

Digital Resilience of SMEs: Conceptual Distinction and Strategic Factors in the Context of Disruptions

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Abstract. *Digital resilience is increasingly recognized as a critical organizational capability in today's business environment, characterized by uncertainty, rapid technological change, and frequent crises. Small and medium-sized enterprises (SMEs), due to their limited resources and lower levels of technological readiness, are particularly vulnerable to these challenges.*

This paper provides a systematic analysis of recent scholarly literature with the aim of conceptually distinguishing digital resilience (DR) from related constructs such as digital transformation (DT), digital maturity (DM), and organizational resilience (OR). The focus is placed on identifying key factors that contribute to the development of digital resilience in SMEs, with an emphasis on technological, organizational, and strategic dimensions. The findings suggest that technological preparedness alone is insufficient; organizational culture, leadership, and the capacity for continuous learning play a decisive role. In conclusion, the paper highlights the importance of a holistic approach to building digital resilience, enabling SMEs not only to respond to disruptions but also to transform them into opportunities for innovation and growth.

Keywords. digital maturity, digital resilience, digital transformation, disruptions, organizational resilience, SMEs, VUCA environment

1 Introduction

The modern business environment is increasingly characterized by volatility, uncertainty, complexity, and ambiguity, often described in the literature by the acronym VUCA (Cho et al., 2025). Agility, innovation and adaptability are the new demands of described unstable and uncertain environment, which is a major challenge for organizations, especially SMEs, to overcome. These firms, already at risk of losing their competitive advantage (Cho et al., 2025), often operate with limited resources and personnel, frequently lacking formal organizational structures (Kawane et al., 2024), which hinders their ability to respond to digitalisation challenges.

The COVID-19 pandemic, as an exogenous shock on a global scale, further underscored the critical role of digital adaptation in achieving resilience and maintaining business continuity (Boh et al., 2023; Papagiannidis et al., 2020). Consequently, digitalisation became essential, especially for SMEs, to build resilience and respond to evolving customer and market demands during the crisis (Sinha et al., 2024). In this context, the crisis served as a catalyst for digital transformation (DT), prompting SMEs to rapidly adopt digital technologies and develop innovative business models (Eggers, 2020; Kraus et al., 2021).

Given that SMEs account for more than 90% of all enterprises globally and contribute significantly to employment and GDP (UN, 2024), their resilience is of critical importance for economic sustainability. In this context, DT appears as a necessary response mechanism to external challenges, affecting the entire organization through changes in management, organizational culture and workforce capabilities (He et al., 2023; Senin et al., 2024). However, DT as a stand-alone concept does not ensure resilience in uncertain environments, which has increased scientific attention to digital resilience - defined as the ability of an organization to use digital technologies to manage disruptions, maintain business continuity and adapt to changes (Boh et al., 2023; Tim and Leidner, 2023).

Despite it is increasingly present in scientific discourse, digital resilience is not yet conceptually developed, with empirical research still in its early stages. As a complex construct, it is often conflated in the literature with the concepts of digital transformation (DT), digital maturity (DM), and organizational resilience (OR). This paper offers a conceptual review to clarify digital resilience (DR) in the SME context and explore factors that support its development in uncertain environments. Accordingly, the following research question is posed: How is digital resilience in small and medium-sized enterprises conceptually differentiated from related constructs, and what factors influence its development?

2 Methodology

This study adopts a qualitative literature review approach to conceptualize the notion of DR and to distinguish it, while also examining its interdependence, from related constructs such as DT, DM and OR within the SME context. To ensure reliability and validity of the research findings, high-quality scientific databases Scopus and Web of Science were used. The search strategy was based on various keyword combinations, including “*digital resilience*”, “*SMEs*”, “*digital transformation*”, “*digital maturity*”, “*organisational resilience*”, “*disruptions*” and “*crisis*”. The inclusion criteria were limited to peer-reviewed articles published in English between 2015 and 2025, as research on business digitalization began to intensify during that period. Identified documents were first screened for thematic relevance (title and abstract), followed by full-text examination. A manual content coding process was applied to tag recurring constructs and identify conceptual patterns related to digital resilience, using a concept-centric approach that facilitates synthesis and identification of theoretical gaps (Webster & Watson, 2002; Snyder, 2019).

While this analysis does not follow the full protocol of a Systematic Literature Review (SLR), it establishes a structured basis for synthesizing existing theoretical insights and identifying conceptual gaps. Accordingly, the study outlines multiple directions for further investigation and contributes to the development of a comprehensive SLR methodology in future stages of this research agenda.

3 Theoretical Framework

In the context of digital challenges and disruptions, understanding organizational resilience requires a clear distinction between several related but distinct concepts that are often used interchangeably in the literature. These include digital transformation (DT), digital maturity (DM), digital resilience (DR), and organizational resilience (OR).

3.1 Digital Transformation

According to Hernández Sánchez & Oskam (2025), DT involves not only the integration of digital tools into business operations, but also a complex process of fundamentally reshaping organizational structures and culture to enable innovation and ensure continuous learning. In contemporary literature, it is described as a strategic imperative that drives the creation of new organisational value and enables development in the face of global pressures and dynamic external influences (Gouveia et al., 2024). These conditions often require internal reorganisation and adaptation of business models. Numerous authors emphasise that DT goes beyond implementing IT solutions, encompassing

governance, organisational culture, employee capabilities and business processes (He et al., 2023; Senin et al., 2024; Hernández Sánchez & Oskam, 2025). As noted by Reis & Melão (2023), DT has become a defining factor in reshaping modern business environments, exerting long-term influence on how organisations function and evolve in response to continuous technological and societal change. Thus, although its importance is widely acknowledged and the interest of researchers is global, DT still lacks a unified and universally accepted theoretical definition (Kraus et al., 2021). Variations in how scholars frame DT have produced multiple conceptual perspectives on its scope and meaning.

Succurro & Donati (2025) define DT as a sociocultural transformation supported by digital technologies and driven by a clearly defined digital strategy, aiming to enhance agility, efficiency, and connectivity throughout the organization. Muhammad et al. (2025) also stress the importance of integrating digital initiatives and advanced technologies as key drivers of business performance and competitive advantage. On the other hand, Hinings et al. (2018) highlight the innovative nature of DT, defining it as the result of the interaction among various digital innovations that collectively bring about changes in how business systems operate.

3.2 Digital maturity

DM is often viewed as a multidimensional concept, integrating the level of an organization's DT and its ability to adapt to environmental changes. He et al. (2023) conceptualized DM through two dimensions - digital intensity and transformation management intensity - which together influence organizational performance and employees' optimism. The adaptive role of digitalisation is further illustrated by Sinha et al. (2024), demonstrating how it enabled SMEs to flexibly adjust operations in response to evolving customer and market demands during the pandemic. Rather than a fixed state, DM is an ongoing process of organizational and operational adjustment, assessed at both organizational and process levels (Tubis, 2023).

To effectively harness the potential of digital technologies, organizations must develop the capability for rapid adaptation, including the reconfiguration of existing digital solutions (Boh et al., 2023). Gross et al. (2022) argue that DM is a prerequisite not only for operational but also for financial benefits, while also emphasizing that SMEs still lag behind in the implementation of digital initiatives.

He et al. (2023) suggest that strategic investment in digital technologies may can help strengthen operational control. However, they note that such investments do not necessarily lead to advanced adaptive capabilities, such as recognizing external disruptions or quickly finding effective solutions. Furthermore, theoretical and methodological

inconsistencies exist among DM models, and there is still no unified approach to this concept. The absence of a standardised framework makes it difficult to establish a clear connection between digital maturity and digital resilience, leaving this relationship open for further investigation (Grooss et al., 2022).

3.3 Resilience - Organizational and Digital

In conditions of uncertainty and disruption, an organization's ability to effectively cope with challenges becomes essential for its long-term sustainability. For this reason, the concept of OR has been developed, referring to the capacity of organizations to anticipate threats, respond effectively to adverse events, and adapt to changing conditions (Duchek, 2020), including recovery and stabilization following disruptive events or threatening situations (Chaudhary et al., 2024). This concept is not limited to reaction alone; it also includes proactive efforts aimed at identifying opportunities and enabling strategic adaptation (Duchek, 2020), with its further development relying on the integration of diverse capabilities such as ambidexterity, adaptability, and agility (Hokmabadi et al., 2024).

In more recent literature, resilience is increasingly interpreted as a meta-capability. Duchek (2020) suggests that it involves the ability to anticipate, respond to, and adapt to change. Building on this, Khurana et al. (2022) describe it as a higher-order meta-capability that goes beyond traditional dynamic capabilities like sensing opportunities, taking action, and supporting organizational change and transformation (Augier & Teece, 2009; Teece, 2012, 2016). With the development of digital technologies, the concept of DR has also been developed, which emphasizes the importance of digital solutions in responding to disruptions. Although still relatively new (Tim & Leidner, 2023) and actively evolving only in the post-pandemic period since 2022, the importance of DR for business stability and growth has already been recognized in the literature.

Despite being defined in various ways, there is still no widely accepted conceptual framework or established model of DR, which presents a challenge for further research (Tim & Leidner, 2023). Broadly speaking, DR refers to a set of capabilities that enable organizations not only to absorb the impact of external disruptions and regain stability, but also to adapt and transform by leveraging digital technologies effectively (Boh et al., 2023). Seen as a meta-capability (Duchek, 2020), it includes capacities that enable not only recovery from adverse events, but also the active use of digital technologies for adaptation and fostering innovation. Authors highlight that many digital capabilities developed during earlier DT initiatives, initially aimed at operational efficiency and competitive advantage, have become essential for building DR (Boh et al., 2023). Beyond the aspects already mentioned, the concept of DR also involves the

design, implementation, and use of information systems to support business recovery and adaptation following exogenous shocks (Tim & Leidner, 2023). The presented definitions show that that resilience isn't just about technical capabilities, but also involves organizational practices, innovation capacity and change management. These capacities are considered particularly critical and essential for small and medium-sized enterprises, which often face limited resources.

3.4 Interrelation and Distinction of Concepts

Although the concepts of DT, DM, and DR are complementary, their roles in the context of organizational adaptation and stability differ significantly. DT is based on the application of digital technologies in organisational and commercial processes, as well as on organisational transformation involving cultural change and talent development, making it a multidimensional process (Hernández Sánchez & Oskam, 2025). It shapes the new landscape of the modern business environment, which still presents major challenges for organizations. However, despite technological advancement, DT does not guarantee resilience. For example, strategies such as just-in-time supply chain management, while effective under stable conditions, proved vulnerable during the COVID-19 crisis, when optimization had to give way to flexibility and robustness (Boh et al., 2023).

The same applies to DM. Conceptualized through two dimensions (digital intensity and transformation management intensity) it reflects both the level of technology use and the degree to which organizations embed vision, governance, and culture into their digital strategies (He et al., 2023). While this supports innovation and adaptability, it does not necessarily ensure the capacity to respond effectively to disruptions. Tim & Leidner (2023) caution that even digitally advanced organizations may be unprepared for unexpected shocks if they lack internal capabilities for reconfiguring and rapidly adapting their business models. Boh et al. (2023) emphasize that digitally prepared organizations are in a better starting position to implement necessary changes, and similar findings were reported by Robertson et al. (2022), who noted that a higher level of digital maturity in SMEs is often associated with greater OR.

These findings suggest that a high degree of DM can contribute to the development of DR, and consequently, to overall OR. Therefore, while DT and DM may support resilience, they are not synonymous with it. While DM reflects technological readiness, resilience also encompasses strategic, organizational, and human resources required to face crises (Awad & Martín-Rojas, 2024; Robertson et al., 2022). DR, in turn, demands the active and purposeful use of technology for adaptation, innovation, and recovery in

uncertain conditions (Boh et al., 2023; Tim & Leidner, 2023).

4 Digital Resilience as a Strategy for SME Growth and Survival

Small and medium-sized enterprises (SMEs), as key drivers of innovation and economic development, are highly vulnerable to increasingly frequent disruptions in an environment marked by volatility, uncertainty, and complexity (Cho et al., 2025; Boh et al., 2023). This vulnerability is largely due to their limited resources, which necessitate a strategic and cautious approach to digitalisation in order to remain competitive and resilient (Sinha et al., 2024), as well as due to a lack of digital competencies, dependence on technological infrastructure (Zirar et al., 2024), and restricted access to financing (Beck & De La Torre, 2007). In this context, DR becomes a necessity rather than an option.

Although DT, and consequently, DM, enhances efficiency and market relevance (Chan et al., 2023; Kim et al., 2025), they do not guarantee resilience. The COVID-19 pandemic demonstrated that even highly digitalized SMEs had limited capacity to reconfigure their business models, highlighting the gap between technological readiness and OR (Boh et al., 2023). Effectively responding to disruptions requires more than just technology and implies an organisation's capacity for rapid decision-making and innovation under pressure. The acceleration of digitalization and the shift from the Industry 4.0 paradigm toward Industry 5.0, with its emphasis on resilience, sustainability, and a human-centric approach (Latino, 2025), further intensify the need for SMEs to adapt their business models and processes.

Within this framework, DR emerges as a strategic meta-dynamic capability (Duchek, 2020; Khurana et al., 2022) that enables proactive crisis response and the conversion of disruptions into opportunities. Beyond ensuring business continuity, it becomes a factor in growth, internationalization, and long-term competitiveness (Razavi Hajiagha et al., 2024). The contemporary business context is shaped by a multitude of external shocks - from pandemics and climate change to geopolitical and cyber threats (Tim & Leidner, 2023). These exogenous crises represent long-term existential threats (Boh et al., 2023) that demand systemic resilience. The COVID-19 pandemic, as a “black swan event” (Cugno et al., 2022), further emphasized the importance of rapid digital responses and innovative action (Papagiannidis et al., 2020). In response, the concept of “digital antibodies” has been developed - digital solutions that enable SMEs to adapt and maintain business continuity (Ragazou et al., 2023).

However, resilience is not the result of technology alone. Robertson et al. (2022) point out that digital

leadership had a stronger impact on resilience than technical preparedness, while Boh et al. (2023) and Awad & Martín-Rojas (2024) highlight the importance of strategically aligned capabilities that go beyond the technical dimension. In this context, DM may be viewed as the foundation for the development of DR, but not as its guarantor. Further research confirms that DT positively influences innovation and resilience in SMEs (Al Omoush et al., 2025), enabling better risk management and the exploitation of market opportunities, with an emphasis on strengthening organizational learning (Awad & Martín-Rojas, 2024), developing frugal innovations as a crisis response (Dubey et al., 2022), facilitating market expansion and improved competitiveness (Yang & Panichakarn, 2025), as well as improving firms' international performance (Razavi Hajiagha et al., 2024).

Digitally advanced SMEs showed greater adaptability and faster recovery during the pandemic, strengthening long-term performance (He et al., 2023; Sinha et al., 2024; Senin et al., 2024), while Saezow & Sukhabot (2024) found that SMEs adopting proactive strategies, DT, and network connections were more likely to survive and adapt effectively. Additional evidence from Mossberger (2024) suggests that SMEs with an established digital presence, such as owning a website, were better prepared to absorb the initial shock of the pandemic. Similar findings come from Chinese SMEs in cross-border e-commerce, which overcame numerous challenges with the help of digital technologies (Fodouop Kouam, 2025). Empirical findings clearly indicate that DR is not a one-time response but a capability for long-term adaptation and transformation in conditions of ongoing uncertainty. SMEs that develop this capability do not perceive disruptions solely as threats, but as opportunities for strategic advancement and growth.

5 Key factors for the development of digital resilience of SMEs

DR development in SMEs depends on technologies and on internal and external factors that enable adjustment and recovery in uncertain conditions (Boh et al., 2023; Tim & Leidner, 2023). Kumar et al. (2024) identified ten key elements of DR for SMEs, highlighting strategic management, human resources management, networking, and monitoring as the most effective drivers of change with low dependence on other factors. This chapter analyzes key DR factors in SMEs, grouped by their nature and activity.

5.1 Technological factors

Access to contemporary digital technologies increases flexibility and speeds up the decision making, with special emphasis on the innovative character of generative artificial intelligence (GAI), including

automation of content generation, predictive analytics (Cho et al., 2025), chatbots (Yun & Park, 2022) and the blockchain technology (Chakraborty et al., 2025). These technologies provide a wider and more equal access to advanced digital tools, which is especially important for SMEs with limited resources because they increase efficiency, reduce costs and facilitate innovation. E.g. the chatbots improve customer support (Yun & Park, 2022), while blockchain contributes to transparency and risk management effectiveness (Chowdhury et al., 2023).

According to Chakraborty et al. (2025), the effective integration of new digital technologies into organizational processes, in addition to technical adoption, requires stimulating organizational conditions, such as an innovation-oriented culture, sustainable investment in human capital, and a strengthened cybersecurity infrastructure. Zhang et al. (2025) point out that technological innovations act as an indirect mechanism in the development of organizational strength, which can also be applied to a digital context. Furthermore, Fodouop Kouam (2025) describes how live streaming, online advertising and contactless delivery emerged as successful technological practices that Chinese SMEs used in cross-border e-commerce during the pandemic lockdowns.

5.2 Organizational factors

Together with the technological aspect, innovation, organizational learning and culture, adaptability of employees, their mutual cooperation and continuous learning also play an important role (Hasayotin et al., 2024; Sony & Mekoth, 2022; Wiesböck & Hess, 2020). Innovation culture, willingness to change and support of creative thinking further strengthens resilience in the digital context. Wiesböck & Hess (2020) emphasize the innovation opportunities (new products, services or business processes) by using digital technologies. Innovations and adaptation of business models are key to improving internal operations (Akpan et al., 2024), while digitalization and innovative strategies are often complementarily implemented (Holl & Rama, 2024).

Innovative companies show higher readiness to DT, and an iterative approach in innovation development has proven to be especially suitable for SMEs with limited resources (Lassen & Larsen, 2024). The adaptability of employees has been emphasized as a meta-ability in overcoming the challenges of DT, with a critical role of continuous learning and knowledge transfer (Sony & Mekoth, 2022). The human factor thus becomes key to the successful integration of social and technical systems aiming to achieving organizational goals. Organizational culture further affects employees' willingness to accept technological changes (Wiesböck & Hess, 2020). In dynamic and disruptive contexts, adaptability and diversification of business have been proved as resilience mechanisms, as confirmed by Hasayotin et

al. (2024) in the context of tourist SMEs in Pattayi, where diversification has proven to be key to survival during pandemic.

5.3 Strategic factors

In addition to internal capacities, DR also contributes to networking, which not only opens access to resources, but increases the chances of knowledge exchange and collective learning, i.e., it creates new opportunities for growth (Hasayotin et al., 2024). The indirect contribution to the strengthening of DR is also evident through collaboration with other companies, clusters and institutional bodies such as government and state agencies. For instance, according to De Sa et al. (2023) companies that had access to institutional financial support, showed greater resilience in crises. Although the support of state and government agencies does not directly relate to digitalization, it can indirectly strengthen the capacity for DT and resilience, especially in the case of SMEs who rely on limited resources.

6 Discussion

Recent literature suggests that, although DR has attracted increasing scholarly attention, its conceptual foundations remain underdeveloped. This study seeks to delineate it more clearly from related constructs such as DT, DM, and OR; interrelated but not synonymous concepts. DR is increasingly described as a meta-capability that transcends the technical dimension of DM and encompasses an organization's ability to respond to disruptions, recover, and innovate through the use of digital technologies (Boh et al., 2023; Tim & Leidner, 2023). Experiences from the COVID-19 crisis have demonstrated that a high level of DM does not guarantee resilience - many technologically advanced organizations struggled to adapt rapidly to change. This highlights the importance of factors such as agility and strategic leadership, yet empirical research on the topic remains limited, especially in transition economies. In accordance with the aforementioned fact, there is a need for develop measurable frameworks and conduct longitudinal research on how DR evolves over time, across industries and economic contexts.

This paper constitutes the starting point of a broader research process, providing a preliminary conceptual basis for examining DR in SMEs. The next stage of research will employ a formal SLR methodology, in order to enable a more comprehensive, transparent, and methodologically rigorous synthesis of existing knowledge. Although the current analysis is constrained by its selective scope and interpretative orientation, the incorporation of validated academic sources and a structured concept-centric approach provides a coherent and credible analytical basis for future theoretical development.

7 Conclusion

The paper offers an insightful review of the recent literature to close identified research gaps and distinguish the concept of DR from interrelated concepts of DT and the DM. The VUCA business environment especially with COVID crisis and growing geopolitical risks due to the arising conflicts and political changes around the world pointed out that the DT and the DM do not guarantee that the companies will also be less vulnerable to external shocks if these are not accompanied by flexibility in strategic, organizational, and human side of companies that enable fast adaptation and innovation. This is particularly important in SMEs as the companies often lack different types of resources (material, human and/or financial). Digital resilience thus represents a very important meta-capability of companies that enables them to sustain and thrive in today's disruptive world.

The key factors that will support building of digital resilience are categorized into three dimensions (technological, organizational and strategic) which offers a holistic approach to tackle modern challenges. The companies must integrate advanced technologies but also accompany these with highly adaptive organizational culture, strong leadership, continuous learning, and robust networking. This together with changes in perspective and looking to challenges as business opportunities offers a vision for how SMEs can not only survive but thrive in an ever more unpredictable business condition.

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