A Framework for Digital Technology and AI Adoption in Slovak Firms: Evidence from Qualitative Analysis

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***Abstract*—This study examines the adoption of digital technologies and artificial intelligence (AI) in Slovak firms, with particular attention to technological integration, employee adaptation, and organizational change. The study is based on qualitative semi-structured interviews conducted with managers and employees from 20 companies across multiple sectors and firm-size categories. The data were analyzed using thematic analysis. The findings identify three levels of digital adoption: basic digitization, process automation, and AI-supported adoption. Basic digital tools were reported across all firms, while advanced forms of adoption were concentrated mainly in IT and manufacturing companies. AI use remained limited and was typically confined to exploratory applications such as chatbots, automated support, or data-processing assistance. Across most cases, employees initially responded to digital change with hesitation or resistance, followed by gradual adaptation through practice-based and informal workplace learning. The results further indicate that digitalization was associated primarily with task reallocation, workflow optimization, and role redesign, whereas direct workforce reduction was reported only in isolated cases. Based on these findings, the study develops a conceptual framework linking technological adoption, employee adaptation, organizational restructuring, and sectoral context. Given the qualitative and exploratory nature of the research, the findings should be interpreted as analytically transferable rather than statistically generalizable. The study contributes to the literature by providing firm-level evidence from a Central and Eastern European context and by proposing a structured interpretation of digital and AI adoption as a multi-level organizational process.**

Keywords*—Digital technology adoption; artificial intelligence; digital transformation; process automation; thematic analysis; Slovak firms

I. Introduction

The rapid digitalization of economies and societies has fundamentally reshaped how organizations operate, compete, and create value. Digital technologies, including artificial intelligence (AI), are increasingly embedded in organizational processes, transforming operational models, decision-making practices, and workforce structures. As a result, firms that effectively adopt and integrate digital technologies gain competitive advantages, while those with limited adaptability risk declining productivity and reduced market relevance.

Despite the growing importance of digital transformation, existing research has primarily focused on technological and infrastructural aspects of digitalization, often emphasizing large organizations or technologically advanced economies. Less attention has been paid to how companies in Central and Eastern Europe (CEE), particularly small and medium-sized enterprises, interpret and implement digital transformation in practice. Moreover, prior studies frequently treat digital adoption as a purely technological process, overlooking the organizational and human dimensions, such as employee adaptation, managerial practices, and workplace learning, which are critical for successful implementation.

In the Slovak context, digital transformation has become a strategic priority, supported by national and European initiatives such as the Digital Economy and Society Index (DESI). However, empirical evidence on how Slovak companies perceive digitalization, adopt digital and AI technologies, and manage associated organizational changes remains limited. Existing studies tend to provide macro-level indicators of digital readiness but offer insufficient insight into firm-level processes, particularly regarding the interaction between technological adoption and employee adaptation.

Despite these developments, important gaps remain in the existing literature. First, empirical research on digital transformation in Central and Eastern Europe (CEE) remains limited at the firm level, particularly in relation to small and medium-sized enterprises. Second, prior studies tend to examine technological adoption and organizational or human factors separately, rather than as interconnected processes. Third, there is a lack of qualitative, process-oriented evidence capturing how firms transition between different stages of digital adoption in practice.

The aim of this study is to examine how Slovak companies adopt and implement digital technologies and artificial intelligence, with a particular focus on the interaction between technological adoption, employee adaptation, and organizational change. By addressing these dimensions simultaneously, the study seeks to provide a more integrated understanding of digital transformation as a multi-dimensional organizational process.

To achieve this aim, the study draws on qualitative semi-structured interviews conducted with managers and employees from 20 companies across diverse sectors.

The study is guided by the following research questions:

- How do Slovak companies perceive digitalization and digital transformation?
- How do companies adopt and use artificial intelligence and other digital tools?
- How do employees react to digital changes, and how do they adapt?
- What organizational effects does digitalization produce in Slovak companies?

This study contributes to the literature in three main ways. First, it provides empirical insights into digital and AI adoption in a CEE context, which remains underrepresented in current research. Second, it develops a structured understanding of digital adoption by identifying three levels of technological integration—basic digitization, process automation, and AI-supported adoption. Third, it proposes a conceptual framework that integrates technological, organizational, and human dimensions of digital transformation. Given the exploratory nature of the study and the qualitative design, the findings should be interpreted as analytically transferable rather than statistically generalizable.

II. Literature Review

Digitalization and digital transformation have become central concepts in contemporary organizational research [34]; however, their conceptual boundaries remain fluid and subject to ongoing debate. In the management and information systems literature, Digitalization is commonly understood as the use of digital technologies and data to improve existing processes and enhance operational efficiency [27], [10]. In contrast, digital transformation represents a broader, strategic reconfiguration of organizational structures, business models, and value creation processes [33]. While this distinction is widely acknowledged, empirical studies suggest that organizations often fail to differentiate clearly between these concepts in practice, frequently adopting a technology-driven rather than strategy-driven perspective. However, despite extensive conceptual development, the existing literature remains fragmented and often lacks empirical validation at the organizational level, particularly in less-studied regional contexts.

Recent literature increasingly emphasizes that digital transformation is not solely a technological process but a socio-technical phenomenon integrating technological innovation with organizational and human dimensions [32], [26]. In this context, digital transformation involves changes in leadership, organizational culture, and employee competencies, alongside the implementation of digital tools. However, despite this broader conceptualization, a significant portion of empirical research continues to prioritize technological adoption while underestimating the role of human capital and organizational learning processes. Nevertheless, many empirical studies continue to operationalize digital transformation primarily through technological indicators, thereby underestimating the complexity of human and organizational dynamics involved in the transformation process.

The importance of human capital in digital transformation has been widely documented. Studies show that employees' digital skills and adaptability are critical determinants of successful technology adoption and organizational innovation [29], [23]. Similarly, [16] argue that digital transformation is driven more by organizational strategy and leadership than by technology itself. Nevertheless, in practice, many firms—particularly small and medium-sized enterprises (SMEs)—struggle to align technological investments with workforce development, resulting in fragmented or incomplete transformation processes. This suggests that, particularly in SMEs, digital transformation is frequently implemented in a fragmented manner, with limited integration between technological investments and workforce development strategies.

Sectoral and regional differences further complicate the adoption of digital technologies. Research indicates that technologically intensive industries, such as manufacturing and information technology, tend to lead digital transformation due to greater access to financial resources, technological expertise, and innovation capabilities [11], [5]. In contrast, service-oriented sectors and smaller organizations often face resource constraints, skill shortages, and higher levels of uncertainty, which slow down the adoption of advanced technologies such as artificial intelligence. The likelihood of AI adoption is strongly influenced by firm-level characteristics, particularly organizational size and sectoral orientation. Large enterprises demonstrate significantly higher adoption rates compared to small and medium-sized enterprises (SMEs), primarily due to greater access to financial resources, technological expertise, and organizational capabilities [28]. Sectoral differences are also pronounced, with firms in the ICT sector exhibiting higher adoption rates, while industries such as agriculture, construction, and public services lag behind [12].

The literature identifies several key drivers of AI adoption. These include the need to address skill shortages in areas such as IT and data analytics, organizational growth and performance pressures, and participation in innovation ecosystems that facilitate access to knowledge and resources [12], [13]. At the same time, firms are primarily motivated by operational goals, such as process optimization, cost reduction, and service innovation.

However, the adoption process is constrained by a range of barriers. Absolute barriers include the lack of financial resources, insufficient technological infrastructure, and limited availability of skilled personnel [20]. In addition, relative barriers—such as data quality issues, integration challenges, and limited managerial support—affect firms already engaged in AI implementation. These findings highlight that AI adoption is not only a technological decision but also a complex organizational process shaped by internal capabilities and external constraints.

In the European context, and particularly in Central and Eastern Europe (CEE), digital transformation is shaped by structural and institutional factors, including disparities in digital skills, infrastructure, and innovation ecosystems. The Digital Economy and Society Index (DESI) highlights persistent gaps

in digital readiness across EU member states, with countries such as Slovakia exhibiting moderate performance but lagging in areas such as advanced digital skills and enterprise-level technology adoption [8]. While DESI provides valuable macro-level insights, it offers limited understanding of how firms interpret and operationalize digital transformation at the organizational level. Recent empirical evidence indicates that the adoption of artificial intelligence (AI) among European enterprises remains relatively limited, although it is gradually increasing. As of 2023, approximately 8% of enterprises in the European Union reported using at least one AI technology, representing a modest increase compared to 7.6% in 2021 [28]. However, significant disparities persist across countries. While Nordic economies such as Denmark and Sweden report adoption rates exceeding 35%, Central and Eastern European countries demonstrate substantially lower levels of implementation [13], [28].

In the Slovak context, AI adoption increased from 5.2% in 2021 to 7.0% in 2023, yet remains consistently below the EU average across all firm-size categories [28], [18]. These findings suggest that structural and institutional constraints continue to limit the diffusion of advanced digital technologies in the region.

Another important dimension of digital transformation concerns employee reactions to technological change. The literature consistently identifies resistance to change as a common response, particularly when new technologies disrupt established work routines [31], [24]. However, research also shows that such resistance is often temporary and can be mitigated through effective change management, communication, and training [19]. More recent studies highlight the role of informal, workplace-based learning as a mechanism through which employees gradually adapt to digital tools, especially in resource-constrained environments [7].

Despite these advances, several important limitations remain in the literature. First, empirical research on digital transformation in CEE countries remains relatively limited, particularly at the firm level. Second, existing studies often examine technological adoption and human adaptation as separate phenomena, rather than as interdependent processes shaping organizational outcomes. Third, most empirical research relies on quantitative indicators or large-scale surveys, providing limited insight into how organizations actually experience and implement digital transformation in practice. As a result, the processual and context-specific nature of digital adoption remains underexplored.

This study addresses these limitations by providing a qualitative, empirically grounded analysis of digital technology and AI adoption in Slovak companies. By integrating technological, organizational, and human perspectives, the study contributes to a more comprehensive understanding of digital transformation as a multi-dimensional and context-dependent process.

Table I presents selected indicators from the Digital Economy and Society Index (DESI), highlighting differences between Slovakia and the European Union average in key areas of digital skills. While Slovakia performs comparably in basic digital skills and exceeds the EU average in digital content creation, it lags behind in more advanced indicators, such as the share of individuals with above-basic digital skills, the proportion of ICT specialists, and the level of enterprise engagement in employing ICT professionals.

TABLE I. COMPARISON OF DIGITAL SKILLS IN SLOVAKIA AND THE EUROPEAN UNION IN 2022

Digital skills	DESI	
	DESI Slovakia	DESI EU
At least basic digital skills (% of population)	55	54
Above basic digital skills (% of population)	21	26
At least basic skills in digital content creation (% of population)	72	66
ICT specialists (% of employed persons aged 15–74)	4.30	4.50
Female ICT specialists (% of ICT specialists)	15	19
Enterprises employing ICT specialists (% of enterprises)	16	20
ICT graduates (% of graduates)	4.40	3.90

Source: [9]

These disparities point to structural limitations in the country's digital readiness, particularly in terms of advanced competencies and workforce specialization. As suggested by the literature, such gaps may constrain the ability of firms to adopt and effectively utilize more sophisticated digital technologies, including artificial intelligence, which require not only technical infrastructure but also highly skilled human capital [23], [30].

Beyond national-level indicators, digital transformation is increasingly understood as a multidimensional process that extends beyond technological capability. Prior research emphasizes the importance of organizational culture, leadership support, and strategic alignment in shaping digital transformation outcomes [17], [32]. In this context, employee reactions represent a critical factor influencing implementation success. Resistance to technological change is a well-documented phenomenon, particularly among employees with lower levels of digital skills or longer-established work routines [31], [24].

However, the literature also suggests that such resistance can be mitigated through effective change management practices, including communication, employee involvement, and training initiatives [19]. At the same time, emerging research highlights the role of continuous learning and skill development as key mechanisms enabling employees to adapt to rapidly evolving technological environments.

Digital transformation also has broader implications for labor markets and employment structures. While automation and AI may substitute routine tasks, studies increasingly indicate that digitalization simultaneously generates new roles requiring higher-order cognitive and technical skills [1], [11], [14]. This dual effect reinforces the importance of ongoing upskilling and organizational investment in human capital as essential components of sustainable digital transformation. At the same time, recent research points to the existence of a "productivity paradox" in AI adoption, whereby the implementation of AI technologies does not immediately translate into measurable productivity gains at the aggregate level [22]. Instead, performance improvements tend to emerge over time, as firms

invest in complementary organizational changes, workforce skills, and intangible assets. This suggests that the benefits of AI adoption are inherently long-term and dependent on broader organizational transformation processes.

Taken together, the literature suggests that digital transformation is best understood as an interaction between three interrelated dimensions: technological innovation, strategic organizational change, and human-capital development. This integrated perspective provides a relevant analytical foundation for examining how Slovak companies perceive and implement digital technologies within their specific institutional and economic context.

III. Methodology

This study employs a qualitative research design to explore how Slovak companies perceive and implement digitalization and digital transformation. Because the research questions are exploratory in nature and aim to capture subjective experiences, meanings and organizational contexts, a qualitative approach based on semi-structured interviews was selected. Such approaches are particularly suitable for examining complex and dynamic processes that are socially and contextually embedded [7], and are widely used in exploratory research where in-depth understanding of organizational phenomena is required.

A. Research Design

This study adopts a qualitative research design to explore how Slovak companies perceive and implement digitalization and artificial intelligence (AI). Given the exploratory nature of the research questions and the focus on understanding organizational processes, meanings, and experiences, a qualitative approach based on semi-structured interviews was considered most appropriate [6], [15]. This design enables an in-depth examination of complex and context-dependent phenomena that cannot be adequately captured through standardized quantitative methods.

B. Research Questions

The study is guided by the following research questions:

- RQ1: How do Slovak companies perceive digitalization and digital transformation?
- RQ2: How do companies adopt and use artificial intelligence and other digital tools?
- RQ3: How do employees react to digital changes and how do they adapt?
- RQ4: What organizational effects does digitalization produce in Slovak companies?

C. Sampling and Participants

A purposive sampling strategy was employed to select information-rich cases across different organizational contexts [26]. The sample consists of 20 Slovak companies representing a range of sectors, including information technology, finance, manufacturing, education, and services, as well as different firm sizes (micro, small, medium, and large enterprises).

The selection criteria included:

- Active use of digital technologies in organizational processes,
- Willingness to participate in the study, and
- Representation of sectoral diversity.

Although the sample size is relatively modest, it is consistent with qualitative research standards, where adequacy is determined by thematic saturation rather than statistical representativeness. In this study, thematic saturation was achieved after approximately 15 interviews, with subsequent interviews confirming previously identified patterns. This approach is consistent with qualitative research standards, where analytical depth and contextual richness are prioritized over statistical generalization, and where smaller samples are considered appropriate for capturing complex organizational processes [6], [25].

TABLE II. Structure of the Research Sample by Sector and Firm Size

Sector/Company size	Micro (1-9)	Small (10-49)	Medium (50-249)	Large (more than 250)	Total
IT	3	0	2	1	6
Finance	1	1	0	2	4
Education	2	0	0	0	2
Business services	0	1	0	0	1
Culture	0	1	0	0	1
Gastronomy	0	0	1	0	1
Manufacturing	0	0	1	1	2
Retail/Wholesale	0	0	0	1	1
Law and Legislation	0	0	0	1	1
Marketing	0	0	0	1	1
Total	6	3	4	7	20

Source: Authors' own processing

Table II summarizes the composition of the research sample, capturing the distribution of participating companies across sectors and firm sizes. The sample reflects a deliberate effort to ensure heterogeneity, including micro, small, medium, and large enterprises operating in diverse industries such as information technology, finance, manufacturing, education, and services.

This variation was intentionally incorporated to capture a wide range of organizational experiences with digitalization and AI adoption, as prior research indicates that sectoral context and firm size significantly influence the scope and depth of technological implementation. In particular, the inclusion of both technologically intensive sectors (e.g., IT, manufacturing) and less digitally advanced sectors (e.g., culture, education) enables a comparative perspective on digital maturity and adoption patterns.

Although the sample size (N = 20) is relatively modest, it is consistent with qualitative research standards, where the objective is not statistical representativeness but analytical depth and contextual understanding. In line with established methodological approaches [6], [25], sampling adequacy was assessed based on thematic saturation. In this study, saturation was reached after approximately fifteen interviews, with subsequent interviews providing confirmatory rather than novel insights.

This sampling strategy strengthens the study's ability to identify recurring patterns while preserving sensitivity to sector-specific differences, thereby enhancing the analytical robustness and transferability of the findings.

D. Data Collection

Data were collected through semi-structured interviews conducted between March and July 2025. Two interview guides were developed to capture both managerial and employee perspectives:

A manager-focused guide addressing digital strategy, AI adoption, organizational change, and digital competencies.

An employee-focused guide examining individual experiences, perceived challenges, and adaptation processes.

Interviews lasted between 30 and 60 minutes and were conducted either in person or online. All interviews were audio-recorded with participants' consent and subsequently transcribed verbatim for analysis.

E. Data Analysis

The data were analyzed using thematic analysis following the six-step framework proposed by [3]:

- Familiarization with the data.
- Generation of initial codes.
- Search for themes.
- Review of themes.
- Definition and naming of themes.
- Production of the report.

Thematic analysis is particularly suitable for identifying patterns across qualitative data and for developing theoretically informed interpretations grounded in empirical evidence, making it an appropriate method for the exploratory objectives of this study.

A hybrid inductive–deductive approach was applied. Deductive codes were derived from the research questions (e.g., "AI adoption," "digital skills," "organizational change"), while inductive codes emerged from participants' responses (e.g., "initial resistance," "informal learning," "automation benefits").

To enhance analytical transparency, a codebook was developed specifying code definitions and representative examples. Coding was conducted by the primary researcher and partially reviewed by a second researcher through peer debriefing, which contributed to the consistency and credibility of the analysis.

F. Analytic Framework (Conceptual Formalization)

Based on the thematic analysis, the study develops a conceptual framework of digital technology and AI adoption. The framework can be formally represented as a three-level structure of organizational digital maturity:

Level 1 (L_1): Basic digitization – use of digital tools for administrative support and data management.

Level 2 (L_2): Process automation – integration of digital systems for workflow optimization and process coordination.

Level 3 (L_3): AI-supported adoption – implementation of AI-based tools for decision support and advanced analytics.

These levels are influenced by three cross-cutting dimensions:

- Employee adaptation (E),
- Organizational restructuring (O),
- Sectoral context (S).

The relationship between these components can be conceptually expressed as:

$$D = f(L, E, O, S) \quad (1)$$

where D represents the level of digital transformation achieved by the organization, L denotes the stage of technological adoption, and E, O, and S represent moderating organizational and contextual factors. This formalization serves as a conceptual abstraction of the relationships identified through qualitative analysis, providing a structured representation of how technological, organizational, and human factors jointly shape digital transformation outcomes.

This formalization does not imply a quantitative model but serves as an analytical representation of relationships identified through qualitative data.

G. Trustworthiness and Validity

To ensure the credibility and trustworthiness of the findings, several strategies were applied:

Triangulation through the inclusion of both managerial and employee perspectives.

Thick description using illustrative quotations to provide contextual depth.

Audit trail documenting coding decisions and analytical steps.

Peer debriefing to validate selected coding procedures. These procedures enhance the credibility, consistency, and analytical rigor of the findings, in line with established qualitative research standards.

H. Ethical Considerations

The study adhered to standard ethical principles, including informed consent, voluntary participation, anonymity, and confidentiality. All participants were informed about the purpose of the study, and identifying information was removed during data processing.

I. Limitations

As a qualitative pilot study, the findings are not statistically generalizable. The sample is based on voluntary participation, which may introduce self-selection bias. However, the study provides analytically transferable insights that can inform future research using larger or mixed-methods designs.

IV. Results

The findings of the study are presented according to the four research questions, with themes identified through thematic analysis illustrating common patterns and divergent experiences across organizations. Overall, the analysis revealed three dominant patterns across organizations: a predominantly process-oriented understanding of digitalization, significant sectoral differences in the adoption of advanced digital technologies, and gradual employee adaptation following initial resistance to technological change. The thematic analysis revealed four dominant themes across organizations (see Table III).

TABLE III. Overview of Themes Identified Through Thematic Analysis

Theme	Description	Illustrative evidence
Process-oriented understanding of digitalization	Companies primarily perceive digitalization as a tool for improving efficiency and automating administrative processes.	Managers frequently describe digitalization as automation of administrative tasks or workflow optimization.
Sectoral differences in technology adoption	The level of technological adoption varies across sectors, with IT and manufacturing firms demonstrating higher digital maturity.	Companies in IT and manufacturing reported using cloud systems, data analytics and automation tools.
Employee resistance and gradual adaptation	Employees initially express resistance to technological change but adapt over time through practice-based learning.	One respondent noted that changes in work systems initially caused discomfort but became easier once benefits were recognized.
Organizational consequences of digitalization	Digitalization leads to job redesign, task reallocation and efficiency improvements, while workforce reductions are relatively rare.	Several managers reported reassigning employees to new roles rather than eliminating positions.

Source: Authors' own processing

A. Process-Oriented Understanding of Digitalization

Addressing RQ1, companies generally perceived digitalization as a process-oriented initiative focused on improving workflow efficiency and reducing manual labor. Managers frequently described digitalization in technical terms, such as automating administrative procedures or optimizing communication systems, while a smaller number articulated a broader understanding of digital transformation as organizational change. This variation suggests inconsistent conceptual clarity across firms. As one retail manager noted, the introduction of digital tools "streamlined several administrative processes, reducing the amount of manual work, particularly in logistics." Although efficiency was widely emphasized, few firms linked digital transformation to employee learning or strategic skill development, indicating a primarily technology-driven approach.

B. Sectoral Differences in Digital Technology Adoption

Regarding RQ2, the adoption of advanced digital technologies, including artificial intelligence, varied across sectors. IT and manufacturing companies reported the greatest technological integration, such as cloud services, data analytics tools, and automation systems. AI use remained limited and exploratory, typically focused on chatbots or automated support functions. Companies in education, culture, law, and business services relied mainly on basic digital tools without substantial transformation initiatives. Organizational resources and size influenced the depth of adoption, with larger firms investing in complex systems such as SCADA or HMI panels, whereas micro and small enterprises pursued incremental and cost-sensitive solutions.

C. Employee Resistance and Gradual Adaptation

In relation to RQ3, employees' reactions to digital changes followed a common pattern: initial resistance, followed by gradual adaptation. Respondents described hesitation, discomfort, and uncertainty during the early stages of technological implementation, a reaction especially pronounced among older workers. An IT employee (aged 56) explained, "I felt resistance. Every change in the work system causes discomfort. It is important to anticipate this and design an implementation strategy in advance." Despite this resistance, employees generally adapted over time as they recognized the benefits of reduced manual tasks and clearer processes. Adaptation occurred through practice rather than through structured training, indicating an experiential learning process.

In several cases, respondents emphasized that the adaptation process was facilitated by informal peer support and gradual exposure to digital tools in everyday work activities. Rather than relying on formal training programs, many organizations introduced new technologies incrementally, allowing employees to learn through repeated use and interaction with colleagues. Managers reported that this approach reduced anxiety associated with technological change and helped employees build confidence when working with digital systems. In smaller firms in particular, learning often occurred through collaborative problem solving, where employees shared knowledge and practical tips regarding the use of new software or digital platforms. These findings suggest that workplace-based learning mechanisms play an important role in supporting employees' adaptation to digitalization, especially in organizations with limited resources for structured training initiatives.

D. Organizational Consequences of Digitalization

Addressing RQ4, digitalization also produced structural effects within organizations. While some firms experienced changes in job roles and responsibilities, workforce reductions were uncommon. Managers commonly reported reassigning employees to new positions rather than eliminating roles. A finance manager stated. "Digitalization has not affected the number of employees. No positions were eliminated, but the people in those positions have changed." In certain sectors, however, digitalization prompted outsourcing or automation

that replaced specific operational tasks. For example, a manufacturing manager described outsourcing IT and analytics functions to partners abroad and implementing SCADA and HMI technologies that "eliminated several operational positions two years ago." Across organizations, digitalization consistently contributed to improved efficiency, workflow clarity, and time savings, with employees often redirected to higher-value tasks.

E. A Framework of Digital Technology and AI Adoption

Building on the thematic analysis, the findings of this study allow for the development of a conceptual framework that captures how companies adopt digital technologies and artificial intelligence across different stages of organizational development.

The analysis identifies three distinct levels of digital adoption. The first level, basic digitization, involves the use of digital tools primarily for administrative support and data management. At this stage, digitalization is understood mainly as a means of improving efficiency and reducing manual workload, which corresponds with the process-oriented understanding identified across most organizations.

The second level, process automation, is characterized by the integration of more advanced digital systems, including cloud-based platforms, workflow automation tools, and data-processing technologies. Companies at this stage move beyond basic digitization and begin to restructure internal processes to enhance operational efficiency and coordination.

The third level, AI-supported adoption, represents a more advanced stage in which organizations experiment with or implement artificial intelligence technologies, such as chatbots, automated analytics, or decision-support tools. However, the findings indicate that this level remains limited and unevenly distributed across sectors.

Across all levels, the adoption process is shaped by several cross-cutting dimensions. First, employee adaptation plays a crucial role, as employees typically exhibit initial resistance to technological change followed by gradual adaptation through practice-based learning. Second, digitalization contributes to organizational restructuring, particularly through task reallocation and job redesign rather than large-scale workforce reductions. Third, sectoral differences significantly influence the depth of adoption, with technologically intensive industries demonstrating higher levels of digital maturity.

Taken together, the framework suggests that digital transformation is not a linear technological upgrade but a multi-dimensional process combining technological implementation with human and organizational adaptation.

V. Discussion and Implications

The findings of this study provide important insights into how Slovak companies approach digitalization and artificial intelligence (AI) adoption, while also contributing to broader debates on digital transformation in organizational contexts. Importantly, the results highlight that digital transformation should be understood not merely as a technological upgrade, but as a multi-dimensional process shaped by the interaction of technological, organizational, and human factors. Taken together, the findings suggest that digital transformation in Slovak firms follows a gradual and non-linear trajectory shaped by both internal organizational capabilities and external contextual constraints.

A. Reinterpreting Digitalization from Operational Tool to Strategic Process

The results indicate that Slovak companies predominantly conceptualize digitalization as a process-oriented tool aimed at improving efficiency and automating administrative tasks. This finding aligns with prior research suggesting that organizations often adopt digital technologies in a reactive and operational manner before recognizing their broader strategic implications [4], [28]. This finding contributes to the ongoing debate by suggesting that the transition from operational digitalization to strategic digital transformation is not automatic, but depends on the alignment of technological investments with organizational capabilities and human capital development.

However, the limited distinction observed between digitalization and digital transformation suggests a lack of strategic integration, particularly in smaller firms. While the literature emphasizes that digital transformation requires alignment between technology, strategy, and organizational capabilities [27], the findings indicate that many firms remain at an early stage of this transition. This reinforces the argument that technological adoption alone does not constitute transformation but must be embedded within a broader organizational change process.

B. Sectoral Inequalities and Uneven Technological Maturity

Consistent with existing research, the study reveals significant sectoral differences in digital adoption. Firms operating in IT and manufacturing sectors demonstrate higher levels of technological maturity, including the use of automation, cloud systems, and early-stage AI applications. This pattern reflects findings by [11], [5], who highlight the role of resource availability, technological capabilities, and innovation intensity in shaping digital transformation trajectories.

In contrast, firms in education, culture, and service-oriented sectors exhibit slower and more incremental adoption. These differences can be interpreted through the lens of resource constraints and perceived necessity, which have been identified as key barriers to digital transformation in SMEs. The findings therefore support the view that digital transformation is uneven and context-dependent, rather than a uniform or linear process across industries.

C. Employee Adaptation from Resistance to Experiential Learning

A central contribution of this study lies in its identification of employee adaptation as a dynamic and processual phenomenon. Consistent with established models of technology acceptance [31], [24], employees initially exhibit resistance to technological change, particularly when faced with unfamiliar systems or disrupted routines.

However, the findings extend this literature by demonstrating that resistance is typically temporary and followed by gradual adaptation through practice-based learning. Rather than relying on formal training programs, many organizations facilitate adaptation through informal

mechanisms, including peer support, collaborative problem-solving, and repeated interaction with digital tools. This aligns with the concept of workplace-embedded learning [7], highlighting the importance of experiential learning in digital transformation processes.

At the same time, the reliance on informal learning may limit the long-term development of digital competencies, suggesting that organizations could benefit from more structured approaches to skill development. This observation contributes to the ongoing debate on the role of human capital in digital transformation, reinforcing the need to integrate technological and educational strategies. These findings extend existing models of technology acceptance by emphasizing the role of informal and practice-based learning as a key mechanism of adaptation, particularly in resource-constrained organizational environments.

D. Organizational Consequences: Transformation Without Displacement

The findings suggest that digitalization primarily leads to job redesign, task reallocation, and efficiency gains rather than widespread workforce reductions [1], [2], [21]. This is consistent with prior research indicating that digital transformation often reshapes rather than eliminates work [1], [2].

Nevertheless, evidence of outsourcing and automation in certain sectors, particularly manufacturing, indicates that digitalization can also contribute to structural shifts in employment. This dual effect reflects broader labor market dynamics, where digital technologies simultaneously create new opportunities while displacing specific routine tasks. The findings therefore underscore the importance of adaptive organizational strategies that support workforce transition and skill development. This suggests that the impact of digitalization on employment should be understood as a process of transformation rather than substitution, where the nature of work changes more significantly than the number of jobs.

E. Contextualizing Digital Transformation in Slovakia

While many of the observed patterns align with broader European trends, the findings also highlight several context-specific characteristics of the Slovak environment. Digital transformation appears to be shaped by a combination of structural constraints, including limited resources in SMEs, gaps in advanced digital skills, and reliance on external expertise through outsourcing.

These factors correspond with macro-level indicators such as DESI, which point to moderate digital readiness but persistent gaps in workforce capabilities and enterprise-level adoption. Importantly, the study demonstrates how these structural conditions are reflected at the firm level, influencing both the pace and depth of digital transformation. This contextual perspective contributes to a more nuanced understanding of digitalization in CEE economies, where institutional and economic conditions differ from more technologically advanced regions.

F. Contributions, Limitations, and Implications

This study contributes to the literature by offering an empirically grounded and conceptually integrated perspective on digital transformation in a CEE context. Specifically, it provides three main contributions. First, it provides empirically grounded insights into digital and AI adoption in a CEE context, addressing a gap in existing literature. Second, it conceptualizes digital transformation as a multi-level process, distinguishing between basic digitization, process automation, and AI-supported adoption. Third, it highlights the critical role of employee adaptation and organizational learning in shaping transformation outcomes.

At the same time, several limitations should be acknowledged. The study is based on a relatively small and non-random sample, which limits the generalizability of the findings. In addition, the reliance on qualitative interviews may introduce subjective bias in participants' responses. Future research could address these limitations by employing mixed methods designs, larger samples, and longitudinal approaches to capture the evolution of digital transformation over time.

From a practical perspective, the findings suggest that organizations should approach digital transformation as an integrated process combining technological investment with human-capital development and organizational change. Policymakers may also play a role by supporting SME digitalization, strengthening digital skills development, and fostering collaboration between industry and educational institutions.

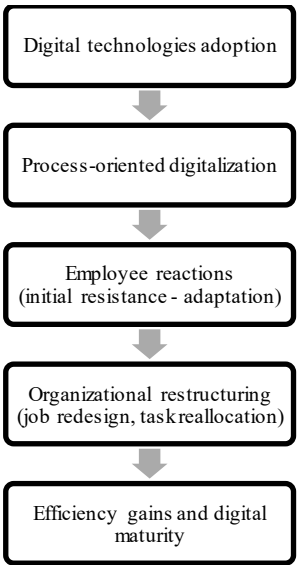

Fig. 1. Conceptual framework of digital technology and AI adoption, Source: Authors' own elaboration based on qualitative data.

Fig. 1 presents the conceptual framework of digital technology and AI adoption derived from the thematic analysis. The framework illustrates three progressive levels of digital adoption—basic digitization, process automation, and AI-supported adoption—reflecting increasing levels of technological maturity within organizations.

In addition to these stages, the model highlights three cross-cutting dimensions that shape the adoption process: employee adaptation, organizational restructuring, and sectoral context. These dimensions influence both the pace and the depth of digital transformation, emphasizing that technological implementation is closely intertwined with human and organizational factors.

The framework conceptualizes digital transformation as a dynamic and multi-dimensional process rather than a linear progression, where organizations may move between stages depending on internal capabilities and external conditions. This perspective extends existing models of digital transformation by explicitly integrating employee-level adaptation and sector-specific variability into a unified analytical structure.

VI. Conclusion and Practical Implications

This study examined how Slovak companies perceive, adopt, and respond to digitalization and artificial intelligence (AI), drawing on qualitative evidence from 20 organizations across multiple sectors. The findings demonstrate that digitalization remains predominantly process-oriented, with firms focusing on workflow optimization and incremental technological improvements rather than comprehensive strategic transformation. While some organizations recognize the broader implications of digital transformation, the integration of human capital development into digital strategies remains limited. These findings reinforce the view that digital transformation in SMEs is not a purely technological process, but a socio-technical transition requiring alignment between technology, organization, and human capabilities.

The analysis further reveals that digital adoption is uneven across sectors, with IT and manufacturing firms exhibiting higher levels of technological maturity, while service-oriented sectors adopt digital tools more gradually and primarily for operational purposes. AI adoption remains exploratory and limited in scope, reflecting both resource constraints and uncertainty regarding its practical implementation. At the organizational level, digitalization leads primarily to task reallocation, job redesign, and efficiency gains, rather than widespread workforce reductions.

A key contribution of the study is the development of a conceptual framework that conceptualizes digital transformation as a multi-level process comprising basic digitization, process automation, and AI-supported adoption. Importantly, the findings highlight that this process is not purely technological but is shaped by employee adaptation, organizational restructuring, and sectoral context. This integrated perspective extends existing literature by explicitly linking technological adoption with human and organizational dimensions.

From a practical perspective, the findings suggest that organizations should approach digital transformation as a structured and phased process. In the initial stage, firms should focus on implementing basic digital tools to improve data management and reduce manual workload. In the second stage, emphasis should shift toward process automation and the integration of digital systems to enhance efficiency and coordination. Finally, in the advanced stage, organizations may begin to experiment with AI-based solutions, provided that sufficient technological and human capabilities are in place.

At the same time, the study underscores the importance of supporting employee adaptation through continuous learning, knowledge sharing, and effective change management. Without adequate investment in human capital, the potential benefits of digital technologies may remain underutilized. These findings also have implications for policymakers, particularly in the context of Central and Eastern Europe, where targeted support for SME digitalization, digital skills development, and collaboration between academia and industry may accelerate digital transformation.

The study is subject to several limitations. The relatively small and non-random sample limits the generalizability of the findings, and the qualitative design may be influenced by subjective interpretations. Future research could address these limitations by employing mixed-methods approaches, larger datasets, and longitudinal designs to capture the evolution of digital transformation processes over time. Comparative studies across countries or sectors would further enhance understanding of contextual differences in digital adoption.

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