weighting and aggregation [5], [6].

To operationalize digital lag, the study defines a yearly frontier as the 90th percentile of the DPS distribution and computes the relative gap as the proportional shortfall from that frontier. This approach is preferable to a static benchmark because it allows the standard of strong digital performance to evolve over time. The econometric specification then models the relative gap dynamically. A fixed-effects benchmark is estimated first, followed by a Sys-GMM specification, which is better suited to models with a lagged dependent variable and possible bias from unobserved factors [7], [8]. The Sys-GMM model uses a limited number of instruments to keep the estimation stable and the diagnostic tests reliable [13].



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The results show a clear comparative hierarchy. Poland, Slovakia, and Hungary remain systematically closest to the digital frontier, while Malaysia and Montenegro occupy an intermediate position, and Thailand and especially Indonesia remain farther behind. More importantly, the relative digital gap is strongly persistent over time. In the dynamic fixed-effects model, the lagged-gap coefficient is about 0.926. In the preferred core Sys-GMM model, the coefficient remains high at about 0.907, indicating that countries far from the frontier tend to remain far from it. The overidentification test does not reject the instrument set, and the AR(2) diagnostic does not indicate problematic second-order serial correlation [7], [8], [13]. The findings therefore suggest that digital convergence is gradual, uneven, and path dependent rather than automatic.

The contribution of this study is methodological and practical. Methodologically, it combines a multidimensional digital-performance index with a dynamic distance-to-frontier framework. Practically, it provides a compact way to compare heterogeneous countries under a common evolving benchmark. Future research will report fuller robustness checks, including alternative frontier definitions and alternative DPS constructions, and will expand the comparative discussion through richer descriptive evidence and extended dynamic decomposition models. Such extensions are especially relevant in light of growing calls for context-sensitive and regionally differentiated analyses of digitalization and the digital divide [9], [10].

JEL classification: O33, C23, F63

Keywords: digital gap; digitalization; distance-to-frontier; Sys-GMM; comparative analysis

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Mediating roles of process innovation in digital strategy implementation

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**Digital Competence of stakeholders in Territorial Development - Case of
Poland**

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Extended Abstract

Internal and external stakeholder and their relationships are important elements of territorial development, based on the importance of human capital. More broadly defining the competences of these stakeholders are most important elements of development. The participation of stakeholders makes it possible to seek their views and identify how each of them can contribute to meeting the identified challenges of both rural and urban areas depending on the classification of competencies they possess. Competencies can be described as a combination of the nature of the work and the characteristics of the employee who performs that work. The components of competencies are knowledge, skills, and attitudes, which apply to a specific person in the workplace. Competencies, thus, should be referred to a particular work, since it is the workplace, through its specific need for a particular set of knowledge, skills, and attitudes, that create the range of competencies required to achieve the goals of the different actors of territorial development.

One can identify and measure competences especially when the territorial development is considered. The digital dimension of the territorial development indicates the importance of the digital competencies not just in the context of innovation, but also digitalization and creativity leading to the growing number of entities contributing to the growth of areas. It is therefore important both to contribute with competences in the phase of conceptualisation of innovative solutions, as well as in the phase of implementation of these solutions, which further translates into a development outcome and rise of urbanization of underdeveloped areas. The importance of competence in regional development is not only related to the generation of innovative solutions and their implementation. Within the broader concept of development, it is about managing resources as efficiently as possible and especially digital competences. The digital competences are differently defined and understood but they mainly refer to the literacy in managing software and hardware. In the territorial context digital competences are about how to enhance and facilitate societies' accessibility to the digital resources available in the rural

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or urban territory. Stakeholders of territorial development should therefore possess adequate competences and in case of digital dimension this is about the digital competences.

The main objective of this work is to contribute to the knowledge related to digital competences based on different types of stakeholders. The main research question is therefore if territorial development digitally oriented is determined by digital competences level.

The study was conducted based on the literature review and reports review where statistical data on the level of digital competences in Poland were present. The study shows that the rural areas in Poland are underpopulated by younger generations. The second variable was the level of digital literacy which indicated higher level of this factor among younger generations. Thus, depopulating is mainly among younger generations which leads to the lower level of digital competences potential, especially in underdeveloped, rural areas. When recommending changes related to the more dynamic growth of those territories' decision makers should refer to the possible retaining of younger generations, which is possible by at least increase in the level of digital infrastructure and digital facilities level on these areas.

JEL classification: R58, J24, O18

Keywords: competences, stakeholders, development



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The social impact of Internet based content for young people

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Extended Abstract

Globalization and digitalization are currently two key imperatives for socio-economic development at the local, regional, and national levels. The leading role of these processes in shaping socio-economic realities in both the short and long term is widely recognized. However, it is not only legal frameworks that struggle to keep pace with the rapid dynamics of technological change. Equally important are the behavioural aspects of science and education, which are increasingly influenced by digitalization.



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The purpose of this study was to examine access to the global Internet among users from culturally diverse regions, including Southeast Asia, the Western Balkans, and Eastern Europe. The study also investigates behavioural aspects associated with Internet use, including the risks arising from excessive Internet consumption.

The findings reveal that the concept of the digital divide has evolved and should now be examined using a more comprehensive set of factors rather than focusing solely on access to global digital resources. As the digital divide is understood differently across cultural and social contexts, these perspectives should also be taken into consideration.

One important dimension of the digital divide is the generational divide. Younger generations deserve particular attention because their online behaviours vary across different cultural and geographical contexts. As digital accessibility continues to expand worldwide, greater attention should also be paid to problematic Internet use by examining the types of online content that may be harmful to young users.

This study contributes to the growing body of knowledge on digital divides by incorporating research findings on the current state of digital accessibility across culturally diverse regions of the world.

JEL classification: O18, R11

Keywords: Internet, Industry 4.0, digital divide

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Introduction to Cybercrime in Malaysia

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Extended Abstract

Digitization, despite all the benefits it brings to improving quality of life, also carries criminal risks, namely cybercrime (Stratton et al., 2017). The more everyday activities depend on and relate to computer and network resources, and the more important these resources are, the greater the potential opportunity for cybercriminals. The main objective of this work is to contribute to the knowledge about cybercrime based on experiences in Malaysia. The work specifies the classification of cybercrimes such as online fraud and financial fraud. In recent years, Malaysia has undergone rapid digital transformation, driven by increased internet



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penetration, widespread smartphone usage, and the expansion of digital financial services. These developments have significantly enhanced economic activity and social connectivity. However, they have also created new vulnerabilities, making individuals and organizations more susceptible to cyber threats. Cybercrime has become an increasingly prominent issue, particularly in the context of online transactions, digital banking, and e-commerce platforms (Ahmad & Ramayah, 2022). As more individuals rely on digital technologies for everyday activities, the risk of exposure to cybercrime continues to rise. Cybercrime in Malaysia manifests in various forms, with financial and fraud-related offences being the most dominant. Common examples include online scams and fraudulent investment schemes. According to available national statistics, Malaysia has reported a substantial increase in cybercrime cases in recent years, with tens of thousands of incidents recorded annually and financial losses exceeding billions of ringgits. This trend highlights the growing sophistication of cybercriminals and the expanding scale of digital threats. The classification of cybercrime provides a useful framework for understanding its complexity. Cybercrimes can be broadly divided into cyber-dependent crimes and cyber-enabled crimes. Cyber-dependent crimes include activities such as hacking, malware distribution, and unauthorized system access, which rely entirely on digital technologies. In contrast, cyber-enabled crimes involve the use of digital platforms to conduct offences such as fraud, harassment, and identity theft (Gordon & Ford, 2006). In the Malaysian context, cybercrime is also categorized into specific types such as telecommunications fraud, e-finance crimes, e-commerce scams, and love scams, reflecting a victim-centred approach that emphasizes economic and social harm. An important aspect of cybercrime in Malaysia is the profile of victims. Evidence indicates that individuals aged between 21 and 40 years are the most affected group, largely due to their active participation in digital economic activities such as online shopping, banking, and investment (Department of Statistics Malaysia [DOSM], 2024). This suggests that vulnerability to cybercrime is influenced more by patterns of digital engagement than by age alone. Younger users are also exposed to risks due to high levels of social media usage (Li et al., 2022). Meanwhile, older individuals may face increased vulnerability due to lower levels of digital competence and awareness. Digital literacy plays a crucial role in mitigating cybercrime risks. It encompasses not only technical proficiency but also critical thinking, ethical awareness, and the ability to evaluate and respond to online threats. Research has consistently shown a strong relationship between digital competence and cybersecurity awareness, indicating that individuals with higher levels of digital literacy are better able to identify phishing attempts, protect personal data, and engage in safer online behaviour (Göldağ, 2021; Akman, 2023). In Malaysia, however, rapid digital adoption has, in some cases, outpaced the development of digital literacy, resulting in increased exposure to cyber threats, particularly among economically active users. From a policy perspective, Malaysia demonstrates a high level of commitment to cybersecurity. The country has established strong legal frameworks, technical measures, and capacity-building initiatives, positioning it among leading nations in terms of cybersecurity readiness. Malaysia's performance across key cybersecurity pillars -including legal, technical, organizational, and cooperative measures-reflects a comprehensive and coordinated approach to addressing cyber threats. Nevertheless, the continued rise in cybercrime cases suggests that institutional

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measures alone are insufficient without corresponding improvements in public awareness and behavioural practices. In conclusion, cybercrime in Malaysia represents a complex and evolving challenge shaped by rapid digitalization and changing patterns of online behaviour. While technological advancements have brought significant benefits, they have also increased exposure to cyber risks. This study highlights that vulnerability to cybercrime is closely linked to digital engagement and literacy rather than demographic factors alone. Therefore, effective strategies to combat cybercrime must integrate technological solutions, regulatory frameworks, and, critically, the enhancement of digital literacy among users. Strengthening awareness, promoting responsible digital behaviour, and fostering a culture of cybersecurity are essential steps toward building a safer and more resilient digital environment in Malaysia.

Keywords: cybercrime, digital competences, digital literacy

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**Towards Industry 5.0: a conceptual model for leading organisational
change in digital age**

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Extended Abstract

Objective – This research establishes a theoretically robust comprehension of Industry 5.0 (IR5) and introduces an integrated conceptual model to elucidate how organizations can navigate and direct change within evolving digital socio-technical landscapes. Methodology – Utilizing socio-technical systems theory as a foundational lens, the authors conducted a systematic integrative synthesis of 160 academic papers and seven high-level institutional reports. Results – The paper redefines Industry 5.0 (IR5) as a socially derived paradigm that reshapes industrial frameworks by integrating human-centric values, ecological sustainability, and systemic robustness into the digital core. The authors present the IR5 CPC (Conditions-Processes-Consequences) model, which maps out critical prerequisites—such as forward-thinking leadership and digital maturity—alongside three distinct digital transformation logics: resilience, sustainability, and human well-being. This model further details the resulting advantages and vulnerabilities across business, economic, social, and ecological spheres. Research Implications – The findings urge further empirical investigation into how AI-driven workflows and enterprise resource planning (ERP) protocols can enable transitions consistent with IR5. It advocates for the use of diverse theoretical frameworks to address the multifaceted nature of socio-technical shifts. Practical Applications – This research provides a roadmap for change managers to architect incremental, ethical digital roadmaps. Additionally, it offers guidance for regulators to synchronize policy incentives with the goals of equitable and sustainable technological progress. Innovation – This work represents the inaugural effort to synthesize a theoretically unified definition and structural framework for IR5, connecting disparate research streams to pave the way for subsequent academic exploration.

Keywords: Next-Generation Industrial Paradigm; Technological Evolution; Environmental Prerequisites; Digital Integration Pathways; Socio-Economic Outcomes

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**The Impact of Artificial Intelligence on Marketing Job Roles, Social-
Economic Transformation and Productivity**

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Extended Abstract

Artificial Intelligence (AI) has gained attention recently, and there is a growing demand for understanding how AI will transform future job roles and in particular marketing job roles. More research is needed in this area to understand this better. This paper synthesises the concepts related to AI and its significance by outlining research concepts and knowledge gaps and formulating future research agendas. The authors considered the different concepts in marketing and AI to answer the research question formulated and suggest future directions for AI and marketing scholarship and practice. The authors' review confirmed that there will be some job disruptions due to the growth and expansion of AI usage. Still, those are mainly repetitive or physical tasks as AI lacks human intuition and intelligence. Marketers are especially creative, and AI has to be well-advanced to replace the creativity of the human mind. The contributions that are made to the social-economic transformation process is unmeasurable. The change in jobs is mainly created to comply with AI usage. Our research concluded by asking questions for further research: What is the impact of the theories that we have developed and learnt to help improve the productivity of marketing functions and the development of the marketer? With the advancement of technology and machine learning, are the days of the marketer numbered?

Keywords: Artificial Intelligence, Marketing Job Roles, Transformation, Productivity



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**Bridging Workplace Digital Divides for the Ageing Workforce in Czechia:
Evidence and an Employer-Oriented Upskilling Framework**

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Extended Abstract

Digital transformation is reshaping European labour markets while simultaneously intensifying age-related disparities in digital competence and workforce participation (Eurostat, 2024). Within the strategic framework of the European Union's Digital Decade, which establishes ambitious targets for basic digital skills attainment by 2030 (Council of the European Union, 2022), inclusive workforce transformation has emerged as a central policy priority. Addressing digital inequalities among older employees is therefore essential not only for economic competitiveness but also for social cohesion.

This paper presents empirical evidence from the Czech Republic generated within the Erasmus+ project Enhancing Digital and Soft Skills for Ageing Workforce (EDSAW) (EDSAW Consortium, 2024). The study aims to identify critical digital and soft-skill gaps among employed adults aged 50–65 and to translate these findings into a structured, employer-oriented upskilling framework aligned with the European Digital Competence Framework for Citizens (DigComp 2.2) (Vuorikari et al., 2022).

The analysis is based on a stratified survey conducted across all 14 Czech regions between 1 July and 10 August 2024 ($n = 114$; response rate 27%). The instrument comprised 31 closed-ended items addressing proficiency in digital productivity tools, cybersecurity practices, data literacy, and selected soft skills relevant to hybrid and digitally mediated work environments (EDSAW Consortium, 2024; Matějková, 2024). Given the sample size and an estimated maximum margin of error of 9.17% at a 95% confidence level, findings are interpreted as indicative rather than statistically representative of the entire employed population aged 50–65.

The results reveal three interrelated capability gaps. First, uneven proficiency in commonly used productivity software and digital communication platforms reduces operational efficiency and constrains effective collaboration. Second, cybersecurity vulnerabilities—particularly susceptibility to phishing and limited adoption of protective mechanisms such as two-factor authentication—pose tangible organisational risks, consistent with research documenting age-related differences in phishing detection and executive functioning (Gavett et al., 2017; Sheng



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et al., 2010). Third, insufficient data literacy and reporting competencies limit participation in data-driven decision-making processes and increase dependence on specialised personnel. These technical deficiencies are further compounded by challenges in adaptive soft skills, including communication quality, feedback management, and resilience in the context of continuous organisational change.

Building on these findings, the paper proposes a staged 12-month organisational upskilling framework integrating applied digital laboratories (Word, Excel, Teams), structured cyber hygiene training, and foundational data and reporting modules embedded in authentic workplace scenarios (EDSAW Consortium, 2024). The model emphasises small-group instruction, mentoring structures, psychologically safe learning environments, and micro-credential incentives. Evaluation mechanisms are operationalised through measurable key performance indicators aligned with DigComp competence domains (Vuorikari et al., 2022). By conceptualising the workplace digital divide as a capability-based phenomenon rather than merely an issue of technological access, the study contributes to scholarly and policy debates on inclusive digital transformation and lifelong learning in ageing European labour markets.

JEL classification: 24 – Human Capital; Skills; Occupational Choice; Labor Productivity
O33 – Technological Change: Choices and Consequences; Diffusion Processes
M53 – Training

Keywords: digital skills; ageing workforce; workplace digital divide; workforce transformation; cybersecurity

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**Financial and Non-Financial Incentives for Small and Medium-Sized
Enterprises in Slovakia and Their Impact on Performance, Fiscal Stability,
and Competitiveness**

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Extended Abstract

Small and medium-sized enterprises (SMEs) represent a fundamental component of the Slovak economy and play a decisive role in employment creation, regional development, innovation, and economic growth. In Slovakia, SMEs account for more than 99% of all active business entities and significantly contribute to gross domestic product and labour market stability. Despite their economic importance, Slovak SMEs continue to face multiple structural and institutional barriers, including limited access to external financing, high administrative and regulatory burdens, insufficient advisory support, unequal regional development, and vulnerability to external economic shocks. These challenges became even more visible during periods of economic instability, particularly after the global financial crisis and the COVID-19 pandemic.

In response to these challenges, the Slovak government and public institutions have implemented various forms of financial and non-financial incentives aimed at supporting the development and competitiveness of SMEs. Financial incentives mainly include direct subsidies, tax reliefs, preferential loans, state-guaranteed financing schemes, and support financed through European Union funds. Non-financial incentives include entrepreneurial education, consulting services, innovation support, digitalization initiatives, export assistance, simplification of administrative procedures, and programs focused on improving the overall business environment. However, the actual effectiveness of these support mechanisms and their



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long-term impact on enterprise performance and fiscal sustainability remain insufficiently examined, especially from the perspective of enterprise-level microdata.

The main objective of this dissertation research is to analyse and evaluate selected financial and non-financial incentives provided to SMEs in the Slovak Republic and to assess their impact on enterprise performance, competitiveness, and fiscal stability using microdata analysis. The research focuses on identifying which types of support generate the most significant positive effects on business performance indicators and whether public support mechanisms contribute to sustainable economic development. Attention is devoted to evaluating the relationship between fiscal support instruments and measurable enterprise outcomes such as revenue growth, profitability, employment, export activity, and innovation performance.

The study is based on a combination of quantitative and qualitative research methods with a strong emphasis on empirical microdata analysis. The theoretical part examines the current scientific literature related to SME support policies, fiscal incentives, competitiveness, and public finance sustainability in the Slovak context. The empirical part relies primarily on enterprise-level microdata obtained from publicly available statistical databases, institutional reports, and firm-level financial statements. The main data sources include the Statistical Office of the Slovak Republic, Eurostat, the Ministry of Economy of the Slovak Republic, the Ministry of Finance of the Slovak Republic, business registers, and firm-level databases such as Finstat. Additional primary data will be collected through a questionnaire survey conducted among Slovak SMEs to obtain direct information regarding the accessibility, utilization, and perceived effectiveness of financial and non-financial support instruments.

The analytical framework of the dissertation applies descriptive statistics, correlation analysis, multiple regression analysis, and panel data econometric models such as Pooled OLS, Fixed Effects, and Random Effects models. These methods will be used to identify statistically significant relationships between the use of support mechanisms and enterprise-level performance indicators. The research will also evaluate differences between micro, small, and medium-sized enterprises as well as regional disparities in access to public support. Qualitative analysis of survey responses will help identify practical barriers, administrative limitations, and inefficiencies in the current support system.

The expected findings suggest that well-targeted financial and non-financial incentives positively influence SME performance, particularly in terms of revenue growth, profitability, innovation activity, and employment generation. It is anticipated that enterprises with greater innovation capacity and higher absorption potential benefit more significantly from combined support mechanisms integrating financial aid with advisory and educational services. At the same time, the research expects to identify several inefficiencies related to administrative complexity, unequal regional accessibility, and limited awareness among SMEs regarding available support opportunities.

From the fiscal perspective, the study assumes that although public support mechanisms may create short-term fiscal pressure through increased public expenditure or reduced tax revenues, their long-term effects may contribute to economic growth, higher productivity, stronger tax bases, and improved fiscal sustainability. The dissertation therefore aims to assess

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not only the effectiveness of individual support instruments but also their broader macroeconomic implications for public finances and economic stability in Slovakia.

The expected contribution of the research is both theoretical and practical. From a theoretical perspective, the dissertation contributes to the literature on SME support policies by providing a detailed microdata-based analysis of the Slovak business environment. From a practical perspective, the study will provide evidence-based recommendations for policymakers, public institutions, and economic development agencies regarding the optimization of financial and non-financial support mechanisms for SMEs. The research also aims to support the development of more transparent, efficient, and regionally balanced support policies that strengthen the competitiveness and long-term sustainability of Slovak SMEs.

JEL classification: H25, M21, G38

Keywords: Small and Medium-Sized Enterprises, Financial Incentives, Microdata Analysis, Fiscal Stability, Competitiveness



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**Problems of Classification and Valuation of Financial Instruments in
Commercial Banks**

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Extended Abstract

The classification and valuation of financial instruments represent one of the most complex and sensitive areas of accounting and financial reporting in the banking sector. Commercial banks operate in an environment characterized by increasing regulatory requirements, rapid financial innovation, and heightened expectations regarding transparency and risk management. In this context, the implementation of International Financial Reporting Standard 9 (IFRS 9) has introduced significant methodological and practical challenges, particularly in developing and transition economies where discrepancies between international accounting standards and local banking regulations remain evident.

The aim of this study is to identify and analyse the principal problems associated with the classification and valuation of financial instruments in commercial banks and to propose methodological solutions that could improve the consistency, transparency, and reliability of financial reporting. Attention is devoted to the interaction between IFRS 9 requirements and national banking legislation, with a focus on how these differences influence financial reporting quality, risk assessment, and managerial decision-making processes in commercial banks.

The research applies a combination of theoretical and empirical methods. The theoretical part is based on induction, deduction, synthesis, and comparative analysis to examine the conceptual foundations of financial instrument accounting and the regulatory framework governing their classification and measurement. The study compares IFRS 9 principles with selected local banking regulations and identifies methodological inconsistencies affecting accounting practice. The empirical part of the research is based on an analysis of commercial



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banks' financial statements, selected performance indicators, and regulatory reports issued by central banking authorities. Case-study analysis is used to evaluate the practical implications of different valuation approaches for financial assets and liabilities.

The findings of the research demonstrate that inconsistencies between IFRS 9 requirements and local prudential regulations create significant challenges in the classification and measurement of financial instruments. The study confirms that the choice of valuation methodology directly affects key banking indicators, including profitability, capital adequacy, liquidity assessment, and credit risk evaluation. Furthermore, the results reveal that differences in interpretation and implementation may reduce the comparability and transparency of financial statements across banking institutions. Based on these findings, the paper proposes an integrated conceptual framework aimed at harmonizing IFRS principles with the practical measurement approaches used in commercial banking practice.

The contribution of the study lies in both theoretical and practical dimensions. From a theoretical perspective, the research expands the discussion on the interaction between international accounting standards and banking regulation by providing a structured analysis of methodological inconsistencies in financial instrument reporting. From a practical perspective, the proposed framework may support commercial banks, regulators, and accounting professionals in improving the quality and consistency of financial reporting, enhancing investor confidence, and strengthening financial stability. The study also provides recommendations for future research focused on the digitalization of banking accounting systems, the application of fair value measurement in emerging markets, and the long-term effects of IFRS 9 implementation on banking sector resilience,

JEL classification: G21, M41, G32

Keywords: Financial Instruments, IFRS 9, Commercial Banks, Financial Reporting, Valuation Methodology

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**Digitalisation, Digital Capability Gaps and Institutional Support: New
Evidence from Europe and Southeast Asia**

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This study explores why substantial differences in digitalisation persist across countries, even where basic digital infrastructure is widely available. Rather than simply documenting the gap between more advanced and catching-up economies, it seeks to explain the underlying mechanisms that sustain these differences, with particular emphasis on the interaction between institutions, investment and digital capabilities. The analysis compares four European Union countries widely recognised as digital leaders—Sweden, Denmark, the Netherlands and Estonia—with Malaysia, a rapidly developing Southeast Asian economy that has made significant progress in digital transformation while continuing to face structural challenges. This comparison makes it possible to distinguish differences arising from broader economic and institutional conditions rather than from unequal access to technology alone.

The empirical analysis combines evidence from both the macro and firm levels. At the macro level, it draws on established international indicators, including the Digital Economy and Society Index (DESI), the World Bank Worldwide Governance Indicators (government effectiveness, rule of law, control of corruption and regulatory quality), internet coverage, innovation performance, digital investment as a share of GDP, human capital and labour productivity. At the firm level, the study employs a synthetic dataset representing small and medium-sized enterprises (SMEs), developed from empirical relationships observed in Eurostat, OECD and World Bank enterprise statistics. Because comparable firm-level microdata are generally unavailable across countries due to confidentiality and GDPR



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restrictions, no primary survey was undertaken. Instead, the synthetic dataset reproduces the statistical patterns reported in the original sources, allowing meaningful cross-country comparisons while recognising that the results represent typical adoption behaviour rather than observations from individual firms.

The macro-level findings reveal a clear and persistent divide. The four EU countries consistently outperform Malaysia in digital maturity, institutional quality, innovation performance, digital investment and labour productivity. Governance indicators, for example, reach values of around 2.0–2.1 for Denmark and Sweden, compared with approximately 0.6 for Malaysia. Likewise, digital investment accounts for roughly 2.5–4% of GDP in the European leaders, compared with around 1.5–2% in Malaysia, while labour productivity reaches approximately 75–88 index points versus about 55. More important than these numerical differences, however, is the balance between complementary factors. In the leading EU economies, infrastructure, digital skills and institutional quality evolve together and reinforce one another. Malaysia, by contrast, has achieved relatively high levels of connectivity but continues to lag in digital skills and business digitalisation, suggesting that infrastructure alone is insufficient to generate broader digital capability. Although Malaysia records faster productivity growth, reflecting the dynamics of economic catch-up, maintaining this momentum will depend on continued investment alongside further institutional strengthening.

The firm-level analysis reflects these broader structural patterns. SMEs in the four European economies display consistently higher levels of digital maturity, with cloud adoption reaching approximately 85–95%, e-commerce participation often exceeding 80%, and stronger cybersecurity preparedness than their Malaysian counterparts. These differences suggest that the institutional environment plays a more decisive role in digital adoption than firm size alone. A strong positive association is observed between digitalisation and labour productivity, with correlation coefficients ranging from 0.75 to 0.85, although these relationships should not be interpreted as evidence of causality. Instead, the findings support a sequential explanation in which institutional quality encourages investment, investment facilitates technology adoption, and digital adoption ultimately contributes to higher productivity. Where this sequence is disrupted—for example, by weak regulatory predictability or limited implementation capacity—a gap emerges between ambitious digital strategies and their practical outcomes.

The study makes both theoretical and practical contributions. From a theoretical perspective, it conceptualises the digital divide as a multidimensional phenomenon involving not only access to digital technologies but also the capabilities, institutional conditions and value creation processes required to use them effectively. From a policy perspective, the findings suggest that ambitious digital strategies, including initiatives such as the EU Digital Decade, are unlikely to achieve their intended outcomes unless they are supported by strong institutional capacity. Investments in digital infrastructure therefore need to be accompanied by improvements in governance, skills and implementation capability if countries are to narrow digital capability gaps.

JEL classification: O33, O43, L86

Keywords: digitalisation, digital divide, institutional quality, SMEs, productivity



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**Bridging the Digital Divide through Education: Skills Formation,
Inequality and Socio-Economic Transformation**

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Extended Abstract

This paper examines the role of education in bridging the digital divide by focusing on the interconnections between skills formation, inequality, and socio-economic transformation. Moving beyond a narrow understanding of the digital divide as a problem of access, the study conceptualizes it as a multi-layered phenomenon encompassing disparities in access, usage, and digital skills. In this framework, education is positioned as a critical institutional mechanism that not only facilitates access to digital technologies but also shapes individuals' capacity to utilize these technologies effectively and convert them into socio-economic advantages.

The existing literature has progressively shifted from first-level digital divide concerns (access to technology) to second- and third-level divides, which emphasize differences in skills and outcomes. This shift highlights the increasing importance of education systems in mediating the relationship between digital technologies and social inequality. However, while education is often presented as a key equalizing force, this paper argues that it can simultaneously reproduce and even deepen existing inequalities under certain structural conditions.

The study adopts a combined theoretical framework drawing on historical institutionalism and critical political economy. From a historical-institutionalist perspective, education systems are embedded within broader political and economic structures that shape their capacity to respond to technological transformations. These systems are path-dependent and reflect long-term institutional arrangements, which can either enable or constrain effective digital inclusion. From a critical political economy perspective, digital transformation is not a neutral or purely technical process; rather, it is deeply intertwined with power relations, capital accumulation, and social stratification. This dual framework allows for a nuanced understanding of how digital skills are produced, distributed, and valued within society.

Methodologically, the paper employs a qualitative comparative approach with a particular focus on Turkey as a case study. Turkey presents a compelling case due to its rapidly expanding digital infrastructure, relatively young population, and ongoing efforts to integrate digital technologies into its education system. At the same time, significant regional disparities, differences between public and private educational institutions, and socio-economic



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inequalities continue to shape access to and outcomes of digital education. The analysis draws on policy documents, secondary data, and existing empirical studies to assess how educational policies aimed at digital inclusion operate in practice.

The findings suggest that while education policies have contributed to reducing access-based inequalities, they have been less successful in addressing disparities in digital skills and outcomes. Students from higher socio-economic backgrounds tend to acquire more advanced digital competencies and are better positioned to translate these skills into economic opportunities. This dynamic reflects the emergence of what can be termed a “skills-based digital divide,” where inequalities are reproduced not through lack of access but through differences in the quality and depth of digital engagement.

Furthermore, the paper demonstrates that digital skills play a crucial role in shaping socio-economic transformation, particularly in the context of labour markets. Individuals with higher levels of digital competence are more likely to access better employment opportunities, participate in knowledge-based sectors, and adapt to rapidly changing economic conditions. Conversely, those with limited digital skills risk being excluded from these opportunities, reinforcing existing patterns of inequality. In this sense, digital transformation functions as both a driver of economic growth and a mechanism of social stratification.

The study also highlights the limitations of current digital inclusion policies, which often focus primarily on infrastructure and access while neglecting pedagogical innovation and institutional capacity. Effective integration of digital technologies into education requires not only technological investment but also comprehensive reforms in curriculum design, teacher training, and assessment systems. Without such reforms, efforts to bridge the digital divide may remain superficial and fail to address its deeper structural dimensions.

In conclusion, the paper argues that bridging the digital divide through education requires a holistic approach that goes beyond access and addresses inequalities in skills formation and outcomes. Education systems must be reoriented towards fostering not only digital literacy but also critical and adaptive competencies that enable individuals to navigate complex socio-economic environments. Policymakers should adopt inclusive and context-sensitive strategies that recognize the diverse needs of different social groups and aim to reduce structural inequalities. By doing so, education can play a transformative role in shaping a more equitable and inclusive digital future.

JEL classification: I24, D63.

Keywords: Digital Divide, Digital Skills, Educational Inequality, Socio-Economic Transformation.

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**Unequal Connectivity, Unequal Voice: How Global Digital Divide Shapes
Public e-Participation**

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Extended Abstract

This study examines the impact of the global digital divide on public e-participation across 193 countries over the period 2003–2024. While digital technologies have expanded opportunities for citizen engagement in governance, substantial disparities in digital access and capability continue to shape uneven participation outcomes worldwide. Using a quantitative research approach and panel data analysis, this study investigates how variations in digital inequality influence cross-national differences in e-participation over time. By employing a longitudinal global dataset, the research captures both temporal and structural dimensions of digital divide and its implications for inclusive digital governance. The findings are expected to provide robust empirical evidence on whether countries with lower levels of digital inequality demonstrate stronger public engagement through electronic participation platforms. Theoretically, this study contributes to the literature on digital governance, digital inequality, and participatory democracy by offering a comprehensive global perspective on the digital divide and e-participation nexus. Practically, the research provides policy insights for governments and international organizations seeking to reduce digital disparities and strengthen inclusive citizen participation in the digital era, particularly in the pursuit of equitable and sustainable governance worldwide.

JEL classification: O38, O57, M48

Keywords: cross country, global, digital divide, e-participation



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**Digital Asset Adoption and the Digital Gap: Evidence from the US, EU, V4,
and IMT-GT**

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Extended Abstract

Aim: This study investigates the determinants of digital asset adoption and the persistence of a “digital asset gap” across four distinct regional groups: the United States, the European Union (top-10 by nominal GDP), the Visegrád Group (V4), and the Indonesia-Malaysia-Thailand Growth Triangle (IMT-GT). The research addresses why digital asset adoption remains highly uneven despite converging digital infrastructure, and examines the conditional role of regulatory clarity, financial inclusion, and innovation capacity.

Method: The study employs an eight-year panel dataset (2018–2025) covering cryptocurrency, NFT, and DeFi revenues and users, combined with indicators of digital infrastructure, financial inclusion, regulatory clarity, and innovation capacity. Data sources include Statista Market Insights, World Bank, ITU, Eurostat, Global Findex, and policy document analysis. Analytical methods include fixed-effects panel regressions, dynamic panel specifications with lagged dependent variables, interaction terms, and marginal effects analysis.

Sample/Databases examined: The balanced panel comprises four regional aggregates observed annually over eight years (32 region-year observations). Regions include the USA, EU-10 (Austria, Belgium, France, Germany, Ireland, Italy, Netherlands, Poland, Spain,



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Sweden), V4 (Czechia, Hungary, Poland, Slovakia), and IMT-GT (Indonesia, Malaysia, Thailand). Variables measured include digital asset users per 1,000 population (log-transformed), internet penetration, financial inclusion index (debit card penetration and account ownership), regulatory clarity dummy (pre/post MiCA and US stablecoin laws), and innovation capacity indicators.

Findings: Digital infrastructure alone has a modest and statistically insignificant independent effect on adoption ($\beta_1 = 0.308$, $p = 0.251$). However, regulatory clarity significantly accelerates adoption: EU MiCA implementation is associated with +87.5 users per 1,000 ($p < 0.05$), and US stablecoin reforms with +64.2 users per 1,000 ($p < 0.10$). Financial inclusion strongly moderates the infrastructure-adoption relationship (interaction term $\beta_3 = 2.47$, $p < 0.01$), with marginal effects 8.6 times larger in high-inclusion regions (USA, EU-10) than in low-inclusion regions (IMT-GT). Innovation capacity amplifies these effects, creating virtuous cycles in advanced regions and persistent gaps in emerging regions with weaker institutions.

Contribution to theory and practice: The study provides the first empirical validation of Szabó's (2024) tripartite framework (structural, cognitive, motivational barriers) in the digital asset context. It operationalizes affordances theory within financial inclusion, demonstrating that technology effects depend fundamentally on institutional context. For practice, the findings demonstrate that closing the digital asset gap requires coordinated policy addressing regulatory harmonization, foundational financial inclusion, and innovation ecosystem support—not infrastructure investment alone.

Recommendations for future studies: Future research should examine intra-regional heterogeneity (urban/rural, income groups, education levels), incorporate informal adoption channels important in emerging markets, extend the post-reform observation window to capture long-run effects of MiCA and US stablecoin laws, and employ quasi-experimental designs to strengthen causal inference. Comparative studies including additional emerging regions (Latin America, Africa) would further test the generalizability of the conditional adoption framework.

JEL classification: G23, O33, O38

Keywords: digital asset adoption, cryptocurrency, digital divide, financial inclusion, regulatory frameworks

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Circular Migration of Highly Skilled Migrants in Europe

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Extended Abstract

Highly skilled migration in Europe is no longer a linear movement from origin to destination. Engineers, researchers, health professionals, data specialists, international graduates and managers increasingly build careers across several labour markets while maintaining professional, family and social ties in more than one country. Circular migration is often presented as a policy answer to this reality because it promises labour-market flexibility, knowledge circulation and a less damaging alternative to brain drain. Yet this promise is still weakly explained at the micro level. The aim of this study is to examine why highly skilled migrants in EU countries develop an intention to migrate circularly rather than only settle, return once, or move onward.

The study develops a migrant-centred model grounded in aspirations-capabilities theory and social capital theory. Aspirations-capabilities theory helps explain how migrants imagine desirable futures and whether they have the resources to act on them. Social capital theory clarifies how information, job leads and institutional knowledge circulate through family ties, professional contacts, friends and migrant networks. Together, these perspectives suggest that circular migration intention is not simply a response to state policy or labour shortages. It is a decision shaped by professional ambition, labour-market disappointment, relational resources and the practical usability of migration rules.

Four hypotheses structure the argument. First, career advancement aspirations are expected to increase circular migration intention because highly skilled migrants may use repeated mobility to keep several labour-market options open. Second, skill-job mismatch is expected to increase circular intention because overqualified migrants or migrants unable to use their qualifications may seek alternative routes to repair disrupted career trajectories. Third, transnational social networks are expected to support circular intention by reducing uncertainty and making opportunities in different countries more visible. Fourth, perceived policy usability is expected to strengthen the relationship between transnational networks and circular intention, since contacts can open opportunities only when residence rules, employer mobility, re-entry conditions and qualification recognition make repeated movement feasible. The empirical design will rely on free secondary microdata, with Eurobarometer mobility modules as the preferred source after screening for suitable indicators. The unit of analysis



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will be the individual highly skilled migrant. High skill will be coded through tertiary education, professional or managerial occupation, or a combined rule when the dataset allows. The dependent variable will be circular migration intention, measured conservatively as a willingness to work, live, return or move again across borders while maintaining plausible links to more than one labour market. This choice avoids claiming to observe completed circular migration when the selected data only capture intentions or mobility attitudes.

The main explanatory variables will be operationalised through survey proxies. Career advancement aspirations will be measured through items on better work, income growth, professional development, job quality or recognition. Skill-job mismatch will be captured through overqualification, education-occupation mismatch or difficulty using qualifications in the current labour market. Transnational networks will be measured through friends, family, professional contacts, native ties, co-ethnic ties or information channels abroad, depending on final data availability. Policy usability will be measured either through individual perceptions of barriers or through a country-level index based on publicly available EU and national policy documents. The controls will include age, gender, education, occupation, country of origin, host country, migration duration, family situation and employment status.

The estimation strategy will use logistic regression when the outcome is binary and multinomial regression when the outcome distinguishes settlement, return, onward movement and circular intention. If policy usability is measured at country level, multilevel modelling will be preferred over country fixed effects because fixed effects would absorb the moderator. Robustness checks will test alternative definitions of high skill, alternative outcome coding, separate models for EU mobile citizens and third-country nationals, and exclusions of very recent arrivals who may not yet have enough destination-country labour-market experience.

The expected theoretical contribution is to shift circular migration from a policy label to a migrant-centred decision process. The study shows that circularity becomes credible when aspirations are strong, networks provide usable information and policy rules do not punish movement. The practical contribution is also direct. Talent attraction, return and re-entry policies will matter more when they reduce the concrete frictions faced by migrants: recognition of qualifications, continuity of residence, employer portability and the right to leave without losing the possibility to come back. Future studies could extend the model with longitudinal data to compare stated circular intention with observed repeated mobility over time.

JEL classification: F22; J24; J61

Keywords: Circular migration; Highly skilled migrants; Career aspirations; Skill-job mismatch; Transnational social networks

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Research Questionnaire about Using AI in SME

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Extended Abstract

Artificial intelligence (AI) has quickly become an essential part of all types of businesses. Such technologies can have the positive impact on improving the operational efficiency of companies, making better decisions and developing new products and services. However, there still exists considerable variation within small and medium-sized enterprises (SMEs) regarding their use of AI. While many SMEs provide significant contributions to the global economy, they typically, do not possess the same level of funding as larger companies; therefore, many SMEs cannot implement or utilize AI as effectively as their larger counterparts. This disparity creates a disconnect between the potential benefits of AI and what is implemented in the SME environment.

To address this gap, the purpose of this research was to assess the major factors that affect the adoption of AI in SMEs. By applying three established models – TAM (Technology Acceptance Model); UTAUT (Unified Theory of Acceptance and Use of Technology); TOE (Technology–Organization–Environment) -- the researchers developed a complete model that explains the behaviour associated with AI adoption in SMEs. A total of five primary categories were assessed in relation to AI adoption in SMEs: Digital Readiness; Perceived Benefits; Support

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for Organization; Barriers to Adoption; and Pressures from Environment. Using a Quantitative Research Design, a Cross-Sectional Survey Design was used. A structured questionnaire containing 35 items was designed. Questionnaires were sent electronically to the SME representatives who included Company Owners/Managers, IT Specialists, and Digital Transformation Leaders. The survey targeted between 150 and 300 SMEs which gives enough numerical power to perform additional multivariate analyses.

Variables are measured utilizing Likert-type scale questions. Statistical procedures such as Reliability Analysis; Factor Analysis; Correlation Analysis; Regression Modelling are utilized to determine whether the hypothesized relationships are statistically supported. It is expected that when digital readiness (i.e., employee skill levels and the availability of appropriate IT systems) is present, then AI will be adopted. In addition, perceived benefits (such as increased productivity, lower costs and better decision-making) are anticipated to promote the adoption of AI. Also, it is anticipated that support for organization (i.e., employee training, financial investment by upper management) will drive the adoption of AI. However, it is also expected that barriers to adoption (e.g., high implementation costs; lack of professional staff; concerns about data privacy) will limit the extent to which SMEs will adopt AI. Finally, external pressures (competitive forces, customer expectations, government encouragement) are expected to encourage the adoption of AI.

As such, this research adds to prior work by developing a multi-dimensional and empirical-based model for understanding how SMEs' unique circumstances influence their adoption of AI. Prior work has primarily focused on larger corporations or generic digital technologies. As such, this work fills a void by highlighting the unique aspects and constraints inherent to SMEs. Moreover, it provides a link between the technological capabilities of AI and the organizational decision-making process thereby providing useful information for both academics and practitioners.

JEL classification: O33, M15, L25

Keywords: Artificial Intelligence, SMEs, Technology Adoption, Digital Transformation

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**Digital Governance and Regulatory Frameworks in the Age of Algorithmic
Administration: A Public Law and Legal Education Perspective from
Hamburg**

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Extended Abstract

The rapid expansion of digital governance—encompassing algorithmic decision-making, data-driven public administration, and platform-based regulation—poses fundamental challenges to traditional public law doctrines and regulatory frameworks. This paper examines how core principles of public law, such as legality, proportionality, transparency, and accountability, are being reinterpreted in response to the rise of digital state practices. Focusing on the German and broader European context, it analyses emerging regulatory approaches to artificial intelligence, automated decision systems, and digital public services.

In parallel, the paper explores the implications of these developments for legal education, with particular attention to teaching public law at a law faculty in Hamburg. It argues that legal curricula must adapt to equip future jurists with interdisciplinary competencies, including technological literacy and an understanding of digital governance infrastructures. Drawing on pedagogical experiences and curriculum design at a major German law school, the paper proposes integrating digital governance topics into core public law courses rather than treating them as peripheral specializations.

By bridging doctrinal analysis with educational innovation, the paper contributes to ongoing debates about how legal systems and legal education can remain responsive and normatively grounded in an era of accelerating digital transformation.

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

Keywords: digital transformation, Germany, legal education, Europe, public law



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**The Digital Transformation of Societies.
The Example of the Selected ASEAN Countries**

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Extended Abstract

This study examines the level and dynamics of societal digitalization in three ASEAN countries—Indonesia, Malaysia, and Thailand—over the period 2016–2023, with a comparative focus on the pre-pandemic (2016–2019) and pandemic (2020–2023) sub-periods. An original composite measure, the Digital Development of Society (DDS) Index, is proposed to assess digital transformation from a human-centred perspective across three dimensions: Access (infrastructure availability), Skills (digital competencies), and Use (technology



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utilization intensity). The index draws on normalized ITU indicators weighted by developmental relevance. The empirical analysis employs composite index modelling, Mann–Kendall trend testing, segmented regression with HAC estimation, Friedman and Wilcoxon nonparametric tests, and deterministic decomposition. The results reveal significant cross-country disparities: Malaysia attained the highest overall digital maturity; Thailand exhibited the strongest pandemic-driven acceleration—particularly in digital commerce and mobile integration—while Indonesia progressed markedly in infrastructure yet continued to face competency and utilization gaps. The Covid-19 pandemic acted as a powerful digitalization catalyst across the region, though its structural effects varied depending on pre-existing skill levels and human capital readiness. The study contributes a framework that treats societal digitalization as an independent analytical category rather than a derivative of economic performance, thereby offering a more comprehensive understanding of digital transformation processes. The findings carry practical implications for the design of inclusive digital policies in emerging economies and point to the need for further comparative research encompassing additional ASEAN members.

JEL classification: O33, L86, O53

Keywords: digital transformation; Digital Development of Society (DDS) Index; ASEAN-3; composite indicators; digital skills; digital divide; ICT adoption; Southeast Asia



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**AI and the Digital Divide: Risks and Opportunities for Inclusive Digital
Development in the EU and ASEAN**

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Extended Abstract

Artificial intelligence (AI) is rapidly transforming economies, governance, and societies, raising critical questions about its impact on the digital divide. While AI promises innovation, efficiency, and improved well-being, it also risks deepening inequalities in access to infrastructure, skills, data, and algorithmic benefits. This study provides a comparative qualitative analysis of how AI interacts with existing digital divides in the European Union (EU) and the Association of Southeast Asian Nations (ASEAN), two regions with contrasting governance models, socio-economic structures, and developmental trajectories. Drawing on policy documents, academic literature, and international reports, the paper examines risks and opportunities, identifies policy gaps, and proposes pathways toward more inclusive AI-driven digital development.

The digital divide has evolved through multiple layers: first level (physical access), second level (skills and usage), and third level (outcomes and benefits). AI introduces a potential “fourth-level divide” characterized by disparities in high-quality data, computational resources, algorithmic literacy, and the capacity to shape or contest algorithmic systems. Traditional frameworks, such as the capability approach, emphasize not only resource access but also individuals’ ability to convert digital tools into meaningful functioning. In AI contexts, this means examining who can meaningfully participate in, benefit from, and influence AI systems rather than merely using basic digital technologies.

The EU and ASEAN offer instructive contrasts. The EU leads globally in ethical AI governance through the General Data Protection Regulation (GDPR) and the Artificial Intelligence Act, emphasizing human-centric, rights-based, and risk-oriented regulation. However, significant intra-regional disparities persist between Northern/Western and Southern/Eastern member states in broadband quality, digital skills, and AI readiness. ASEAN, by contrast, exhibits dynamic private-sector innovation, rapid mobile adoption, and a youthful population, yet faces stark unevenness: advanced ecosystems in Singapore, Malaysia, and parts of Indonesia and Vietnam coexist with severe infrastructure gaps in countries such as Cambodia, Laos, and Myanmar. These differences make the regions complementary cases for understanding how governance traditions and structural conditions mediate AI’s distributional effects.



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Risks of AI adoption: centre on four interconnected domains. First, infrastructure gaps limit foundational access to high-bandwidth networks, affordable data, reliable electricity, and compute capacity. In ASEAN, rural–urban and cross-national divides are particularly pronounced, constraining both service delivery and local innovation. Even within the EU, peripheral regions lag, reducing the ability of communities to engage with AI-enabled applications.

Second, skills and labour-market vulnerabilities arise as AI automates routine tasks while increasing demand for advanced cognitive, data, and digital competencies. In ASEAN's large informal economies with limited reskilling infrastructure, displacement risks are heightened for vulnerable workers. The EU faces skill shortages alongside automation pressures in certain sectors and regions, underscoring the need for proactive upskilling and active labour-market policies.

Third, algorithmic bias and representational harms emerge when training data under-represent minority languages, ethnic groups, or socio-economic contexts. Multi-lingual and multi-ethnic settings in both regions amplify risks of exclusion in areas such as credit, hiring, justice, and content moderation. These harms are socio-technical, stemming from data collection choices, model design, and deployment contexts.

Fourth, governance asymmetries create additional challenges. The EU's stringent regulatory framework offers strong protections but may impose compliance burdens that disadvantage smaller actors or slower-adopting member states. ASEAN's more heterogeneous and often nascent regulatory environment risks weaker safeguards, data extractivism by dominant platforms, and regulatory fragmentation that hinders cross-border cooperation and local entrepreneurship. Power concentration in a few global technology firms further exacerbates winner-take-most dynamics.

Opportunities arise when AI is deliberately designed and governed for inclusion. AI can enhance public service delivery through targeted health diagnostics, multilingual e-government interfaces, and efficient social protection systems, particularly benefiting remote or underserved populations. In both regions, pilot projects demonstrate potential when paired with equitable infrastructure and transparent governance. AI also lowers barriers for small and medium enterprises (SMEs)—key employers in both blocs—by providing accessible analytics, automation, and market-expansion tools. Public programmes such as Digital Innovation Hubs or subsidized cloud services can democratize these benefits, supporting productivity gains in peripheral areas.

In education and skills, AI-enabled personalized learning, adaptive tutoring, and scalable reskilling programmes offer pathways to address teacher shortages and support lifelong learning, especially when focused on algorithmic literacy and critical digital citizenship alongside basic skills. Finally, accessibility and multilingual tools—including machine translation, speech-to-text, and assistive technologies—can promote inclusion for linguistic minorities and persons with disabilities, provided models are trained responsibly on diverse datasets.



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JEL classification: O33, O15

Keywords: Artificial intelligence, Digital Divide, Inclusive Digital Development



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Cost

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Extended Abstract

The definition of cost in economics and the use of the concept are unique and distinctive. Textbooks define the concept quite broadly. This is not conducive to understanding. The examples used to illustrate make matters worse. The paper gives an accurate mathematical definition of the concept based on the accepted verbal definition of cost. Precise definition, interpretation, and use can help to understand the economic way of thinking and to apply this approach correctly.

JEL classification: A10, A22, B13, B21, D01, D24

Keywords: alternative cost, definition, mathematical

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**The Role of Critical Incidents in the Digital Development of Tourism
Organizations**

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Extended Abstract

Digitalisation has become one of the key determinants of economic performance, productivity, and organisational resilience globally. At the same time, the pace and depth of digital development remain highly uneven, with substantial differences observed across countries, regions, and sectors. Complex, multidimensional digitalisation indicators clearly demonstrate that, even within Europe, pronounced disparities exist between northern benchmark countries and the Central and Eastern European region, while several Southeast Asian countries face structurally different yet partly comparable challenges. In these diverse contexts, digital advancement increasingly depends not merely on access to digital tools but on their organisational integration, strategic utilisation, and incorporation into managerial decision-making processes, particularly among small and medium-sized enterprises.

The interpretation of these structural differences lies at the core of the Overcoming Digital Divide in Europe and Southeast Asia (ODDEA) project, which examines the digital divide not only from an infrastructural perspective but also through its structural drivers, measurement frameworks, and sector-specific implications. Tourism, as a service-intensive sector, is especially sensitive to these inequalities, as its operations are strongly influenced by the quality of digital infrastructure, the level of digital competencies, and the degree of technological integration. This study constitutes one empirical sub-study of the ODDEA project, focusing on how the digital divide manifests itself at the organisational level and how it is addressed within tourism enterprises. The research represents the first phase of a larger, multi-stage investigation; subsequent phases will extend the analysis through international interviews and comparative assessment.

The primary aim of the study is to explore how the digital development of tourism organisations responds to concrete critical events and how digitalisation evolves from a reactive response into a strategically embedded organisational capability. The central research question concerns which types of events trigger digital transformation and through which learning mechanisms they lead to differentiated levels of digital maturity across organisations. The



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theoretical framework draws on event-driven organisational development and organisational learning perspectives. Methodologically, the study builds on the Critical Incident Technique (CIT), which enables the identification of events that disrupted routine operations and necessitated digital decision-making. Digitalisation is conceptualised not as a static outcome but as a temporally unfolding, adaptive process closely linked to managerial sense-making and organisational learning dynamics.

The empirical research adopts a qualitative multiple-case study design. Data collection was conducted among five Hungarian tourism-related small and medium-sized enterprises representing travel intermediation, the hotel industry, and thermal and wellness services. Semi-structured, in-depth interviews were conducted with senior and middle managers directly involved in digital development decisions. Interview data were triangulated with company documents and publicly available sources to enhance the reliability and validity of the findings. The results indicate that, in all analysed organisations, digitalisation was accelerated by clearly identifiable critical events. The most prominent triggering factors included operational shocks associated with the COVID-19 pandemic, labour shortages, rising energy and operational costs, as well as ownership and generational changes. Initially, these events predominantly gave rise to operational, reactive digital solutions, such as the introduction of online booking systems, administrative automation, or basic enterprise management modules. Based on the empirical evidence, a three-phase development pattern was identified. In the reactive phase, the primary objective of digitalisation is to ensure operational continuity. In the learning and integration phase, recurring events foster data-driven decision-making and the gradual integration of CRM and ERP solutions. In the proactive phase, organisations apply artificial intelligence-based tools, and digitalisation becomes a structural element of competitiveness and long-term organisational resilience.

Sectoral comparison reveals further differentiation. In travel agencies, digitalisation is predominantly knowledge- and data-intensive, whereas in hotel and wellness service providers, greater emphasis is placed on operational efficiency and workforce substitution. The main contribution of the study lies in its ODDEA-aligned interpretation of the digital divide not only at the macro level but also through firm-level decision-making processes, thereby providing a foundation for the next research phase focusing on international comparative analysis.

JEL classification: L83, M15, O33

Keywords: digitalisation, critical events, tourism, small and medium-sized enterprises, organisational learning

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**What Really Determines Digital Success Beyond echnology - lessons for
SMEs**

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Extended Abstract

This study examines the determinants of digital solution (DS) implementation success in organizations, with a particular focus on small and medium-sized enterprises (SMEs). Combining a systematic literature review following PRISMA guidelines with qualitative expert interviews, the research identifies critical success factors through the lens of the Technology–Organization–Environment (TOE) framework. The findings challenge technology-centric perspectives by demonstrating that organizational readiness—rather than technological sophistication—is the primary driver of successful implementation. Key factors include answering business needs, a well-grounded business case, sufficient organizational readiness, and harmonizing the business and the DS. The study highlights the central role of technology–organization fit as an integrative concept encompassing strategic, organizational, technological, and process dimensions. Empirical insights from the Hungarian context further reveal how resource constraints and lower digital maturity shape implementation trajectories. The paper contributes to the literature by offering a cross-system, process-oriented perspective and provides actionable recommendations for SMEs to enhance digitalization outcomes through better alignment and incremental implementation strategies.

Keywords: digital transformation, small and medium-sized enterprises, organizational readiness, business intelligence, ERP, document management system, software robot, workflow system

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**From Accessibility to Outcomes: Understanding the Digital Divide 2.0 in
the Indian context**

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Extended Abstract

India is the world's fourth largest economy with the fastest growing digital ecosystem; however, the increasing Digital Public Infrastructure (DPI) has created peculiar disparities in terms of skills, usage and outcomes. Thus, necessitating the need to re-frame the frameworks and parameters to understand Digital Divide beyond the binaries of haves and have nots in terms of electronic devices and internet connections. Internet in India report 2025 states that India has over 950 million Internet subscribers while highlighting that 548 million active internet users hail from rural India accounting for 57% of the total active users in the country. Whereas villages data as per Registrar General of India in 2024 showcased that 95.18% of Indian villages are connected to the internet by 3G or 4G connectivity. India constitutes 6,44,131 villages as per the Government of India data. Thus, the issue of connectivity and access have been resolved to a large extent with the support of creation of public infrastructure, but there seems to have a 'production gap' and 'usage gap' that exists within the usage patterns, digital skills and outcomes pertaining to digital usage accurately defined by various scholars as 'Digital Divide 2.0'. The paper tries to deconstruct the concept of 'Digital Divide 2.0' in the Indian context as the society faces other structural issues and socio-economic inequalities. It would delve into understand the evolution of theoretical frameworks to understand the concept of Digital Divide by analysing the works of Jan van Dijk, Eszter Hargittai and Ellen Helsper. It would aim to study the challenges and successful case studies in the implementation of the governmental and other institutional programmes like PMGDISHA (a governmental initiatives to make 6 crore rural households digitally literate in India).

Keywords: Digital Divide, Digital Public Infrastructure, Digital Divide 2.0, Digital Skills, Digital India.



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**Bridging the Generational Divide: Evaluating the Effectiveness of Change
Management Strategies in Fostering Digital Literacy and Technology
Adoption During Organizational Transformation**

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Extended Abstract

Purpose – The research is to study the generation groups – Baby Boomers, Generation X, Millennials and Generation Z adopting and responding to the organization transformation. Additionally, to evaluating and understanding the change management strategies which suite and leads to the successfully adopting and foster the digital transformation in Thailand organization.

Design/Methodology/Approach – Qualitative research, multiple cases approach, In-Dept case studies interview to analyse and by conducting thematic analysis to identify similar strategies, adoption patterns with each case. Establishing different strategies, change management strategies pattern in finding the similarity and differences in each organization across the generations with various industries, including Retail, Services, Finance and Banking and Manufacture in Thailand.

Finding – The analysis across manufacturing, Finance and banking, Retail companies and service companies indicates that Generation Z demonstrates a high willingness in adopting the digital skill during organization transformation, while Baby boomers often establish resistant mindset and generally a slow learning curve during digital adaptation. Furthermore, applying change management frameworks - such as Kotter's 8-step model, Lewin's 3-stage model and ADKAR Framework shows that "Top-down" management strategies are crucial to establishing the strong structural direction in organizational transformation, while "bottom-up" approaches is crucial for enable team to integrate and establishing digital mindsets in long-term. This research proposes a strategic roadmap that incorporates management frameworks and cultural behaviour to bridge the generational divide, ensuring resilient and sustainable organizational transformation. Research Limitations/Implications – Limitations of the research is the inability to expand the scope of the interview organization to various provinces in Thailand due to the limited of resources availability.



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Keywords – Digital Literacy, Digital Transformation, Digital Skills, Digital divide, Organizational Transformation, Change Management, Generation gap, Generation divide



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**Digital Transformation as a Context-Dependent Process: Insights from
Clinical Psychology**

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Extended Abstract

This study investigates how digital transformation is interpreted and enacted across different organizational contexts, with a particular emphasis on clinical psychology as a potential outlier. While digitalization is widely promoted as a universal driver of efficiency, innovation, and competitiveness, empirical observations suggest that adoption patterns vary significantly between sectors. These differences raise important questions about the psychological, professional, and contextual factors that shape how organizations respond to digital change. The primary aim of this research is to explore these variations and provide a more nuanced understanding of digital transformation processes beyond purely technological or economic explanations.

The study employs a qualitative, interpretative research design based on five semi-structured interviews conducted with representatives of upper-medium and large organizations operating in different sectors, including one clinical psychologist. This methodological approach allows for an in-depth exploration of participants' perceptions, experiences, and decision-making processes related to digitalization. The data analysis is informed by theoretical frameworks from behavioural economics and organizational psychology, particularly the concepts of bounded rationality and sensemaking. These frameworks help explain how individuals interpret complex technological changes under conditions of uncertainty, limited information, and cognitive constraints.

The findings reveal that most organizations in the sample perceive digital transformation as an inevitable and beneficial process. Digital tools are commonly associated with increased efficiency, improved control, cost reduction, and enhanced competitiveness. In these contexts, digitalization is often framed as a strategic necessity, and decision-making reflects a



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predominantly instrumental and goal-oriented logic. Organizations tend to adopt digital solutions to optimize performance, streamline processes, and maintain their competitive position in rapidly evolving markets.

In contrast, the case of clinical psychology diverges from this dominant narrative. The psychologist interviewed demonstrates a more cautious and selective approach to digital adoption, emphasizing the importance of personal connection, trust, and the therapeutic relationship. Concerns are raised about the potential loss of emotional depth, reduced quality of interaction, and the uncertain effectiveness of digital tools in therapeutic settings. This highlights that, in certain professional contexts, the perceived risks of digitalization may outweigh its potential benefits.

These differences are interpreted through the lens of cognitive biases and professional identity. In the psychological domain, decision-making appears to be more strongly influenced by status quo bias, loss aversion, and ambiguity aversion, leading to a preference for established, face-to-face methods. Furthermore, professional norms and ethical considerations inherent in clinical psychology contribute to a distinct logic of action, where relational quality and client well-being are prioritized over efficiency gains. This suggests that digital transformation is not solely a rational or technology-driven process but is deeply embedded in context-specific meaning-making systems.

The study contributes to the theoretical literature by demonstrating that digital transformation should be understood as a socially constructed and psychologically mediated process rather than a uniform or deterministic trend. It challenges the assumption that digitalization is universally desirable or applicable across all sectors. From a practical perspective, the findings highlight the importance of considering human, relational, and professional factors when designing and implementing digitalization strategies, particularly in fields where interpersonal interaction plays a central role.

Future research should expand the sample size, incorporate quantitative methods, and examine additional sectors to further validate and refine these findings. Comparative cross-country analyses could also provide valuable insights into how cultural and institutional contexts influence digital adoption patterns. Such research would contribute to a more comprehensive and context-sensitive understanding of digital transformation.

JEL classification: D91, O33, M10

Keywords: digital transformation, clinical psychology, bounded rationality, organizational behaviour, technology adoption

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Digitalization in SMEs - results of the qualitative research

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Extended Abstract

The aim of this study is to explore the digitalization in a medium-sized clothing discount retailer's warehouse logistics. Using a qualitative single-case study method, data were collected through an in-depth, semi-structured interview with the warehouse manager, a key informant with 16 years of tenure, capturing the transformation from paper-based processes to an ERP-driven automated system. The company operates a central warehouse that serves around 400 stores across three Eastern European countries, employing approximately 250 warehouse staff. Findings reveal that despite being a late majority adopter, the firm achieved substantial operational improvements: a 27% productivity increase, error reduction to 0.08%, elimination of 3,000 m² of storage space through sub-location digitalization, and a 34% reduction in staffing needs. Employee resistance, initially rooted in fear of surveillance, was mitigated through participatory change management. The study contributes to theory by extending the technology adoption lifecycle to SME logistics, highlighting the mediating role of internal process planning and employee empowerment. For practice, it offers a replicable blueprint for digitalizing warehouse operations, including scanner-based task assignment and inventory sub-location strategies. Future studies should compare multiple SME cases, investigate the long-term durability of these gains, and integrate quantitative metrics on employee satisfaction and supply chain resilience.

JEL classification: O33, M15, L23

Keywords: digitalization, warehouse logistics, ERP system, SMEs, change management



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**Beyond Digital Maturity: Persistent Tensions and Practices of Digital
Transformation**

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Extended Abstract

Digital technologies increasingly affect organizational structures, processes, and workflows, and, as a result, addressing digital transformation has become critical for modern firms. For a long time, academic work viewed digital transformation primarily as a technological upgrade or a tool for achieving operational efficiency. More recently, the focus has shifted toward organizational, strategic, and socio-technical aspects. This stream of literature highlights that digital transformation is associated with the emergence of new organizational structures, the redistribution of decision-making authority, and changes in organizational complexity. At the same time, a growing body of empirical research challenges the assumption that higher levels of digitalization within firms automatically lead to improved organizational performance. Digital transformation research has identified a number of recurring challenges. Firms frequently report persistent tensions between centralization and decentralization, control and autonomy, standardization and adaptability, as well as between operational efficiency and increasing operational complexity. Firms often implement multiple digital transformation initiatives simultaneously, thereby increasing organizational complexity and the degree of change required from both employees and managers. Notably, prior research also shows that a firm's digital focus or substantial digital investment does not necessarily correlate with improved performance or increased competitive advantage. Rather, outcomes depend on



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organizational structures, the depth of digital transformation, and the nature of improvement and change initiatives associated with digitalization.

Much of the existing digital transformation literature continues to portray organizational tensions as issues related primarily to governance, strategy, or digital maturity, which may place organizations in a state of ongoing discontent. This perspective tends to downplay how organizations experience and manage these tensions as an inherent aspect of organizational life. More importantly, the literature lacks empirical studies that explicitly examine the persistence of organizational tensions across organizations with differing strategies and levels of digital maturity.

This study aims to develop a more process-oriented perspective on digital transformation by examining how organizations deal with persistent tensions and the forms these tensions take throughout digital transformation processes. The study focuses on the implementation and everyday practice of digital transformation. It is guided by two primary research questions: (1) How do organizations experience and manage ongoing tensions during digital transformation? and (2) How do these tensions differ across organizations with different levels of digital maturity and strategic orientation?

Methodologically, the study employs a comparative qualitative case study approach. The empirical analysis focuses on organizations operating in different organizational contexts and representing different stages of digital maturity. Data is collected through structured interviews with members of organizational leadership who are directly responsible for, or closely involved in, digital transformation initiatives. This approach allows for a focused examination of how digital transformation processes are understood, guided, and managed at the leadership level, as well as how key decision-makers perceive and respond to emerging challenges and tensions over time.

The preliminary findings suggest that tensions associated with digital transformation are persistent rather than temporary features of organizational life. Organizations are continuously required to balance competing demands, such as the introduction of standardized digital systems alongside the need for local flexibility and adaptation, or pressures for technological advancement alongside the need for employee adjustment and capability development. These tensions are addressed through a mix of formal governance mechanisms, strategic prioritization, experimentation, negotiation, and localized problem-solving practices. At the same time, the findings indicate that the ways in which tensions are experienced and managed vary depending on organizational context, strategic orientation, and levels of digital maturity. Overall, the study contributes to the digital transformation literature by shifting attention away from linear and maturity-based interpretations toward a practice-based perspective that emphasizes ongoing tension management and organizational adaptation. From a practical standpoint, the findings aim to offer managers a more realistic understanding of digital transformation as an ongoing balancing process rather than a one-time implementation effort with clearly defined endpoints. Future research should further investigate how digital transformation tensions evolve over time and across different organizational and institutional settings.

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JEL classification: M15, O33, L20

Keywords: digital transformation; organizational tensions; digital maturity; qualitative case study; organizational practice.



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Language, Accessibility, and Digital Skills as Determinants of the Digital Gap: NLP-Informed Indicators from Public Portals and Policy Texts in Seven Countries

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Extended Abstract

Digital transformation has emerged as a central policy priority across both European and Southeast Asian countries, with governments investing extensively in digital infrastructure and e-government services. Despite these efforts, substantial disparities persist in citizens' ability to access and effectively use digital public services. These disparities are commonly conceptualised as the digital divide, which has evolved beyond issues of access to encompass differences in skills, usability, and institutional support (van Dijk, 2020; Hargittai, 2010). While much of the existing literature focuses on structural or "hard" indicators such as income, education, and connectivity, less attention has been paid to "soft barriers" embedded in the design and communication of digital public services.



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Recent research suggests that these soft barriers, particularly language complexity, accessibility, and the emphasis on digital skills, play a crucial role in shaping user engagement with digital systems (OECD, 2020; World Bank, 2016). Public sector communication is often characterised by formal and technical language, which can create cognitive barriers for users, especially those with lower levels of education or digital literacy. Readability measures such as the Flesch Reading Ease and the Gunning Fog Index provide systematic tools for assessing linguistic complexity and have been widely used to evaluate the accessibility of texts across various domains (Flesch, 1948; Gunning, 1952). In the context of e-government, higher linguistic complexity may reduce comprehension and limit effective usage, thereby reinforcing digital inequalities.

In addition to language, digital accessibility is a key component of inclusive digital governance. Accessibility encompasses not only compliance with technical standards but also broader considerations such as usability, clarity, and support for diverse user needs. International guidelines, particularly the Web Content Accessibility Guidelines developed by the World Wide Web Consortium, emphasise the importance of designing digital services that are perceivable, operable, understandable, and robust (W3C, 2018). Failure to incorporate these principles can systematically exclude certain groups, including individuals with disabilities, older populations, and those with limited digital experience (Jaeger, 2012).

Furthermore, digital skills represent a fundamental dimension of digital inclusion. The ability to navigate, interpret, and interact with digital systems is increasingly recognised as essential for participation in modern societies. Frameworks such as the European Commission's Digital Competence Framework for Citizens highlight the multidimensional nature of digital skills, encompassing information processing, communication, content creation, and problem-solving (European Commission, 2019). Empirical studies further demonstrate that disparities in digital skills persist even in contexts where access to technology is widespread, suggesting that skills constitute a critical "second level" digital divide (van Deursen & van Dijk, 2014).

Against this theoretical background, this study develops a novel approach to analysing digital inequality by focusing on textual and communicative features of e-government systems. Rather than relying on a fully automated natural language processing pipeline, the study applies an NLP-informed indicator approach, using structured textual metrics as proxies for language complexity, accessibility, and digital skills orientation (Gentzkow et al., 2019; Grimmer & Stewart, 2013).

The empirical analysis covers seven countries – Montenegro, Indonesia, Malaysia, Slovakia, Hungary, Poland, and Thailand – allowing for a comparative examination across European and Southeast Asian contexts. A structured corpus is constructed from official e-government portals (including service descriptions and user guidance) and national policy documents (such as digital strategies and skills development programmes). These materials are analysed using a consistent framework of textual indicators.

Four categories of indicators are developed: (1) language complexity indicators based on readability metrics and sentence structure; (2) accessibility indicators capturing multilingual support, user guidance, and inclusiveness; (3) digital skills indicators reflecting the extent to

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which systems support user competencies; and (4) update indicators capturing the responsiveness and timeliness of digital content.

These indicators are aggregated into a composite measure – the Digital Soft Barrier Index (DSBI) – which captures the extent to which communication and design features may hinder or facilitate digital inclusion. The results reveal systematic cross-country differences. Malaysia exhibits the lowest level of soft barriers, reflecting strong user-oriented communication and digital skills integration. European Union countries (Poland, Slovakia, and Hungary) demonstrate moderate levels of soft barriers, characterised by well-developed institutional frameworks but higher linguistic complexity. Montenegro and Thailand occupy intermediate positions, while Indonesia displays the highest level of soft barriers, largely due to system fragmentation and limited accessibility.

These findings suggest that digital inequality is shaped not only by infrastructure and access, but also by how digital services are communicated and structured. Clear language, user-centred design, and support for digital skills emerge as key factors in reducing soft barriers.

This study contributes to the literature by operationalising soft barriers through measurable textual indicators, integrating insights from digital governance and communication research, and providing comparative empirical evidence across diverse institutional contexts. The findings point to the need for a more holistic approach to digital transformation that combines technological development with improved communication and user accessibility and emphasise the role of communication practices and system design as critical, yet often overlooked, determinants of digital inclusion.

JEL classification: O33, D83, H83

Keywords: digital divide, e-government, Digital Soft Barrier Index (DSBI)

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