

THE TOBE PLAYBOOK: IDENTIFYING BARRIERS AND DRIVERS OF DIGITAL SUCCESS IN THE SERVICE SECTOR

Csiki, O., Pop, R., Baksa, M., Seer, L.

Ottó Csiki / Babeş-Bolyai University, Faculty of Economics and Business Administration, Cluj-Napoca, Teodor Mihali Street, 58-60, 400591, Romania. Email: otto.csiki@econ.ubbcluj.ro

Rebeka Pop / Babeş-Bolyai University, Faculty of Economics and Business Administration, Cluj-Napoca, Teodor Mihali Street, 58-60, 400591, Romania. Email: rebeka.pop@econ.ubbcluj.ro

Máté Baksa / Babeş-Bolyai University, Faculty of Economics and Business Administration, Cluj-Napoca, Teodor Mihali Street, 58-60, 400591, Romania. Email: mate.baksa@econ.ubbcluj.ro

László Seer / Babeş-Bolyai University, Faculty of Economics and Business Administration, Cluj-Napoca, Teodor Mihali Street, 58-60, 400591, Romania. Email: laszlo.seer@econ.ubbcluj.ro

Abstract

The process of digitalization varies across organizations, with many encountering significant barriers that hinder them from fully using the benefits of digital technologies. This limitation is primarily attributed to a lack of knowledge and expertise. This study aims to answer the following research question: what are the most important factors that affect technology adoption in the service sector? Drawing from the literature findings, a semi-structured interview protocol was applied to facilitate exploratory discussions. Six service companies were analyzed. Based on the interviews conducted, organizational factors emerged as the most prevalent barriers and drivers, underscoring the importance of aligning digitalization with organizational goals. Furthermore, based on the interviews, we propose the extension of the TOE (Technology–Organization–Environment) framework to TOBE: this extension incorporates a dedicated behavior (B) dimension, which is crucial as it captures the nuances of employee actions, attitudes, and cultural influences that directly affect technology adoption and implementation. The addition of the behavior dimension allows the framework to better address the human element in digital transformation, ensuring that both technical and interpersonal dynamics are considered in strategic decision-making. During this research, 37 unique drivers and 27 barriers were identified. In both cases, organizational factors are the most frequent, followed by behavioral factors, highlighting the importance of aligning digitalization with organizational structures and considering behavioral aspects as well.

Implications for Central European audience: A key insight from our research is the critical role of strategic alignment in overcoming barriers; organizations in the CEE region often lack a coherent digital strategy or face misaligned priorities, which hinders effective implementation. Policymakers and industry leaders in CEE countries should prioritize initiatives that guide businesses in formulating actionable digital strategies, supported by leadership training and management development programs that enhance strategic clarity.

Keywords: digitalization; barriers; drivers; service sector

JEL Classification: O32, O33

Introduction

Businesses actively integrate digital technologies to facilitate adaptable transformations in operational processes, information systems, and broader societal contexts (Parviainen et al., 2017). Effective utilization of digitalization can empower companies with dynamic capabilities, fostering agility, flexibility, and resilience in the delivery of products and services aligned with customer preferences (Lee & Trimi, 2021). The adoption of digital technologies has experienced rapid acceleration, particularly in the aftermath of the COVID-19 pandemic (Statista, 2023), primarily in the service sector. The services sector accounted for a significant 72.4% of the total value added in the European Union (EU) in 2023 (Eurostat, 2024), underscoring its pivotal role in the overall economy. While the Central and Eastern European (CEE) region has a slightly smaller share, the services sector still holds a substantial portion of economic activity. For instance, services contribute 67.4% of value added in Hungary and 66.7% in Romania, demonstrating their critical importance across the region. Unfortunately, the digitalization process and the integration of digital technologies in Hungary and Romania are below the EU average. Moreover, this process is also slower, as indicated by the Digital Economy and Society Index (DESI).

Despite this momentum, the process of digitalization is not uniform across all organizations, with many facing significant barriers that prevent them from fully leveraging the benefits of digital technologies. This limitation is chiefly ascribed to a lack of knowledge and expertise, compounded by uncertainty surrounding the benefits associated with the technology (Vimal et al., 2023). To address this critical research gap, the present study poses the following **central research question (RQ): what are the most important factors that affect technology adoption in the service sector in CEE?**

To answer the research question, this study employs the Technology–Organization–Environment (TOE) framework to examine the factors affecting the adoption of digital technologies (e.g., Weerabahu et al., 2022) in service sector organizations. The aim was to provide a detailed analysis, focusing on how these dimensions manifest within individual organizations. The choice of the Technology–Organization–Environment (TOE) framework for this study is rooted in its holistic and organizational-level focus, which aligns closely with the research objectives. While alternative models such as the Unified Theory of Acceptance and Use of Technology (UTAUT) and the Technology Acceptance Model (TAM) are widely used to study technology adoption, they primarily emphasize individual-level factors, such as user attitudes, intentions, and perceptions. These models are valuable for understanding personal adoption behavior but are less equipped to address the complex, multidimensional barriers and drivers that organizations face during digital transformation. In contrast, the TOE framework offers a broader perspective by integrating three critical dimensions: technological, organizational, and environmental factors. This comprehensive approach allows for a deeper exploration of systemic issues, such as resource constraints, strategic alignment, and external pressures, which are particularly relevant in the service sector. Additionally, the flexibility of the TOE framework facilitates its extension to include behavioral dimensions, as demonstrated in this study. Based on interviews conducted, we propose the extension of the TOE framework to TOBE, thereby incorporating a dedicated Behavior (B) dimension. This addition is crucial because it captures the nuances of employee actions, attitudes, and cultural influences; factors that play a fundamental role in either facilitating or resisting digital technology adoption. Furthermore, the TOE framework's application in prior

studies on organizational digitalization supports its relevance and adaptability (Valdez-Juárez et al., 2023). It has been successfully used to analyze barriers and drivers in diverse contexts, making it a robust theoretical foundation for examining the unique challenges faced by companies in Central-Eastern Europe (CEE). The region's low digital competitiveness rankings and distinct socio-economic landscape necessitate a framework capable of capturing both macro- and micro-level dynamics, which TOE effectively provides.

The main research question, derived from the extended TOE framework, referred to as TOBE, is accompanied by four pivotal sub-questions: **(a) What are the environmental barriers? (b) What are the organizational barriers? (c) What are the technology barriers? (d) What are the behavioral barriers affecting digital technology adoption?**

1 Literature Review

To map current knowledge and gaps in the literature, we have conducted a systematic literature review based on the recommendations of Durach et al. (2017). The search was conducted in the Web of Science (WoS) database (the largest and the most recognized scientific database in terms of the quality of journals indexed) on September 25, 2024. The next subsections present the inclusion criteria, keyword selection, and the article filtering process.

1.1 Inclusion criteria

Several inclusion criteria have been defined to create a relevant initial pool of sources. These inclusion criteria were the following: (a) papers written in English; (b) type of publication is a scientific article; (c) based on its topic, the journal is included in at least one of Management, Business, Business Finance or Economics categories in Web of Science; (d) the paper focuses on the barriers of digital transformation in the service sector. The inclusion criteria and the arguments behind them are summarized in Table 1.

Table 1 | Inclusion criteria

Inclusion criteria	Detailed argument
(a) Papers written in English.	English is the dominant research language in business and economics research; the use of English ensures the accessibility and comparability of our results.
(b) Type of publication: scientific article.	We focus only on high-quality, peer-reviewed scientific papers, where a rigorous review process ensures the reliability of the results. Other publication types, such as conference papers or book chapters are excluded. Literature reviews and conceptual papers were also excluded, only the empirical papers were analysed.
(c) Based on its topic, the journal is included in at least one of the Management, Business, Business Finance or Economics categories in Web of Science.	This review focuses exclusively on the managerial and economic-related barriers to digital transformation.
(d) The paper focuses on the barriers of digital transformation in the service sector.	Various barriers to change have been identified in the literature, but this research focuses only on the barriers related to digital transformation and in addition only in the service sector.

Source: Authors' own construction

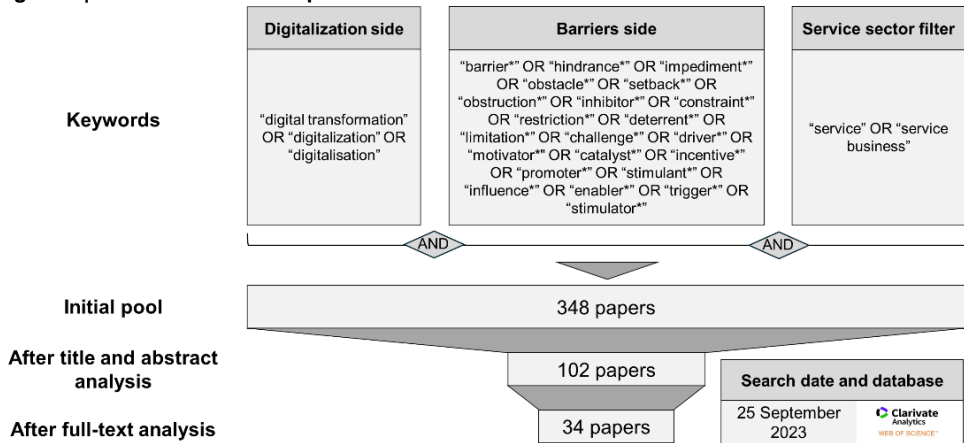
Inclusion criteria (a), (b) and (c) were easy to set during the search, while inclusion criterion (d) was operationalized by keywords, the process is described in the next subsection. Criterion (d) was also assessed during title, abstract and full-text analysis.

1.2 Keyword selection

In operationalizing the last inclusion criterion (d), several keywords have been defined to identify potentially relevant articles. These keywords were established in connection with the two main domains of investigation, namely digitalization and its barriers. Our research specifically focused on the service sector; consequently, we included service-related words in the keywords. We aimed to encompass all synonyms of barriers, including the positive aspects, such as incentives, as, according to our approach, the absence of an incentive can also function as a barrier.

To account for different word endings, the WoS feature was employed, wherein words contained only the main parts and an asterisk (*), ensuring the inclusion of all types of word endings. This approach was applicable in almost all cases, including instances involving barrier, obstacle, or limitation. Figure 1 presents the exact words.

Figure 1 | The article selection process



Source: Authors' own construction

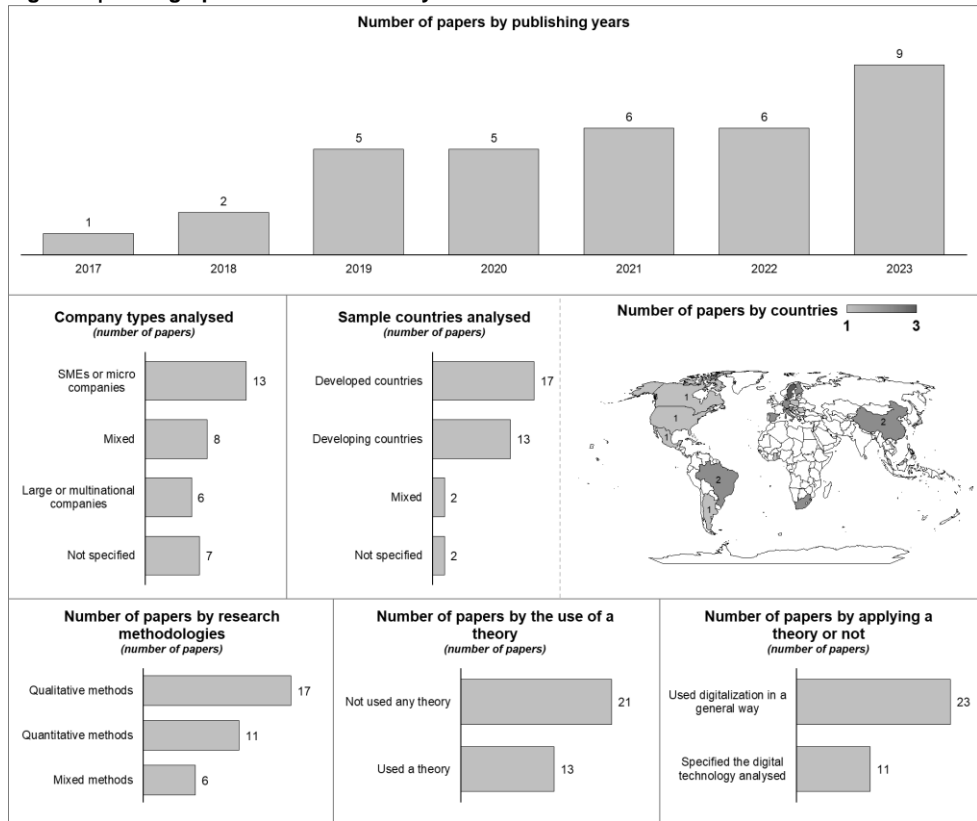
The keyword-based search yielded a total of 348 articles. Initially, we reviewed the title and abstract of each article to assess their potential relevance, applying inclusion criteria (d) at this stage. Following this evaluation of titles, we identified a subset of 102 papers as potentially pertinent. In the final step, a comprehensive analysis of the full texts of these 102 papers was conducted to ascertain whether they indeed contained relevant information for our topic. The ultimate sample consisted of 34 papers deemed to be directly relevant (Figure 1).

1.3 Summary of findings from the literature review

The concentration of journals on this topic is atypical, as the reviewed papers are distributed across 31 different journals. Notably, the Journal of Business and Industrial Marketing stands out by publishing three papers on this subject. This observation aligns with the novelty of the

topic, evident from the publication years, with the oldest publications dating back to 2017, making them no older than 8 years. Interestingly, more than a quarter of the literature results are from last year, from 2023 (Figure 2).

Figure 2 | Bibliographical results of the systematic literature review



Source: Authors' own construction

Developed and developing countries have received nearly equal attention in the literature, with 17 papers analyzing samples from developed countries and 13 from developing countries. This suggests that barriers associated with digital transformation may emerge in any country, irrespective of its level of development. The balanced distribution of research across different country categories underlines the universal nature of challenges related to digital transformation.

Moving forward, when examining the companies analyzed, it becomes evident that the majority of studies have focused on SMEs and micro companies. The emphasis on SMEs could be attributed to their accessibility, but an alternative explanation may be that these smaller entities encounter more barriers in the context of digital transformation compared to larger companies.

Surprisingly, less than half of the articles have incorporated any theoretical frameworks. The Resource-Based View (RBV), Technology–Organization–Environment (TOE), and Unified Theory of Acceptance and Use of Technology (UTAUT) stand out as the most notable

theories applied. This fact indicates that the topic is loosely connected to well-established theories, and there may be a tendency for a more exploratory or interdisciplinary approach in the current research landscape. This idea is underlined by the prevalence of qualitative papers in the sample, as qualitative methods are primarily used for exploratory purposes. The analyzed papers often used a broad and generalized term, simply "digitalization". However, in 11 papers, there was a clear definition of the specific digital technologies under examination, including but not limited to AI, RPA, and others.

Table 2 presents the key findings from the systematic literature review, outlining the identified barriers and categorizing them within the extended TOE framework. Notably, the review highlighted a significant gap in the existing research: only four papers explicitly focused on the Central-Eastern European (CEE) region. This underscores the scarcity of studies addressing the unique challenges and dynamics of digital technology adoption within this context, emphasizing the need for further exploration in this underrepresented area.

Table 2 | Summary of the relevant results of the literature

Author(s), year	Dimensions used	Barriers identified	Sample
Aghimien et al. (2021)	T	Perceived risk.	South Africa
	B	Resistance to use; effort expectancy.	
Amoah et al. (2023)	O	Perceived knowledge gap; perceived cost burden; perceived infrastructural deficit.	Ghana
Cardinali et al. (2023)	O	Organizational culture; organizational processes; level of investment.	Italy
	E	Fear of dependence on the technological provider/partner; lack of integration of activities conducted with the network of actors.	
	B	Employees/owners' aversion to change; customers' aversion to change.	
Chavalala et al. (2024)	O	Poor leadership style of top management via several mediators.	South Africa
Christ-Brendemühl & Schaarschmidt (2019)	B	Resistance to change (emotional reaction, routine seeking); "destructive process deviance".	USA
Cichosz et al. (2020)	O	Complexity of the logistics network and lack of resources.	Poland
	T	Service paradox (new development results in higher cost but not higher revenue); technology out licensing.	
Frishammar et al. (2019)		Cognitive cost and coordination cost; risk for knowledge leakage; core rigidities; deficient learning process; hollowed efficiency and effectiveness; deficient capabilities to meet required levels of participation. Innovation culture: lack of cross-functional competence; failing to sustain different subcultures; loss of efficiency and exploitation; traditional revenue streams disappear; hard to develop new business models.	Sweden
	O		

Kraus & Marchenko (2021)	O	Financing innovation; capability to generate knowledge, to learn and disseminate knowledge; governance of innovation.	Ukraine
	E	Innovation infrastructure	
Kronblad et al. (2023)	E	Structural and cultural barriers.	Sweden
Li et al. (2020)	O	Value co-creation as a main challenge; new human requirements; greater need for advanced human skills.	Mixed
Li et al. (2023)	E	Regional digital industry innovation level.	China
Pelletier & Cloutier (2019)	T	Difficulties in strategic IT alignment; one-size-fits-all approach; wrong IT perceptions; business context and IT misalignment.	Canada
	O	Operational focus; wrong management practices.	
Rachinger et al. (2019)	T	Old technology.	Austria and Hungary
	O	Employee recruitment; qualification.	
Sánchez (2020)	O	Lack of organizational strategy; multiple priorities that compete; insufficient resources; lack of leadership; faculty members competence in e-learning; lack of organizational agility; employees' lack of skills.	Argentina
	B	faculty members attitude towards e-learning; satisfaction with the status quo.	
Smania et al. (2022)	O	Lack of knowledge; lack of digital capabilities; unclear understanding; resource constraints.	Brazil
	B	Resistance to change.	
Tuisku et al. (2023)	O	Culture; lack of motivation.	Finland
	B	Attitude and mindset; path-dependency; resistance to change; uncertainty.	
Ulatowska et al. (2023)	O	Lack of resources; ethical and security issues.	Finland, Poland
	B	Negative attitude; lack of openness; anxiety; reluctance to learn.	
Valdez-Juárez et al. (2023)	T	Technical barriers.	Mexico
	O	Organizational barriers; lack of capital; lack of commitment from management and employees.	
Weerabahu et al. (2022)	E	Legal barriers; lack of government subsidies.	Sri Lanka
	T	Lack of infrastructure; complexity of desired technology.	
	O	Lack of digital strategy; lack of resources; lack of capacities; lack of expertise.	

Source: Authors' own construction

1.4 Content analysis of the systematic literature review

In today's business landscape, adopting digital technologies is essential for competitiveness and efficiency. The evolution of digital solutions like cloud computing, artificial intelligence (AI), and the Internet of Things (IoT) transforms business operations and value delivery (Demeter & Losonci, 2020). Organizations must adapt and integrate these advancements to remain relevant (Parviainen et al., 2017). The multifaceted process of digital technology adoption requires a framework for thorough analysis and implementation.

The TOE (Technology-Organization-Environment) framework is fundamental in this context (Awa et al., 2017). It provides a structured approach to understand the complexities of digital technology adoption, focusing on three dimensions: technological context (technical features and capabilities of new technologies), organizational context (internal attributes like managerial structure and resource availability), and environmental context (external factors such as market trends and regulatory constraints). This framework helps organizations align their technology adoption strategies with internal capabilities and market demands.

However, the TOE framework mainly focuses on objective factors, often overlooking individual-level behavioral aspects. Integrating behavioral theories like the Theory of Reasoned Action (TRA), Theory of Planned Behavior (TPB), Technology Acceptance Model (TAM), and the Unified Theory of Acceptance and Use of Technology (UTAUT) is essential. These models emphasize individual psychological factors, such as perceptions, attitudes, and intentions, that influence technology adoption (Li et al., 2020). Incorporating behavioral models into the TOE framework enriches understanding by showing how individual factors interact with organizational, technological, and environmental elements. The so-called extended TOE framework incorporates additional factors or dimensions to better explain and predict the adoption and implementation of technological innovations within organizations. This holistic approach acknowledges external influences and internal psychological processes, facilitating more effective technology adoption and implementation strategies.

This research focuses on analyzing the barriers to digitalization in the service sector. However, digital transformation studies consistently analyze barriers and drivers together, as drivers serve as active catalysts that counteract the resistance imposed by barriers (e.g., Ronchini et al., 2023). By adhering to well-established theoretical and empirical frameworks, the adopted approach ensures a more precise and impactful analysis of digital transformation, accurately capturing both the forces driving adoption and the challenges obstructing it.

In the context of digital technology adoption within organizations, several **technology-related barriers** have been identified that significantly impact the process. Aghimien et al. (2021) discuss effort expectancy and perceived risk as two critical factors influencing the decision-making process. These concerns can lead to hesitation or resistance to adopting new digital technologies. Furthermore, the innovation process itself, as outlined by Frishammar et al. (2019), presents its own set of challenges. The presence of old technology, as highlighted by Rachinger et al. (2019), can exacerbate these challenges. Additionally, technical barriers identified by Valdez-Juárez et al. (2023) further complicate the adoption process. These barriers can include inadequate IT infrastructure, lack of technical expertise, and difficulties in integrating new technologies with existing systems. However, in contrast, infrastructure,

technological compatibility, and/or digital readiness and orientation can **drive** the digitalization process on the **technology side**.

Organizational barriers to digital adoption are numerous and varied, presenting significant challenges for businesses seeking to integrate digital technologies. Amoah et al. (2023) identify barriers such as perceived knowledge gaps, cost burdens, and infrastructural deficits. Cardinali et al. (2023) focus on the impact of organizational processes and the level of investment, while Frishammar et al. (2019) consider the compatibility of digital technologies with the existing business model. Kraus and Marchenko (2021) emphasize the necessity of innovation infrastructure and financing, whereas Li et al. (2020) point to the low level of social investments and the strategic development of human resources as limiting factors. Rachinger et al. (2019) address the difficulties in strategic IT alignment and the recruitment and qualification of employees, respectively. Resource constraints are highlighted by Smania et al. (2022) as a barrier, and Tuisku et al. (2023) note the influence of path dependency and organizational culture on digital adoption. Ethical and security issues are raised by Ulatowska et al. (2023) as potential obstacles. The lack of commitment from management and employees is identified by Valdez-Juárez et al. (2023) as a critical barrier, and the absence of a digital strategy is underscored by Weerabahu et al. (2022) as a significant oversight. When it comes to **organizational drivers**, a well-developed strategy and the necessary skills are the most frequently mentioned factors. Their absence can be viewed as a barrier. These factors are also identified as barriers in the form of a lack of knowledge, lack of skills and capabilities, and lack of strategy. Each of these is frequently mentioned as a barrier, just as they are recognized as drivers, which further emphasizes the need to analyze both barriers and drivers.

Behavioral barriers significantly influence the adoption of digital technologies in organizations. Aghimien et al. (2021) highlight resistance to use as a key issue, while Cardinali et al. (2023) note the impact of employees' and owners' aversion to change, as well as the influence of organizational culture. Smania et al. (2022), and Tuisku et al. (2023) identify additional behavioral obstacles such as resistance to change, lack of motivation, and contentment with the current state of affairs. Sánchez et al. (2020) discuss the preference for maintaining the status quo, which can hinder the implementation of new digital solutions. Ulatowska et al. (2023) also point to negative attitudes and a reluctance to engage with new technologies as barriers to digital innovation. It is also worth considering that variables borrowed from individual-level theories, such as the Technology Acceptance Model and its extensions (i.e., UTAUT), can effectively predict organization adoption of several technologies (Li et al., 2020). **Behavioral drivers** are rarely present in the literature, with self-efficacy being the most frequently mentioned (e.g., Christ-Brendemühl & Schaarschmidt, 2019).

Environmental barriers also impact an organization's digital adoption journey, with various external factors playing a role. Cardinali et al. (2023) point out the challenges posed by customers' aversion to change and the fear of dependence on technological providers or partners. Kraus and Marchenko (2021) discuss the importance of governance in innovation, indicating that inadequate governance can hinder digital progress. Additionally, structural and cultural barriers within the ecosystem, identified by Kronblad et al. (2023), further complicate the adoption of digital technologies. Valdez-Juárez et al. (2023) address the obstacles related to regional digital industry innovation, legal constraints, and the absence of government

subsidies. Fewer **environment-related drivers** were identified, with the most frequent one being adaptation to customers' needs (e.g., Watanabe & Mochimaru, 2017; Rachinger et al., 2019).

Literature results are summarized in Table 3.

Table 3 | Summary of the literature results about barriers and drivers (barriers and drivers mentioned, along with the count of papers and the sum of the frequency of the variables mentioned by dimensions)

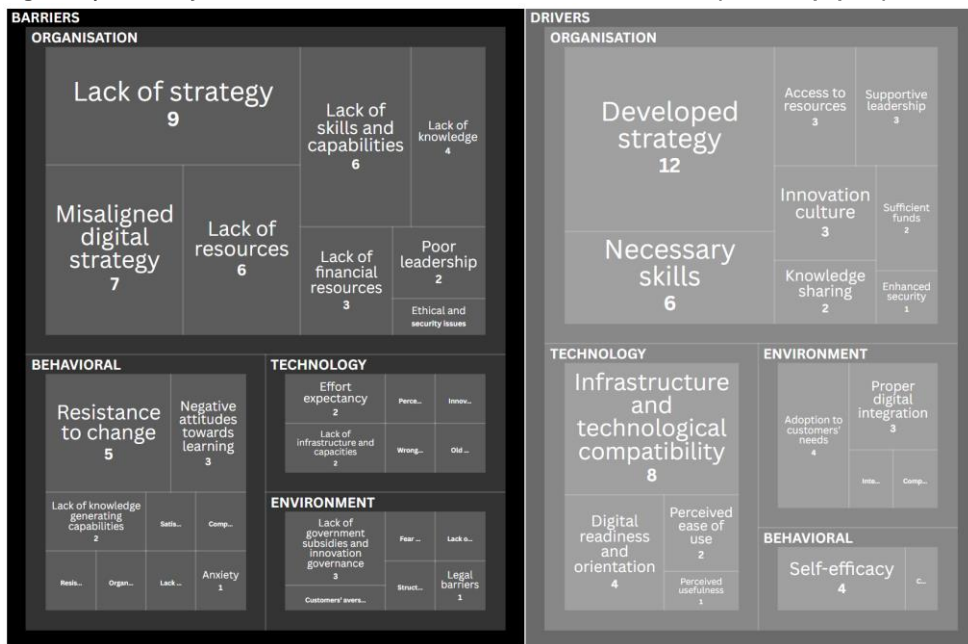
Barriers				Drivers			
Dimension	Variable	Count	SUM	Dimension	Variable	Count	SUM
T	Effort expectancy	2	8	T	Perceived usefulness	1	15
	Perceived risk	1			Digital readiness and orientation	4	
	Innovation process	1			Infrastructure and technological compatibility	8	
	Wrong IT perceptions	1			Perceived ease of use	2	
	Old technology	1		O	Knowledge sharing	2	32
	Lack of infrastructure and capacities	2			Sufficient funds	2	
O	Lack of knowledge	4	38	Access to resources	3		
	Lack of financial resources	3		Supportive leadership	3		
	Misaligned digital strategy	7		Innovation culture	3		
	Poor leadership	2		Developed strategy	12		
	Lack of resources	6		Necessary skills	6		
	Lack of strategy	9		Enhanced security	1		
	Lack of skills and capabilities	6		B	Self-efficacy	4	5
	Ethical and security issues	1			Customer involvement	1	
B	Resistance to use	1	16	E	Adoption to customers' needs	4	9
	Resistance to change	5			Interaction with industry actors	1	
	Organizational culture	1			Proper digital integration of the environment	3	
	Lack of knowledge generating capabilities	2			Compliance with new regulations	1	
	Satisfaction with the status quo	1		E	8		
	Competence of the members	1					
	Negative attitudes towards learning	3					
	Lack of motivation	1					
Anxiety	1						
E	Customers' aversion to change	1	8				
	Fear of dependence on the technological provider/ partner	1					
	Lack of integration of activities conducted with the network of actors	1					
	Structural and cultural barriers	1					
	Legal barriers	1					
	Lack of government subsidies and innovation governance	3					

Note: T – Technological; O – Organizational; B – Behavioural; E – Environmental
 Source: Authors' own construction

Figure 3 illustrates the frequency and distribution of variables identified in the systematic literature review, categorizing them as barriers or drivers within the TOBE framework. Among the barriers, the most frequently emphasized was the lack of strategy within the organizational dimension, followed closely by misaligned digital strategy and insufficient resources – all of which are ultimately linked to poor management practices. Conversely, the most frequently

identified drivers included a well-developed strategy, robust infrastructure, technological compatibility, and the presence of necessary skills. These findings underscore the pivotal role of strategic alignment and effective management in successfully adopting new technologies.

Figure 3 | Summary of the literature results about barriers and drivers (count of papers)



Source: Authors' own construction

2 Methodology

Drawing from the findings of an extensive literature review, this study employed a semi-structured interview protocol (see Appendix) to facilitate exploratory discussions and gather nuanced insights into the barriers to digital technology adoption. This methodological approach was chosen to bridge the gap in the literature, where the business perspective on digital transformation is often underrepresented, despite digitalization's ultimate aim to enhance various performance dimensions (e.g., operational efficiency, flexibility, and quality) (Cardinali et al., 2023). Recognizing this gap, the interview guide was meticulously designed to ensure alignment with both theoretical constructs and practical realities. The interview guide was structured around the four overarching categories of barriers and drivers identified during the literature review – technological, organizational, environmental, and behavioral – which are central to the extended TOE framework, referred to as the TOBE framework. TOBE framework integrates behavioral dimensions, often overlooked in traditional models, thereby providing a more holistic understanding of the digital transformation process. The interview guide consisted of nine thematic blocks, each corresponding to a significant dimension of the digital adoption process. Starting with general information about the company, it systematically explored the context of digitalization, motivational factors, and the implementation and outcomes of digital technology initiatives. Behavioral and cultural

aspects, often underrepresented in traditional frameworks, were also emphasized, providing richer insights into the human factors influencing adoption.

The geographical focus of this study on Hungary and Romania was informed by their unique position within the Central-Eastern European (CEE) region, where digital competitiveness rankings remain among the lowest globally (Statista, 2024). Despite the global push for digital transformation, these countries face distinctive challenges, such as infrastructural deficits, limited digital skills, and underdeveloped policy frameworks, making them a critical area of study for understanding barriers to adoption. Both Hungary and Romania scored 58.25 out of 100 in digital competitiveness, according to recent rankings, underscoring the significant hurdles these nations face in fostering digital transformation within enterprises and government organizations (Statista, 2024). By focusing on CEE, this study provides valuable insights into a region that has received limited scholarly attention but faces pressing digitalization challenges.

The main selection criteria for the companies were as follows: first, the region, as this study focuses on the CEE region, specifically Romania and Hungary. Second, the company had to belong to the services sector. Third, the company needed to have completed at least one digitalization process to enable discussions on barriers and drivers. Additionally, we excluded micro-enterprises (fewer than 10 employees) since digitalization is more relevant from small-sized companies to large ones.







The sample for this study consists of six companies operating in Hungary and Romania. This selection aligns with the study's objective to provide an in-depth understanding of organizational dynamics in Central-Eastern Europe (CEE). The diversity of the sample, spanning different sectors and organizational sizes, ensures that the findings capture a broader spectrum of challenges and drivers relevant to the adoption of digital technologies.

The six companies represent a mix of industries within the service sector, including energy services, IT service provision, travel, and IT consultancy. This sectoral diversity enables the study to investigate how specific contextual factors influence the adoption process. Notably, IT consultancy firms are well-represented in the sample, reflecting their dual role as both adopters and facilitators of digital technologies. Their inclusion is particularly valuable for uncovering insights into behavioral and organizational challenges during the implementation process. At the same time, companies from other sectors, such as energy and travel, contribute perspectives on unique external and resource-based barriers.

The interviews were conducted between January and June 2024, ensuring the findings are grounded in contemporary organizational practices and responses to recent technological advancements. Interview durations ranged from 45 to 80 minutes, allowing for in-depth discussions while accommodating the specific circumstances of each respondent. Senior-level decision-makers, such as digital transformation leads and managing directors, were the primary respondents, ensuring that the data captured strategic insights into the implementation process and organizational barriers.

Table 4 provides an overview of the sample, including details on the companies' sectors, interviewees' position, interview durations, and dates.

Table 4 | Sample characteristics

Company code	Country	Sector	Interviewee	Interview duration	Date
A	 HU	Energy services	Senior Domain Expert	60 min	30.01.2024
B	 HU	IT consultancy	Senior Change Manager	60 min	20.03.2024
C	 RO	Travel agency	CFO	80 min	15.03.2024
D	 RO	IT consultancy	HR and Local Unit Manager	60 min	31.05.2024
E	 HU	IT consultancy	Senior Consultant and Partner	60 min	10.06.2024
F	 HU	IT consultancy	Head of Cybersecurity	45 min	07.06.2024

Source: Authors' own construction

The interviews were transcribed and analyzed using QualCoder software, a robust qualitative analysis tool that facilitates systematic coding and theme identification. The thematic analysis was guided by the four dimensions of the TOBE framework, enabling a structured comparison of cases. The coding process relied on a deductive approach to align the findings with the theoretical categories identified during the literature review. Emergent themes that underscored regional characteristics or behavioral nuances were also incorporated into the analysis. triangulating the findings with insights from the literature ensured the robustness of the conclusions while identifying potential gaps in existing frameworks, particularly in their ability to account for the behavioral dimensions of digital transformation.

The sample companies have achieved a similar level of digitalization, and their experience in digitalization is extensive, as all companies have been using digital solutions for more than 10 years, with some adopting them from their very foundation. However, while the projects differ (e.g., company C, the travel agency, digitized its booking system, whereas company D developed internal software for HR management), their experiences with digitalization can be analyzed together. This is because all the companies operate in the service sector, and the research focuses on higher-level and more general questions about digitalization, which are not highly firm-specific or sub-industry-specific.

3 Results

Based on the interviews, this research identified more unique drivers (37) than barriers (27). In both cases, organizational factors are the most frequent ones, highlighting the importance of aligning digitalization with the organization. If not aligned properly, this could be a significant barrier; if aligned correctly, it could be a driver of digitalization.

Focusing on the barriers, within the behavioral dimension, this research identifies 6 different items with a mention frequency of 19. The environmental dimension includes only 3 items with a mention frequency of 6. The organizational dimension consists of 14 elements, with the highest total mention frequency of 34. The technological barriers are not numerous; this research identified only 4 items. Moving forward to the drivers, the behavioral category also

includes 4 items with a mention frequency of 13. During the interviews, only 2 environmental drivers were identified, while 25 different organizational-related drivers were found. This research has identified 6 different technology-related drivers. The detailed items are visible in Table 5.

Table 5 | Main results of the interview analysis about the barriers and drivers of digitalization (barriers and drivers mentioned, along with the total frequency of the variables referenced in the 6 interviews, summarized by dimensions)

Barriers				Drivers				
Dimension	Variable	Count	SUM	Dimension	Variable	Count	SUM	
T	Lack of business proof	4	9	T	Customizability	3	11	
	Lack of technological infrastructure	3			Easy-to-use	1		
	Poor specification	1			Interconnectivity	1		
	Technology misalignment	1			Perceived usefulness	2		
			Technological innovation		3			
O	Destructive culture	2	34		Technological maturity	1	68	
	Lack of benchmark practices	1		Agile management	4			
	Lack of business honesty	3		Bottom-up input	2			
	Lack of business process alignment	2		Business strategy	7			
	Lack of communication	1		Continuous improvement	2			
	Lack of education	1		Cooperation with branches	3			
	Lack of knowledge	3		Cooperation with departments	3			
	Lack of skilled workforce	3		Dedicated responsible	1			
	Lack of skills	2		Experienced workforce	4			
	Lack of technology integration	1		Feedback system	4			
	Misevaluation of workforce	2		Good benchmarking	1			
	Poor client-company cooperation	4		Good client management	2			
	Poor leadership	6		Good coordination	1			
	Project visionary fail	3		Good leadership	6			
B	Fear of growth	2	19	O	Knowledge base	2	68	
	Lack of motivation	2			Leading by example	2		
	Passive mindset	3			Learning abilities	2		
	Resistance to change	8			Market monitorization	1		
	Resistance to learn	2			Process management	2		
	Unreasonable mimic	2			Proper expression of needs	1		
E	Cultural differences	1	6		Skilled workforce	8		13
	Generational gap	1			Specialized departments	1		
	PES factors	4			Support from employees	2		
					Support from management team	1		4
					Training program	5		
					Transparent communication	1		
					B	Need for digitalization		2
				Openness to change		8		
				Openness to learn		2		
					Trust	1	4	
				E	Competitive landscape	1		
					Young workforce	3		

Note: T – Technological; O – Organizational; B – Behavioural; E – Environmental
 Source: Authors' own construction

During our systematic literature review, we found similar patterns in terms of the most commonly identified barrier category – **organizational barriers** – and the same can be observed for the drivers as well (Figure 4). Lack of knowledge and poor leadership are among the common organizational barriers identified in the literature and our research. Similarly,

Regarding **organizational drivers**, a skilled workforce, a well-developed business strategy, and good leadership form the basis of successful technology implementation. These drivers align with the common barriers identified in the literature and our case research; essentially, they represent the exact opposites of those barriers. For instance, lack of knowledge is a barrier, whereas a skilled workforce serves as a driver. Similarly, poor or missing strategy is a barrier, while a dedicated strategy can act as a driver.

It is noteworthy that the interview results highlighted the **behavioral drivers** category as the second most important success category, with openness to change emerging as the most frequently mentioned driver (5), compared to the literature review findings where resistance to change emerged as the most frequently mentioned behavioral barrier.

Regarding **technological drivers**, the literature review findings suggested that infrastructure and technological compatibility were the most frequently highlighted success factors, while our results showed a different pattern, indicating that the perceived usefulness of technology is the most important technological driver. When employees at all levels perceive the introduced technology as useful, they are more open to changes and more willing to learn the given technology. Practically, if companies present the benefits of the technology to employees and help them understand why it is needed, a major barrier can be addressed, as resistance to change can be managed effectively.

As for **environmental drivers**, our results indicate low interest in this category. However, the young workforce emerged as a driver for implementing technology innovation, as younger workers are more eager to change and use new technologies.

In order to show the context of the interviewees' thoughts, some ideas were highlighted (Table 6). Starting with the behavioral barriers, a lack of motivation and resistance to change represent the most significant obstacles. The highlighted drivers can mitigate these, as focusing on openness to change (or creating a company culture that rewards openness to change) can help tackle resistance from employees or colleagues. A learning culture can fuel colleagues' motivation, thus eliminating the lack of motivation.

The environmental dimension was not heavily emphasized during the interviews. PES (Political, Economic, and Social) factors were occasionally mentioned as potential barriers, but companies undergoing digitalization in Hungary and Romania seem to be effective internally and do not require much external support. A young workforce may help implement digital technologies.

Organizational barriers and drivers are diverse, but a significant barrier could be poor leadership and the hierarchical, power-centric approach. As a solution to these barriers, we can highlight – unsurprisingly – good leadership, as well as a clear business vision. A lack of training could also be a barrier, while a skilled workforce acts as a driver. This suggests that training programs must be organized if companies aim to digitalize. Aligning business objectives with technological initiatives helps companies achieve a positive (financial) return on digitalization.

Lastly, deficiencies in existing technology infrastructure, a lack of technological justification, and inadequate specifications could hinder digitalization. Customization and perceived usefulness (PU) of technology, however, can help overcome these challenges.

Table 6 | Most relevant phrases from the interview analysis

Category	Barriers	Drivers
T	<p>Inadequate specification of requirements: "The specification was not very precise, not very detailed in a particular development area."</p> <p>Lack of technological justification: "In many places, there is no business goal behind the technological implementations."</p> <p>Deficiencies in existing technology infrastructure: "So far, they have solved everything, but there was something they couldn't do; at one point, they said it couldn't be done. We asked for something, and they said it couldn't be done with the current program."</p>	<p>Customization: "If the decision is to handle money in the form of travel agency activities, then this methodology can be implemented, fully customized, made country specific. If a new payment method appears elsewhere, it can be introduced in a similar manner."</p> <p>PU: "They expected increased efficiency. It should help processes operate more efficiently."</p>
O	<p>Poor leadership: "After the 2008 crisis, the management culture in Hungary became extremely insular, and over the past 11-12 years, it has dramatically declined."</p> <p>Hierarchical and power-centric approach: "In conservative management logic, everything is a power issue. If we place digital competences in new organizational silos, these projects will have no substantive impact. They will purely be conduits of power struggles."</p> <p>Lack of training: "Training for users often does not happen, and that hinders the process. I am thinking of internal users, like a cashier who should be using the software"</p>	<p>Alignment of technological initiatives with business objectives: "It works well, and it is correct if it starts from business motivation."</p> <p>Clear business vision: "To achieve business motivation, you need everything else, but it is correct if you have a business vision."</p> <p>Good leadership: "A lot depends on an enlightened leader."</p> <p>Skilled workforce: "Yes, we had an advantage in that most employees already understood the technology."</p>
B	<p>Lack of motivation: "There is no internal motivation to learn and use new things. I think this is a very strong barrier."</p> <p>Resistant to change: "There are always a few who grumble when there is a change." & "Generally speaking, people do not like change. Whenever there is a major modification or a complete change of logic, it is harder for them to accept it."</p>	<p>Openness to change: "Perhaps openness to change is an aspect of this culture, as these IT solutions can change quickly and develop from nothing."</p> <p>Culture of learning: "Learning is very important to the company." & "The most important thing is to have learning in the value system. I think this is the most crucial aspect of digitalization."</p>
E	<p>PES factors: "Normally, it's already developed to be quite complex, so new changes are only needed when the labor code undergoes significant updates."</p>	<p>Young workforce: "And I really see this in young people: they quickly adapt from one technology to another, or if there's some new innovation, they immediately jump on it. Meanwhile, the older employees at the company, in my opinion, are trying to keep up."</p>

Note: T – Technological; O – Organizational; B – Behavioural; E – Environmental

Source: Authors' own construction

4 Discussion and conclusion

The research presented in this paper makes a fair contribution to the understanding of digital technology adoption within the service sector by expanding the traditional Technology-Organization-Environment (TOE) framework to include behavioral factors. This extended framework provides a more comprehensive view of the barriers and drivers affecting digital adoption, highlighting the importance of not only technological, organizational, and environmental factors but also the critical role of human behavior in the process.

Theoretical implications

The comparison of the interview results with previous literature reveals both consistencies and novel insights, particularly in relation to the role of organizational and behavioral factors in digital technology adoption (Table 7).

Table 7 | Main results of the interview analysis compared to the literature

	Barriers	Drivers
Similarities with previous studies	Resistance to change; Lack of knowledge; Lack of motivation; Poor leadership.	Skilled workforce; Business / developed strategy; Perceived usefulness; Supportive leadership.
Novelties compared to previous studies	Fear of growth; Unreasonable mimic; Lack of business proof.	Openness to change; Openness to learn; Training programmes; Learning abilities; Young workforce.
Not identified factors, but present in the literature	Perceived risk; Lack of financial resources; Lack of ethical and security issues; Lack of knowledge generating capabilities; Anxiety.	Access to resources; Innovation culture; Enhanced security; Compliance with regulations; Adaptation to customers' needs; Self-efficacy.

Source: Authors' own construction

A key similarity identified in our study is the significant impact of resistance to change as a major behavioral barrier. This aligns with prior findings from Sanchez (2020) and Smania et al. (2022), who emphasized that resistance often stems from uncertainty, perceived complexity, or a lack of perceived usefulness of digital tools. Similarly, lack of knowledge and skills has been widely reported as a critical barrier (Pelletier & Cloutier, 2019; Amoah et al., 2023), confirming that employees' ability to adopt new technologies is crucial for successful digitalization. Moreover, our study supports the argument that poor leadership and misaligned strategy hinder digital adoption, as highlighted by Cardinali et al. (2023) and Ulatowska et al. (2023). These studies found that organizations with unclear digital strategies or weak leadership structures often struggle to implement and sustain digital initiatives. The results reinforce these observations, showing that hierarchical decision-making processes, common in CEE firms, can further amplify these barriers.

On the driver side, this paper corroborates the importance of a skilled workforce, business strategy alignment, perceived usefulness of technology, and strong leadership in driving digital transformation. The presence of a skilled workforce as a driver aligns with findings from Tuisku et al. (2023), who noted that digital capabilities at all levels of an organization are key to adoption success. Likewise, the role of clear strategic alignment echoes research from Frishammar et al. (2019) and Weerabahu et al. (2022), emphasizing that organizations

with well-defined digital strategies are more likely to overcome resistance and implement change effectively. Furthermore, perceived usefulness of digital tools as a major driver validates prior research (Li et al., 2020), which found that when employees understand the value of technology, they exhibit lower resistance and higher engagement. Finally, the findings reaffirm the crucial role of supportive leadership, consistent with Valdez-Juárez et al. (2023), who demonstrated that leaders capable of fostering digital confidence and providing clear guidance significantly impact adoption outcomes.

Beyond these similarities with extant literature, this study introduces multiple novel insights that are underrepresented in previous research. One notable contribution is the identification of fear of growth as a digitalization barrier. This factor has not been extensively explored in prior studies, yet our findings suggest that some organizations hesitate to scale digital transformation due to concerns over operational complexity and resource allocation. Additionally, our study highlights unreasonable mimicry, where firms adopt digital solutions without proper alignment to their business model. This phenomenon is particularly relevant in the CEE region, where companies often pursue digitalization under external pressures rather than strategic necessity. Lack of business proof, another newly identified barrier, underscores the importance of demonstrating tangible business benefits before technology adoption – a challenge particularly evident in SME contexts.

On the driver side, our research draws attention to the importance of openness to change and a culture of learning as major success factors. While resistance to change has been widely discussed, the proactive role of organizational learning in easing digital transitions has received limited attention in previous frameworks. The results suggest that fostering a learning culture helps mitigate knowledge gaps and supports employees in adapting to technological shifts. Similarly, the presence of a young workforce as a key driver suggests that demographic factors play a more prominent role than previously acknowledged in digital transformation literature. Organizations with younger employees appear to experience fewer behavioral barriers and a greater willingness to experiment with new technologies.

These findings contribute to the refinement of digital transformation models by emphasizing the interconnectedness of organizational and behavioral factors of TOBE, while also introducing new considerations for how companies navigate the digitization process.

Practical implications

The digital transformation of the service sector in the CEE region carries substantial strategic implications, particularly as the region seeks to enhance its position within global value chains. CEE economies are often classified as dependent market economies in the world economy, competing with other medium-developed nations in Latin America and Southeast Asia (Demeter et al., 2023). Digitalization offers a critical avenue for these economies to move beyond low-value-added activities and secure a more competitive role within multinational corporate structures.

One of the most pressing challenges for CEE firms is the integration into global value chains. Multinational corporations are increasingly prioritizing digital capabilities when selecting regional partners for outsourcing and offshoring activities. The findings suggest that improving digital infrastructure and workforce skills can help CEE firms transition from back-office service providers to higher-value-added functions within international corporate networks. This aligns with broader trends observed in digital globalization, where regions with

strong digital ecosystems benefit from enhanced participation in GVCs (McKinsey & Company, 2022).

Additionally, bridging the digital skills gap remains a critical concern. This research highlights that perceived usefulness and digital literacy significantly influence technology adoption. In the CEE region, where brain drain remains a persistent issue, investment in digital education and reskilling programs could not only facilitate digital adoption but also improve labor retention (Smania et al., 2022). Companies must implement structured training initiatives to ensure that employees at all levels understand the strategic benefits of digital transformation and can effectively engage with new technologies.

From a policy perspective, government-backed digitalization initiatives play a pivotal role in reducing financial and technological entry barriers. Several EU-funded programs exist to support SME digitalization; however, awareness and participation rates remain uneven across CEE countries. The findings suggest that policymakers should enhance outreach efforts and streamline bureaucratic processes to improve the accessibility of digital transformation subsidies. Furthermore, targeted incentives, such as tax relief for digital infrastructure investments or subsidized training programs, could accelerate adoption rates.

Limitations and further research

While this study provides valuable insights into digital transformation in the CEE service sector, several limitations must be acknowledged.

First, the study's sample size and sectoral focus may limit the generalizability of its findings. Our research primarily examines service companies, yet digitalization barriers and drivers may differ across industries. Future research should explore manufacturing and industrial sectors, where digital adoption dynamics may involve different organizational and technological constraints.

Second, the cross-sectional nature of this study captures a snapshot of digital transformation efforts at a specific point in time. However, digital adoption is an ongoing process, influenced by evolving regulatory, technological, and market conditions. Longitudinal studies tracking firms' digital transformation journeys over time would provide richer insights into how digital adoption barriers evolve and how firms overcome them.

Third, quantitative validation of findings remains an important avenue for future research. While our study identifies qualitative interdependencies among organizational, behavioral, and technological barriers, further empirical validation using large-scale surveys or econometric models could strengthen the robustness of these findings. Measuring the relative impact of different barriers and drivers across a wider sample of firms could provide more actionable insights for both business leaders and policymakers.

Finally, the role of external macroeconomic factors in shaping digital adoption remains an underexplored area. The CEE region faces distinct economic and geopolitical pressures, including supply chain disruptions, labor market shifts, and regulatory changes within the European Union. Future research should examine how these external factors interact with internal organizational barriers, potentially influencing digital adoption trajectories in unforeseen ways.

By addressing these limitations, future research can build upon our findings to provide a more comprehensive understanding of digital transformation in dependent market economies, ultimately supporting both academic discourse and strategic policymaking efforts in the CEE region.

Acknowledgement

This work was supported by the project “Strengthening the digitalization of businesses in Eastern Europe – a micro and macro-level approach” funded by the European Union – NextGenerationEU project and the Romanian Government, under the National Recovery and Resilience Plan for Romania, contract no. 760036/23.05.2023, code PNRR-C9-I8-CF 198/28.11.2022, through the Romanian Ministry of Research, Innovation and Digitalization, within Component 9, Investment I8.

References

- Aghimien, D. O., Ikuabe, M., Aigbavboa, C., Oke, A., & Shirinda, W. (2021). Unravelling the Factors Influencing Construction Organisations' Intention to Adopt Big Data Analytics in South Africa. *Construction Economics and Building*, 21(3), 262–281. <https://doi.org/10.5130/ajceb.v21i3.7634>
- Amoah, J., Jibril, A. B., Odei, M. A., Egala, S. B., Dziwornu, R., & Kwarteng, K. (2023). Deficit of digital orientation among service-based firms in an emerging economy: A resource-based view. *Cogent Business & Management*, 10(1): 2152891. <https://doi.org/10.1080/23311975.2022.2152891>
- Awa, H. O., Ojiabo, O. U., & Orokor, L. E. (2017). Integrated technology-organization-environment (T-O-E) taxonomies for technology adoption. *Journal of Enterprise Information Management*, 30(6), 893–921. <https://doi.org/10.1108/jeim-03-2016-0079>
- Cardinali, S., Pagano, A., Carloni, E., Giovannetti, M., & Governatori, L. (2023). Digitalization processes in small professional service firms: drivers, barriers and emerging organisational tensions. *Journal of Service Theory and Practice*, 33(2), 237–256. <https://doi.org/10.1108/jstp-06-2022-0132>
- Chavalala, M. M., Bag, S., Pretorius, J. H. C., & Rahman, M. S. (2024). A multi-method study on the barriers of the blockchain technology application in the cold supply chains. *Journal of Enterprise Information Management*, 37(2), 745–776. <https://doi.org/10.1108/jeim-06-2022-0209>
- Christ-Brendemühl, S., & Schaarschmidt, M. (2019). Frontline backlash: service employees' deviance from digital processes. *Journal of Services Marketing*, 33(7), 936–945. <https://doi.org/10.1108/jsm-03-2019-0125>
- Cichosz, M., Wallenburg, C. M., & Knemeyer, A. M. (2020). Digital transformation at logistics service providers: barriers, success factors and leading practices. *The International Journal of Logistics Management*, 31(2), 209–238. <https://doi.org/10.1108/ijlm-08-2019-0229>
- Demeter, K., & Losonci, D. (2020). Business and technological perspectives of Industry 4.0 A framework for thinking with case illustration. *Vezetéstudomány / Budapest Management Review*, 51(5), 2–14. <https://doi.org/10.14267/veztud.2020.05.01>
- Demeter, K., Losonci, D., Szalavetz, A., & Baksa, M. (2023). Strategic drivers behind the digital transformation of subsidiaries: a longitudinal approach. *Post-Communist Economies*, 35(7), 744–769. <https://doi.org/10.1080/14631377.2023.2236864>
- Durach, C. F., Kembro, J., & Wieland, A. (2017). A New Paradigm for Systematic Literature Reviews in Supply Chain Management. *Journal of Supply Chain Management*, 53(4), 67–85. <https://doi.org/10.1111/jscm.12145>

- Eurostat (2024). *Gross value added and income by main industry*. Eurostat. Retrieved January 19, 2026, from https://ec.europa.eu/eurostat/databrowser/view/NAMA_10_A10__custom_29150/bookmark/table?lang=en&bookmarkId=75a8f98b-314b-41ef-9b66-2a8a04f5bfd6&c=1601651467363
- Frishammar, J., Richtnér, A., Brattström, A., Magnusson, M., & Björk, J. (2019). Opportunities and challenges in the new innovation landscape: Implications for innovation auditing and innovation management. *European Management Journal*, 37(2), 151–164. <https://doi.org/10.1016/j.emj.2018.05.002>
- Kraus, N., & Marchenko, O. (2021). Innovative-Digital Entrepreneurship as Key Link of Industry X.0 Formation in the Conditions of Virtual Reality. *Baltic Journal of Economic Studies*, 7(1), 47–56. <https://doi.org/10.30525/2256-0742/2021-7-1-47-56>
- Kronblad, C., Pregmark, J. E., & Berggren, R. (2023). Difficulties to digitalize: ambidexterity challenges in law firms. *Journal of Service Theory and Practice*, 33(2), 217–236. <https://doi.org/10.1108/jstp-05-2022-0120>
- Lee, S. M., & Trimi, S. (2021). Convergence innovation in the digital age and in the COVID-19 pandemic crisis. *Journal of Business Research*, 123, 14–22. <https://doi.org/10.1016/j.jbusres.2020.09.041>
- Li, A. Q., Rich, N., Found, P., Kumar, M., & Brown, S. (2020). Exploring product–service systems in the digital era: a socio-technical systems perspective. *The TQM Journal*, 32(4), 897–913. <https://doi.org/10.1108/tqm-11-2019-0272>
- Li, S., Gao, L., Han, C., Gupta, B., Alhalabi, W., & Almakdi, S. (2023). Exploring the effect of digital transformation on Firms' innovation performance. *Journal of Innovation & Knowledge*, 8(1): 100317. <https://doi.org/10.1016/j.jik.2023.100317>
- McKinsey & Company. (2022). *Digital challengers on the next frontier in Central and Eastern Europe*. Retrieved from <https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/digital-challengers-on-the-next-frontier-in-central-and-eastern-europe>
- Parviainen, P., Tihinen, M., Kääriäinen, J., & Teppola, S. (2017). Tackling the digitalization challenge: how to benefit from digitalization in practice. *International Journal of Information Systems and Project Management*, 5(1), 63–77. <https://doi.org/10.12821/ijispm050104>
- Pelletier, C., & Cloutier, L. M. (2019). Conceptualising digital transformation in SMEs: an ecosystemic perspective. *Journal of Small Business and Enterprise Development*, 26(6/7), 855–876. <https://doi.org/10.1108/jsbed-05-2019-0144>
- Rachinger, M., Rauter, R., Müller, C., Vorraber, W., & Schirgi, E. (2019). Digitalization and its influence on business model innovation. *Journal of Manufacturing Technology Management*, 30(8), 1143–1160. <https://doi.org/10.1108/jmtm-01-2018-0020>
- Ronchini, A., Moretto, A. M., & Caniato, F. (2023). Adoption of additive manufacturing technology: Drivers, barriers and impacts on upstream supply chain design. *International Journal of Physical Distribution & Logistics Management*, 53(4), 532–554. <https://doi.org/10.1108/IJPDLM-12-2021-0541>
- Sánchez, I. R., Williams, A. M., & Andreu, H. G. (2020). Customer Resistance to Tourism Innovations: Entrepreneurs' Understanding and Management Strategies. *Journal of Travel Research*, 59(3), 450–464. <https://doi.org/10.1177/0047287519843188>
- Sánchez, M. A. (2020). University E-readiness for the Digital Transformation: The Case of Universidad Nacional del Sur. *Revista Gestão & Tecnologia*, 20(2), 75–97. <https://doi.org/10.20397/2177-6652/2020.v20i2.1848>

- Smania, G. S., Mendes, G. H. de S., Lizarelli, F. L., & Favoretto, C. (2022). Service innovation in medical device manufacturers: does the digitalization matter? *Journal of Business & Industrial Marketing*, 37(3), 578–593. <https://doi.org/10.1108/jbim-02-2020-0082>
- Statista. (2023). *Global impact of COVID-19 on digital transformation speed 2020, by industry*. Statista. Retrieved January 4, 2024, from <https://www.statista.com/statistics/1200484/covid-digital-transformation-process-industry/>
- Statista. (2024). *Digital competitiveness rankings by country worldwide 2023*. Statista. Retrieved November 4, 2024, from <https://www.statista.com/statistics/1042743/worldwide-digital-competitiveness-rankings-by-country/>
- Tuisku, O., Parjanen, S., Hyypiä, M., & Pekkarinen, S. (2023). Managing changes in the environment of human–robot interaction and welfare services. *Information Technology and Management*, 25, 1–18. <https://doi.org/10.1007/s10799-023-00393-z>
- Ulatowska, R., Wainio, E., & Pierzchała, M. (2023). Digital transformation in HRM of the modern business service sector in Finland and Poland. *Journal of Organizational Change Management*, 36(7), 1180–1192. <https://doi.org/10.1108/jocm-11-2022-0339>
- Valdez-Juárez, L. E., Ramos-Escobar, E. A., & Borboa-Álvarez, E. P. (2023). Reconfiguration of Technological and Innovation Capabilities in Mexican SMEs: Effective Strategies for Corporate Performance in Emerging Economies. *Administrative Sciences*, 13(1), 15. <https://doi.org/10.3390/admsci13010015>
- Vimal, K. E. K., Sivakumar, K., Kandasamy, J., Venkat, V., & Mani, R. S. (2023). Barriers to the adoption of digital technologies in a functional circular economy network. *Operations Management Research*, 16(3), 1541–1561. <https://doi.org/10.1007/s12063-023-00375-y>
- Watanabe, K., & Mochimaru, M. (2017). Expanding impacts of technology-assisted service systems through generalization: case study of the Japanese service engineering research project. *Service Science*, 9(3), 250–262. <https://doi.org/10.1287/serv.2017.0183>
- Weerabahu, W. M. S. K., Samaranyake, P., Nakandala, D., Lau, H., & Malaarachchi, D. N. (2022). Barriers to the adoption of digital servitization: a case of the Sri Lankan manufacturing sector. *International Journal of Emerging Markets*, 19(10), 3011–3039. <https://doi.org/10.1108/ijoem-01-2022-0011>

The article has been reviewed. | Received: 29 November 2024; **Revised:** 25 April 2025; **Accepted:** 9 June 2025; **Available online:** 4 February 2026; **Published in the regular issue:** 30 June 2026

Appendix

Appendix 1 | Interview guide

1. General information about the company and respondent

Name of the company:

Industry:

Respondent position:

Respondent work experience:

What was the implemented technology:

2. Context

- In which phase is digitalization within the company? Please, attempt to compile a comprehensive list of the digital technologies (software or hardware) utilized within the company.
- What was the pool from which the technology was selected? Please enumerate the options associated with the chosen digital technology.
- What do you think have been the most important factors in the implementation of the I4.0 projects and why?
- What is the scale of the project? If possible, provide data, e.g., project headcount, budget, etc.

3. Motivation

- What was the purpose of implementing the technology? What business needs/management problems justified the implementation? Which process KPIs did it target (e.g., cost, flexibility, lead times, quality)? Was there any specific goal to reach by the implementation of the technology?
- Please describe how the technology was selected and who made the final decision. (clarification for us: "how" refers to the selection process)
- Where did the inspiration come from to use digital technologies (e.g., internal pressures, external demands, necessity, or possibility, decrease in workforce, better ROI on automated solutions)?
- How does the project respond to external pressures / needs / incentives (e.g., competitive trends; changing consumer demands; pressure from firms up/down the value chain)?
- How does the project respond to internal pressures / needs / incentives (e.g., too high fluctuation, skill shortages; job quality related problems (like occupational accidents, employee's complaints about working time, workloads etc.)?)

4. Implementation of the technology

- Please describe each step of the project.
- Which products or processes were affected by it? How were they affected?
- Did the organization receive any external support or funding to introduce the innovation (e.g., public support policies, public funding program, networks, clusters, academic support, trade/employer associations + chambers of commerce). Please describe the support.
- Who was responsible for the project? Which department? New or existing? Why? Who were the participants, departments involved (positive and negative experiences about them, the most important internal challenges, strengths etc.)?

5. Employees

- If employees, business representatives, or frontline staff were involved in any capacity, at which stage of the digitalization project implementation were they engaged? If so, how? Is participation formalized (e.g., through continuous improvement processes)? Other formats of employee involvement / participation?

6. Expectations

- What were the expected results? What turned out to be the results? How about the maintainability of the results (did the results count at all, or did the company have some other motivations in the implementation)?
- Were there any unpredicted positive or negative impacts, synergies?
- Have you received any staff feedback on the project? If so, what has it revealed?
- How successful do you consider the changes to be? Why do you think they are overall successful/unsuccessful?

7. Barriers

- What kind of obstacles and barriers did you face during the implementation of the technology? (e.g., resources: financial, human, etc.; employees: adoption resistance etc.; knowledge; external support, etc.)?
- How were the barriers mitigated?

8. Success factors

- What were the identified success factors in the implementation of new digital technology?
- How does the company plan to strengthen the factors of success in the future?

9. Behavioral aspects

- How would you describe the behavior of employees at each level? Were they resistant to change or willing to actively contribute to the implementation?
- During the phases of the procurement process, were there any irrational decisions made regarding the adoption of the technology?
- When you and your team decided to purchase and implement this technology we are discussing, how would you argue that you have made the optimal decision? How do you know it was the optimal choice?
- In your opinion, which stages of the purchase and implementation process have been the most subjective and/or irrational and, therefore, the most prone to potential subjective judgements?