Entrepreneurial Digital Resilience in War: Lessons from Ukrainian SMEs

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Abstract

Limited IS research is available on how SMEs achieve digital resilience in the context of major geopolitical shocks. Other than large organizations, SMEs typically lack the resources to quickly produce capabilities to resist and recover. At the same time, entrepreneurial bricolage teaches us that such organizations are used to improvisation with resources-at-hand. We turn to a study of Ukrainian entrepreneurs during the ongoing war through the lens of bricolage for the creation of digital resilience. Our interviews with Ukrainian SME founders reveal that entrepreneurs actively repurpose and recombine existing digital tools, infrastructures, and platforms to maintain operations, ensure remote work, and reconfigure business models. Our study contributes to the digital resilience literature by highlighting how resilience emerges through cumulative learning, cognitive framing, and entrepreneurial improvisation, offering new insights into managing SMEs under extreme conditions.

Keywords: Digital resilience, war, Ukraine, SMEs, bricolage.

1. Introduction

The full-scale invasion of Ukraine has grown to become the largest war in Europe since WWII (Mankoff, 2022). Such disruptions typically have severe impacts on local economies, oftentimes requiring substantive efforts to rebuild a country and its industries (Glick & Taylor, 2010). Start-ups as well as small- and medium-sized enterprises (SMEs) are frequently seen as drivers of economic growth and, in general, of a country's wealth (Devece et al., 2016). However, these companies are also the most vulnerable to economic downturns, crises and disruptions (Khalil et. al, 2022). This is why it is particularly these companies that need to develop some form of digital resilience against major shocks (Boh et al., 2023); however, as of now literature in the area of digital resilience has largely explored resilience in the context of larger firms and public institutions (Boh et al., 2023; Lindström et al., 2024).

Exploring how Ukrainian entrepreneurs leveraged digital resources such as tools and data (Boh et al., 2023; Faulkner & Runde, 2019) to become resilient and ensure operations in face of their country being invaded, we ask the general research question "*How do ventures create digital resilience during war?"* While stemming from the Ukrainian context, our research has general relevance as global conflicts have doubled over the past five years (Armed Conflict Location & Event Data Project, 2024) rendering societies and businesses across the globe to be at ever-increasing risks of facing major shocks. Therefore, societies and SMEs in particular need to learn how to function in highly dynamic and partially armed environments by becoming resilient (Briel et al., 2025).

Against this background, we integrate interviews with 15 Ukrainian entrepreneurs through the conceptual lens of entrepreneurial bricolage (Baker & Nelson, 2005). We focus our analysis on how bricolage draws on digital resources, tools, and data (Boh et al., 2023; Faulkner & Runde, 2019) and how doing so affects the digital resilience of ventures.

Our study offers two main contributions. First, we extend the concept of digital resilience to specifically speak about how ventures achieve it in times of war. We detect patterns of bricolage that give rise to digital resilience. Secondly, our empirical contribution lies in examining and mapping out how bricolage unfolds in times of war, thereby providing insights into an area that has remained largely peripheral to IS research.

2. Previous research and theoretical framework

2.1. Building digital resilience

Resilience describes a system's ability to absorb disruption in the environment before undergoing structural changes to internal parameters (Holling et al., 1995). In the setting of societies and organizations,

resilience refers to the ability to withstand disorder (Fiksel, 2003). Organization and management research considers resilience as a strategy to withstand the complexity, uncertainty, and volatility of a business environment (e.g., Hamel & Välikangas, 2003; Neilson and Pasternack 2005; Riolli & Savicki, 2003; Sheffi, 2007). On an organizational level, resilience describes the unique characteristics that enable an organization to respond faster, recover quickly or develop more unusual ways of doing business under pressure comparatively (e.g., Sutcliffe & Vogus, 2003; Vogus & Sutcliffe, 2007). Hamel and Välikangas (2003), Fiksel (2006) and Boh et al. (2023) explore resilience within business contexts, highlighting the ability of companies to withstand, adjust to, and thrive amid significant changes in the environment, especially major shocks. Major shocks are defined as existential threats that pose ongoing and long-term risks to individuals, groups, organizations, and institutions (Boh et al., 2023). Digital technologies play a significant role in producing resilience that tackles major shocks, especially in response to the increasing frequency and severity of exogenous shocks such as pandemics, natural disasters, socio-political conflicts, and cyberattacks. In a digitally integrated society that is regularly hit by different shocks - digital resilience helps firms to thrive, not simply survive (Tim & Leidner, 2023). The goal of digital resilience is to minimize disturbances and maintain stability, adjust to new conditions and advance to a stronger state (Tim & Leidner, 2023; Boh et al., 2023), including digital tools and data (Faulkner & Runde, 2019).

Strategic investment into the right digital tools produces resilience as it allows organizations to maintain service delivery at high quality and customer satisfaction during crises, effectively replicating their performance under normal operating conditions (Park et al., 2023). The ability to use digital data creates digital resilience as it provides firms with analytic means to predict, recover from, and learn from a shock (Tremblay et al., 2023). Here, digital tools and data play two important roles for digital resilience, producing (1) *resistance* in the immediate period and (2) quick *recovery* in the following period of a major shock (Liu et al., 2023). Digital resilience thereby results from reactive and emergent activities to low-probability, high-impact events that disrupt routine and require a quick response (Tim & Leidner, 2023). It is an emergent quality of a firm to maintain continuity while facilitating adaptation and creating conditions for and promoting advancement after exogenous shocks, not a fixed characteristic (ibid).

This study builds on Tim and Leidner's (2023) conceptual framework for digital resilience, which defines resilience as a capability that can be studied through the "what, how, and why" model. Following this basic framework, this study refines it by clarifying the main components to better reflect the SME context and the analytical focus of the study (see *Table 1*). "What" stands for assets and the organizational abilities to leverage these assets in the face of crises. We consider *assets* as digital resources (e.g., data, tools, procedures) and *abilities* as organizational abilities (e.g., coordination, improvisation, management). This includes IT governance structures (Park et al., 2023), established routines (Tremblay et al., 2023), and availability of digital resources (Leidner et al., 2009). These pre-existing digital resources and organizational abilities represent an organization's readiness and are essential for initiating crisis response activities for resistance and recovery. Importantly, as previous work has shown digital resilience is also affected by the ability to mobilise new resources and skills in emergency situations, such as the "forced digitalisation" phase during a pandemic (Hacker et al., 2020).

The "how" includes strategic activities by which digital resilience is delivered, including the planning, implementation and use of information systems. These activities entail processes to mobilise digital resources that support objectives of resistance and recovery. We consider activity as a strategic activity, emphasising the purposeful and adaptive nature of developing, deploying and using information systems in times of crisis.

Lastly, the "why" of digital resilience describes the outcomes of recovery and resistance, which enable firms to ensure continuity (maintaining operations during disruption), adaptation (adjusting to new realities), and advancement (emerging stronger) (Tim & Leidner, 2023; Liu et al., 2023). Therefore, we distinguish between two outcomes: resistance and recovery.

Component	**Description**
What: Digital Resources & Organizational Abilities	Resources and internal capabilities that SMEs possess or develop to respond to exogenous shocks. - *Digital resources*: IT infrastructure, platforms, data, digital tools, routines - *Organizational abilities*: the ability to use digital tools effectively
How: Strategic Activities	Purposeful, often emergent, actions taken to mobilize digital resources and leverage organizational abilities in response to crisis. Includes:

	- Designing IS - Deploying IS - Using IS strategically
Why: Outcomes of Digital Resilience	**Resistance**: coping and maintaining operations, including: *Continuity* (Tim & Leidner, 2023) / *Absorb* (Boh et al., 2023) **Recovery**: returning to or improving upon prior state, including: - *Adaptation*: adjusting to new realities - *Advancement*: transformation to a better state or long-term innovation

Table 1. Adapted Framework of Digital based on Leidner (2023).

2.2. Resilient entrepreneurs - a bricolage-view

Prior studies on resilience focused primarily on large companies, emphasizing organizational traits such as formal crisis management procedures and redundancies, which are not typical for ventures. Data on critical trends to anticipate and deter large shocks are often controlled by a small number of influential institutions, potentially denying smaller organizations and entrepreneurs' access to the information they need to plan and prepare for such shocks (Boh et al., 2023). As a result, there has been limited focus on how small and medium-sized enterprises pursue resilience when they cannot rely on the same redundancies or resource access as large corporations. This creates a gap in our understanding.

A way to address this gap is the theory of bricolage, which offers insights into how SMEs and entrepreneurs respond to crises despite limited resources. Levi Strauss (1966) introduced the concept of bricolage as "making the most of existing resources" (p. 17). Baker and Nelson's (2005) expanded the definition to "making do by applying combinations of the resources at hand to new problems and opportunities" (p. 333).

In entrepreneurship, the bricolage theory is a key approach for overcoming resource limits in low-income environments and is also called entrepreneurial bricolage (Garud & Karnøe, 2003; Baker & Nelson, 2005). For example, Fisher (2012) lists bricolage as one of the primary tactics used by entrepreneurs in their businesses. Entrepreneurs who practice bricolage reinterpret challenges based on existing resources, shifting from a "what I need" to a "what I have" attitude; It values resourcefulness over resource acquisition (Mateus & Sarkar, 2024). As a strategic tool, bricolage is used by organizations to address resource constraints, aligning with the resource-based view that emphasizes using unique resource combinations (Barney, 1991). This strategic use of bricolage represents the deliberate arrangement of limited resources to generate innovation and competitive advantage (Baker & Nelson, 2005). In practice, bricolage is used in employees' daily improvisations. It is the art of ingenuity in action, an emerging practice in which people overcome their immediate limits through creativity and innovation (Duymedjian & Rüling, 2010).

Bricolage can be especially useful during wars and conflicts, where limited resources can lead to unexpected opportunities for entrepreneurs (Kwong et al., 2017). According to Shane (2000), deprivation might motivate individuals to reflect on their life path with greater scrutiny and persistence, leading to a deeper search within themselves. This could unlock previously untapped resources and competencies, making bricolage more feasible (Kwong et al., 2019). Given that war and conflict represent contexts of severe scarcity, one can expect that innovative use of available resources becomes crucial to the process (Kwong et al., 2019). Entrepreneurs must overcome resource constraints, industry standards, and regulations (Desa & Basu, 2013; Weick & Sutcliffe, 2007). They can also "creatively reinvent" underutilized resources, such as materials, labor, skills, practices, assets, or networks, that are readily available or can be acquired cheaply (Rice & Roger, 1980; Baker & Nelson, 2005). Bricolage inherently focuses on maximizing the use of available resources when confronted with challenges (Crupi et al., 2021; Duymedjian & Rüling, 2010). Employing this strategy results in a range of intertwined behaviors that aim to discover new sources of capital and manage crisis-induced adversities associated with resource constraints (Santos et al., 2022).

During the economic disruption caused by the COVID-19 pandemic, SMEs have implemented several crisis management tactics, including bricolage-coping measures, to increase their organizational resilience (Park & Seo, 2024). In this context, a bricolage approach could result in more flexible and diversified trials with alternative solutions to resource constraint challenges and attain a resilient recovery (Park & Seo, 2024). One such tactic is entrepreneurial digital bricolage. This includes, amongst others, an organizations' response to a crisis (e.g., COVID-19), where the organization switches between physical and remote work (Cui et al., 2021). Rüling and Duymedjian (2014) define digital bricolage as a type of bricolage that involves digital resources and tools. Karanasios et al. (2022) presented the finding that micro-enterprises use a set of practices to repurpose, improve, and assign value to limited resources. They also create digital and non-digital resource configurations for multichannel and lean support of business operations.

Improvisation and innovative combinations of resources can be driving forces behind resilience-building processes in wartime, which is characterized by an acute shortage of resources and unpredictability. By describing how businesses "make do" with the resources available to them to overcome disruptions, we believe that the theory of entrepreneurial bricolage and its extension to digital resources complements the concept of digital resilience by offering a view of how businesses mobilize digital resources and skills to achieve resistance and recovery.

3. Participants and methods

This study draws on semi-structured interviews with 15 owner/managers of micro, small and medium-sized businesses operating in Ukraine during the war. The definition of SMEs was used following the EU recommendation 2003/361regulation (European Commission, 2003). The sample consisted of 2 micro, 8 small and 5 medium sized companies. Micro, small, and medium enterprises all operate with limited resources, but by including variation in the sample, the diversity of their experiences was captured.

Participants represented diverse industries as selecting companies facing similar situations (in our case, war adaptation) but in different "places" (in our case, industries) helps to generalize the findings (Eisenhardt, 2021). All the businesses interviewed were originally founded and continue to operate in Ukraine. While some have relocated parts of their operations, supply chains, or sales channels abroad since the onset of the war, their core business activities remain rooted in Ukraine. Furthermore, it is important to note that this study does not focus exclusively on digital companies. Digital technologies are affecting businesses in all industries, including those that are not digital in nature. Following similar approaches to crisis research, a small sample size was chosen to allow for in-depth analysis, theory building, and theoretical generalizations (Buchanan & Denyer, 2013; Hycner, 1985; Eisenhardt & Graebner, 2007).

For the present study, the ethical considerations involve the confidentiality of the participants and their businesses. Participants were notified about the purpose of the data collection and the nature of the research. The confidentiality and anonymity of participants were guaranteed throughout the research procedure. The real names of the participants or their businesses were not used and were coded through the data collection and analysis process. Their verbal consent was collected.

The interviews were carried out in two phases: August 2024 and March–April 2025. All interviews were conducted one-on-one via Zoom and lasted between 10 and 35 minutes. The original language of data collection was Ukrainian to secure full understanding and inclusivity of the subjects. In line with Creswell (2009), semi-structured interviews were chosen to enable the emergence of new themes and ensure a rich understanding of the phenomena studied. The interview questions were designed to gather comprehensive insights into various aspects of the participants' business experiences. The questions were categorized into four main sections: general questions, exploring the impacts of war, adapting to challenges, and future outlook to capture their experiences and the role of digital technologies. The data collection started with the baseline assumption that the Ukrainian government's provision of digital services would contribute to firms' digital resilience during the war. Accordingly, the initial phase of interviews (total of 9) focused on exploring how entrepreneurs leveraged these digital governmental services to sustain and adapt their businesses. Participants were asked about their experiences using these services and the extent to which they facilitated business continuity and adaptation. However, upon analyzing the interview data, it became evident that digital governmental services did not play a crucial role in fostering digital resilience as initially anticipated. This led to a reconsideration of the study's focus, shifting attention towards how entrepreneurs produce digital resilience.

For analysis, the study followed Creswell's (2009) six-step approach to qualitative data analysis. Transcripts were first prepared and translated from Ukrainian to English using Sonix AI. MAXQDA was then used for thematic coding. The following themes have been discerned in the analysis of interviews: (1) Prior crises adapted digital infrastructure, (2) Digital government platforms, (3) Using digital tools to quickly adapt supply and demand sides, (4) Improvising and reconfiguring information systems (5) Adapting existing hardware to become resistant, (6) Setting cognitive frame on quick adaptation.

4. Results

The following results should be seen in the context of Ukraine's wartime conditions, which are shaped by severe economic contraction alongside rapid advances in digital transformation. First, due to the war, Ukraine's real GDP fell by 29.1% in 2022, the sharpest decline in its history, bringing the economy back to early 2000s levels (Pogarska, 2023). Second, even before the full-scale invasion, Ukraine had been advancing digitally; for example, the Ministry of Digital Transformation launched Diia.Business in 2020 - a nationwide project to support entrepreneurship and exports (Diia, n.d.). Building on this trajectory, Ukrainian researchers found that digitization played a key role in maintaining

financial stability and basic living standards during the invasion's early weeks. They identified the strongest link between digital government and digital business (Shkolnyk et al., 2022). Therefore, this study should be interpreted within Ukraine's specific circumstances.

4.1. Prior crises adapted digital infrastructure (continuity)

Adaptations to digital resources through previous crises, particularly responses during COVID-19, laid the groundwork for SMEs becoming more digitally resilient through decentralized digital infrastructures and remote work. Entrepreneurs leveraged digital resources and remote work habits formed during COVID to quickly continue working after the war broke out. Entrepreneurs directly linked their operational survival to this shift: *"In fact, we all went online, and we all learned how to build remote processes. And I think this is what basically saved the Ukrainian economy... I would say that now it is probably 99% digital, in fact, with the beginning of the lockdown quarantine, we have transferred those activities that were offline" (C2.3).* Digital infrastructures provided immediate business continuity during the crisis, enabling companies to maintain workflows and coordinate staff in the face of disruption. From project management systems to communication apps, these tools became the backbone of remote operations, enabling teams to stay connected and productive regardless of physical distance. Firms that have previously digitized their operations have been able to move to a fully remote work environment almost seamlessly: *"I think we were greatly helped by the fact that before the war, there was a COVID with quarantine and it taught everyone how to work online... Accordingly, with the start of the full-scale invasion, it was easier, because the ecosystem had already been built, how to work on a full remote and how to organize a team" (C2.1).*

Continuation of remote work practices became vital when in-person activities were impeded by bombings or blackouts. Some companies have kept remote working practices post-pandemic, leaving many of the digital tools enabling such work in place. Those who abandoned these practices have returned to them because they already knew how to integrate remote work into continuous operations. In Interview 1.6, a participant stated: *"Also in connection with all the problems with the shelling and mobilization, remote work has become a daily practice, which has not been the case since COVID" (C1.6)*. In this way, entrepreneurs demonstrated bricolage by drawing on familiar digital resources and organizational work practices of remote work, using them in new configurations to respond effectively to the evolving crisis.

Previous exposure to major shocks, such as the global pandemic, acted as a primer for resilience, allowing companies to layer new adaptations on top of existing ones. This layered adaptation facilitated quick decision-making under new constraints, such as physical distance between employees, curfews, or times of lethal danger. Several participants noted that they did not need to re-learn how to coordinate with digital tools or remotely manage each other; instead, they repurposed earlier solutions and intensified their use under wartime conditions. This suggests that resilience carries potentials of path-dependency, emerging from not only current responses but also from accumulated learnings, previous system configurations, and embedded digital practices.

4.2. Digital government platforms

Digital platforms provided by the Federal government, such as the "Diia" platform, supported business continuity during the war through decentralization and decoupling of public services from physical proximity. These required simplifications of administrative tasks, lowering the costs of bureaucracy in the process.

Entrepreneurs widely recognized that the "Diia" platforms developed by the Ministry of Digital Transformation of Ukraine significantly reduced bureaucratic barriers that could otherwise have been an obstacle to business operations in wartime. *"I think if we had such bureaucracy as in some European countries, let's just say it's simply impossible. This is incompatible with life... That is, there is no chance to simply coexist, to do business during the war, if you are so slow, if you are so uncompetitive" (C2.5).* Although the services offered were not seen as groundbreaking, they were consistently praised for speeding up processes, increasing convenience, and saving operational costs: "*These services help optimize business costs and help optimize the number of employees. They speed up the work" (C1.6)*. Interviews 1.4, 1.8 and 2.5 said, *"It would have taken longer" (C1.4). 'Without these digital services - yes, it would be much more difficult" (C1.8), "It's convenient. It really saves a lot of money, time, and human resources and this is a very powerful thing" (C2.5).*

The war resulted in a shortage of human resources, as many male employees were subject to military service. The reservation function in "Diia" provided a mechanism to temporarily retain critical staff through a quick and efficient dismissal process. "Diia" thereby

allowed businesses to continue operation in a wartime environment by reducing the time employees spend with administrative tasks: "We *have fewer really qualified personnel, and we have not yet grown new ones…the Diia platform helps, because there in two clicks, I can do reservation in two minutes" (C2.2).* Moreover, it provided new sources for obtaining funds and maintaining financial flows. Interview 1.9 noted how "Diia" facilitated government grants that helped business purchase be deemed as essential equipment: *"I also used the E.robota program... I received this grant, and it helped me. I bought equipment with this grant" (C1.9).*

Beyond costs, digital government services like "Diia" decoupled the administrative tasks from physical spaces. This was important not only because Ukrainian citizens had fewer opportunities to travel within the country, but also because the necessary procedures had to be carried out by people who were outside the country. Grant applications and document signing were made available to citizens abroad. This was vital as many employees and business owners have been relocated to safe countries, as described by Interview 2.4: *"The Diia for signing all the documents, of course, because, again, I'm in America, but nevertheless, I have the right to sign some documents there, for example, even when we apply for grants. Or the signing of post-grant documents and I can't be physically present, or I don't have a stamp. Of course, Diia simplifies everything in this sense... So, it's because I can't be physically present" (C2.4).* This shows adjustment to new wartime operational and geographic realities. It's not just about maintaining continuity; it's about modifying how operations are conducted in a fundamentally changed context.

Through digital government services, entrepreneurs were able to obtain access to public services that otherwise would not have been rightly available for bricolage in wartimes. On top of that, Interview 1.7 praised the platform for offering training seminars and support that helped with strategic adaptation: *"Now I use their program, Diia.Business, which has a lot of training seminars. They are very good at telling you what to do and how to do it. And they are assisting; they have a large support team" (C1.7)*. The use of "Diia.Business" reflects a clear example of adaptation, as entrepreneurs adjusted to new wartime realities by actively seeking strategic support and knowledge. This illustrates how businesses have turned to state resources not only to improve administrative efficiency, but also to copy successful work practices from other entrepreneurs who suffer under equal conditions, receive guidance and adapt their strategies in the face of uncertainty and rapid environmental change.

4.3. Using digital tools to quickly adapt supply and demand sides

In response to the cessation of domestic production, decrease in the domestic demand and collapse of financing, as well as supplier availability, many Ukrainian businesses have turned to changing the demand and supply side towards international actors to ensure survival and allow quicker recovery as a result of full-scale invasion. Several respondents highlighted that digital tools have played a key role in these efforts. For example, one company has shifted from domestic production of equipment to international partnerships, abandoning physical production in Ukraine due to security risks: *"That's why we stayed on the market, but we stopped producing hardware. In other words, we changed the company's strategy and abandoned one of the types of hardware products... through partnerships with Chinese companies that manufacture the products themselves" (C2.2).* Instead of relying on proprietary infrastructure, businesses repurpose open-source tools, informal networks, and globally active digital platforms to rapidly redesign their value chains and continue operating: *"We realized that we needed robots and what kind, we Googled and looked at what might be there, wrote to Chinese colleagues on LinkedIn, and contacted them by mail" (C2.2).*

Similarly, a high-tech enterprise in the space industry lost significant investments and relocated supply, considering that it could no longer test prototypes due to missile threats. To survive, it moved its testing to the US, while its engineering core remained in Ukraine: *"*[the owner] *gave me carte blanche to try to help the company develop in America, namely, to take the company from Ukraine to America and thus give the opportunity to take the engine out of the lab…our Ukrainian engineers, they do all the development, and they teach American engineers how to build the same engine, how to test it, and how to build this bigger rocket to go into space" (C2.4).* With engineers unable to relocate, the business improvised by keeping development in Ukraine and conducting full-scale testing in the U.S., training American engineers remotely. They adjusted to the new geopolitical reality and transformed into a globally distributed R&D model, using technology and international partnerships. This cross-border cooperation was made possible by the use of digital communication tools like Google Meet, WhatsApp, and Solidworks, allowing for secure, real-time knowledge transfer: *"we use Google Meet all the time, it's a regular tool for us, we use WhatsApp all the time. We constantly use all Google tools in terms of Google mail and Google chat... I know that my guys use Solidworks for engineering purposes. It's a program like Photoshop, but they store their drawings there and*

another engineer can open this drawing and also make his own edits, make them on the same drawing" (C2.4).

This reflects bricolage not only in combining existing tools creatively but also in coordinating human and technical resources across war-affected and stable regions. The recovery journey of this company thus illustrates adaptation to wartime constraints, and advancement toward a more resilient and internationally integrated operational model. By leveraging familiar digital tools in novel ways and improvising through remote collaboration.

For others, declining domestic demand, such as in the interior design sector, triggered a change towards international demand-sides through exports via digital platforms. Interviewer C1.9 states, *"I work in the field of decor in a country that is at war. They say that all this decor is not time-appropriate" (C1.9).* The solution was a pivot to international sales via the Etsy platform: "*We built our exports mainly on the Etsy online store" (C1.9).* Using an existing online marketplace to reach global customers without setting up new infrastructure represents adaptation and transformation through bricolage. While these platforms were rightly available, they required the entrepreneurs to partly change their practices of sales and delivery dramatically.

4.4. Improvising and reconfiguring information systems

Ukrainian SMEs demonstrated entrepreneurial bricolage by improvising and reconfiguring their information systems under conditions of extreme uncertainty and infrastructural disruption. These digital adaptations supported both resistance, through urgent operational continuity, and recovery, by enabling long-term adjustments and strategic redirection. On the resistance side, bricolage is evident in the creative use of blockchain-based financial tools to circumvent broken banking infrastructure to support employees at the beginning of the invasion: "*transfers through blockchain, in fact, crypto assets... helped a lot...we have many examples of teams paying salaries, helping relatives, transferring money to those who need it, supporting those who are left behind either in the occupation or near the frontline" (C2.5).*

From a recovery standpoint, firms reconfigured their systems to support new business models and reduce vulnerability. For instance, when forced to close physical outlets, businesses pivoted toward digital B2B operations with major retailers and adapted by integrating procurement platforms directly into their systems: "*We also closed half of our physical retail outlets... we began to work more with large chains such as Epicentr or Leroy Merlin" (C1.6).* And to do that more effectively they adapted their procurement solutions: *"If we are talking about some big clients like Epicentr, these are their personal solutions" (C1.6).* Recovery efforts also involved ethical and strategic choices, including the removal of software with Russian origins and blocking IPs associated with hostile actors: *"We were abandoning the remnants of some Russian software... This is 100% additional time, costs and money for the team to do this. But this fundamental component was important to us" (C2.3).* These efforts show how digital bricolage extends beyond continuity; it is also a means of building autonomy, security, and long-term adaptability.

4.5. Adapting existing hardware to become resistant

While much of the entrepreneurial adaptation relied on digital tools and organizational flexibility, the findings also reveal that physical hardware infrastructure was important in maintaining operational continuity during wartime disruption. Several ventures transformed their office environments into safe, functional spaces by equipping bomb shelters with heating, internet access, and water systems, often without any prior infrastructure in place. At first, this was meant to create an ad-hoc response to the wartime threats of rockets and drone attacks. Eventually, changes to physical hardware were vital to become resistant towards future threats: *"Our security was not very good, for example, we had no bomb shelters… Now we have re-equipped them, and in fact, we are doing well. But it was not obvious, and we had to set them up so that people could get heat, internet, water, and some kind of warning system to provide access to them." (C2.5).* Others implemented hybrid models to reduce risk exposure by partially shifting staff to remote work while securing physical safety on-site: *"In addition to the fact that each of our offices has bunkers, we have perimeter bunkers, i.e., basements where you can hide. So, we have moved our employees to a partial home office so that people can also be at home, if possible" (C1.2).*

An important element to becoming resistant beyond physical protection was decentralization of digital infrastructures. In order to safeguard operational continuity, entrepreneurs relocated digital infrastructure that was considered critical abroad. One participant noted: *"We moved this part from Ukraine to Germany, for example, to the servers, so that it can be used during blackouts and when there are massive attacks. We've had situations where several data centers went down, and it's good to have backups, additional copies that can be quickly deployed." (C 2.1).* Entrepreneurs also turned to Starlink, a satellite internet solution deployed through the combined efforts of the Ministry of Digital Transformation and private partnerships, to ensure

connectivity during crises: *"We got into those companies that were distributed there at the beginning of the war through the Ministry of Digital Transformation and Elon Musk... we have Starlink" (C 2.2).*

4.6. Setting cognitive frame on quick adaptation

Beyond technical adaptations, the interviews revealed that bricolage functioned as a deeper cognitive frame for the entrepreneurs, i.e., a way of thinking and raising action under conditions of uncertainty, urgency, and constraint. Rather than relying on fixed strategies or linear planning, participants described a fluid, solution-first orientation that emphasized action over deliberation. As one founder put it: "*you don't look at the problem as a problem. It's simple, it's a question that needs to be solved, and you solve it in one way or another... we start with something that can be done to make it work" (C2.5).* This cognitive frame prioritized improvisation and openness to iterate for resilience, especially when conventional pathways were blocked. Entrepreneurs frequently operated with the understanding that there was no single "right" way forward. Instead, success came from the ability to explore and combine multiple possible responses: *"We actually look for all solutions and use all solutions. There is no single algorithm. Algorithms change every day" (C1.7).*

This mode of operating was not passive or reactive—it involved intensive, continuous efforts to mobilize available resources and relational capital: "*I would say that it is about the speed of decisions and maximizing the use of all the opportunities that are available... We definitely did not have the opportunity to even sit down and think about strategy here....we started to hustle a lot... to do anything, to reach out, to raise partners, to raise companies, organizations with which we once cooperated, to look for some options for what we have"(C2.3).*

When brought together, these accounts show bricolage as a dynamic, improvisational process rooted in a distinctive cognitive frame. It reflects a fundamental shift in how entrepreneurs interpreted the crisis, not as barriers, but as open-ended challenges demanding creativity, persistence, and flexible experimentation. Digital tools and work practices engaging with these tools were vital elements to these experiments due to their lack of physicality.

5. Discussion

This paper highlights how Ukrainian SMEs are actively using digital resources as adaptive instruments for resistance and recovery in the face of high uncertainty. Instead of becoming passive victims of disruption, entrepreneurs have participated in bricolage, which involves improvising with existing tools, infrastructures, and networks to support operations, preserve assets, and rearrange business models.

First, our study shows that pre-existing digital capabilities from prior crises, such as from the COVID-19 pandemic, served as a foundation for resilience, allowing companies to adapt quickly when the war broke out, when front lines shifted, and new types of attacks were launched. This highlights digital resilience as an outcome of an accumulative process, where past adaptations to crises produced digital resources and practices that could be picked up on in future ones. We thereby find a close connection between attempts to recover and build the capacity to resist in the future (Boh et al., 2023). When facing a crisis like war, we learned that entrepreneurs produce new practices that allow quick recovery but make organizations also more resistant in the future. Highlighting the role of adaptive culture, where being open to experimentation enables entities to face new threats from previous experiences, tested practices (Boh et al., 2023) and the adjustment of existing practices or the invention of new ones (Tim & Leidner, 2023). Such newly formed practices remain available to entrepreneurs in future crises. They can easily be called upon and stay in the cognitive frame of an entrepreneur who seeks to experiment with potential solutions to a threat. Entrepreneurs accumulate digital resources through unplanned encounters, gradually building a stock of technologies that can be recombined to produce positive business outcomes (Karanasios et al., 2022).

Second, experimentation with digital tools for continuing operational processes, or changing demand and supply sides, has put an increasing set of digital tools into the cognitive frame of entrepreneurs. We realized that the entrepreneurs prioritized solutions that allowed them to increasingly work remotely and make them independent from the physical vicinity or physical threats. This was most vivid for vital public services and critical infrastructures. This prioritization of experiments towards resistance implies that experimentations primed the cognitive frame of the entrepreneurs increasingly on solutions that help them become more resistant. Our observations thereby extend and exemplify what Rüling and Duymedjian (2014) emphasize as digital bricolage that involves trial and error, layering, and assembling of existing digital

resources to reach a configuration that "works" under uncertain and fragmented conditions.

Moreover, the role of IS in major shocks is neither static nor purely technical; it is deeply linked to entrepreneurial decisions and the constant recalibration of systems and strategies in real-time. When contextualizing the research question "How do ventures create digital resilience during war?" this study discovered that under conditions of extreme uncertainty, Ukrainian SMEs did not follow linear recovery plans but rather engaged in bricolage—improvising with whatever digital and physical resources were immediately available. They repurposed pandemic-era digital infrastructures and tools, adapted existing platforms to new functions, and experimented with digital solutions to support operations and respond to threats.

6. Conclusions, limitations, and future research

This study sheds light on how Ukrainian SMEs demonstrate digital resilience in the extreme context of war, revealing that such resilience is not only possible but actively constructed through bricolage. Findings show that digital resilience emerges as a cumulative and cognitive process - entrepreneurs build on previous crisis experiences (e.g., the COVID-19 pandemic) by maintaining effective practices that remain cognitively available for future threats. These practices are becoming part of the adaptive cognitive frame of entrepreneurs, who are increasingly experimenting with digital solutions aimed at operational independence and resilience to physical risks. Thus, experimentation is not only reactive but also strategically shapes the cognitive system of entrepreneurs, making them better prepared for the next major shocks. Furthermore, the study highlights that the digital resilience of SMEs is closely linked to context-specific bricolage, where trial and error, layering, and recombination of digital resources become the main methods of navigating in the face of fragmentation and uncertainty.

This study is limited by its focus on a specific geopolitical context, which may affect the generalizability of the findings to other regions or types of crises. The results of the study provide an initial understanding of how businesses stayed resilient during the Russian war in Ukraine. However, some areas remain unexplored, and further research could deepen the findings of this study. This paper looked at companies from a variety of industries. Therefore, sectoral studies could provide more detailed information.

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