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A Systematic Literature Review on Digital Resilience in Organizations: Towards a Conceptualization

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Abstract

The COVID-19 pandemic has been a source of major disruption for organizations and society. This dramatic situation urged the Information System (IS) community to further investigate how potentials of IS were used to cope with such shocks. In this paper, we respond to the recent calls in IS research for a better understanding of digital resilience (DR). The rapid and sporadic growth of knowledge on this emerging notion calls for a comprehensive review. Using a systematic literature review method, we aim to contribute to a clearer conceptualization of DR. First, we distinguish several levels of analysis on DR in the literature: resilience of the IS-user (RIU), resilience of the IT infrastructure (RITI) and resilience of wider systems (RWS). Second, different perspectives on DR are highlighted: resilience through digital and resilience to digital.

Keywords: Digital Resilience, Organizational resilience, Systematic review.

1. Introduction

Recent crises (especially COVID-19 pandemic) highlight the need for organizations to develop their ability to cope with uncertainty when they are confronted to major exogenous shocks (i.e., the “black swans”, Taleb, 2013). This dramatic situation has been an opportunity for the Information System (IS) community to further investigate how potentials of digital technologies were used to cope with such shocks (Sein, 2020).

This paper aims to take part to this discussion in further exploring the notion of Digital Resilience (DR) (Boh et al., 2020, Rai et al., 2020b). The interest in this topic can notably be measured through the number of influent conferences and symposiums interested in DR (e.g., ICIS 2021; ECIS 2021; HICCS 2021; AIM 2022). In this paper, we define DR as “*the property of an IS to increase the ability of its wider system, to prevent, anticipate, absorb, and adapt to shocks while satisfying*

a sufficient resilience of itself and of its input systems”. By wider system, we mean any entity (e.g., an individual, an organization, a community etc.) that benefits from the design, deployment, and the use of the IS. In this paper, we focus on DR within organizations. We conduct a Systematic Literature Review (SLR) drawing on existing works to address the following research question: What is the current state of research regarding the conceptualization of digital resilience within organizations?

The challenge of this SLR is therefore to identify relevant papers exploring DR but also Organizational Resilience (OR) related to digital. This particularity calls for a specific SLR method. In the next sections, we describe the methodology and present our findings. Lastly, we discuss these findings and suggest directions for future research.

2. Methodology

We argue that the field of OR presents relevant insights to understand the emerging notion of DR within organizations. OR is defined as “*how organizations continue to achieve desirable outcomes amidst adversity, strain, and significant barriers to adaptation or development*” (Vogus & Sutcliffe, 2007). The objective is to gather papers on OR and digital on the one hand, and on what appears directly under the term of DR in the literature on the other hand. We seek to gather knowledge on “*digital resilience*” as well as on “*organizational resilience AND digital*”. We perform a SLR of relevant publications within the IS and management literature, carrying out a computerized search of the literature enquiring Business Source Complete (Ebsco) and Web of Science (WoS) library services. We use a combination of 2 databases to ensure a satisfactory representation of the literature (Bramer et al. 2017). The bibliography software Zotero helps in managing references. The articles identification is proceeded by keyword-based search on these 2 databases: one is done by searching the term “*digital resilience*”, the other by coupling the term

“organizational resilience” with the Boolean operator “and” and multiple terms that refer to *digital* in the literature (table 1). Hence, the first step of the SLR is to search papers under the term *digital resilien** into Ebsco and WoS search engine (table 1) (6/51 papers). For the second step, we couple the term “*organization* resilien**” with a total of 9 terms for *digital* (41/51 papers). The keywords referring to digital are found inductively through an exploratory literature review on DR and digital transformation. We keep the keywords that appeared the most in the literature and ensure a satisfying exhaustivity of topics related to digital technologies in the IS and management literature. To this extent, the SMACIT (*Social; Mobile; Analytics; Cloud; Internet of Things*) acronym, referring to the most current digital technologies (Sebastian et al., 2017), is particularly helpful. Other terms related to digital are also added such as Artificial Intelligence (AI) (Rai, 2020b) and Distributed Ledger Technology (DLT) (Fraga-Lamas & Fernandez-Caramés, 2019). Drawing on existing methodological framework (Tranfield et al., 2003), the SLR is performed on a multilevel process to identify and summarize the fragmented literature on DR.

Table 1. Search string table

Scientific databases	Search string
Web of Science	TS= ("digital resilien*")
Web of Science	TS= ("organization* resilien*") AND TS= ("digital technolog*" OR "emerg* technolog*" OR "social media" OR "IT" OR "informat* technolog*" OR "AI" OR "artificial intelligence" OR "IOT" OR "internet of thing*" OR "big data" OR "analy*" OR "cloud" OR "DLT" OR "distribut* ledger technolog*")
Business Source Complete	TI "digital resilien*" OR AB "digital resilien*" OR KW "digital resilien*"
Business Source Complete	TI "organization* resilien*" OR AB "organization* resilien*" AND AB ("digital technolog*" OR "emerg* technolog*" OR "social media" OR "IT" OR "informat* technolog*" OR "AI" OR "artificial intelligence" OR "IOT" OR "internet of thing*" OR "big data" OR "analy*" OR "cloud" OR "DLT" OR "distribut* ledger technolog*")

Following established methods and protocols (Paul and Criado, 2020; Conz and Magnani, 2020) and to provide a clear understanding and replicability of our method, we adopt a step-by-step approach (figure 1 in [appendix](#)). We operate a format screening to eliminate all non-peer-reviewed article, and all papers from journals lower than B in the ranking of Australian Business Dean Council (ABDC) as recommended for systematic literature review (Paul and Criado, 2020). We accept empirical papers as well as conceptual papers. A screening on content was performed, based on

title and abstract, and later the full text. We kept the articles that fit our definition of DR in the context of organizations. Finally, to get an overview on DR as updated as it can be, we operate the manual addition of proceedings papers from leading conferences in the IS discipline (AIS library and HICCS) (16/51 papers) as it is particularly relevant to include them when studying an emerging notion (Bandara et al., 2015).

The analysis part is done following existing guidelines (Bandara et al., 2015) on the software N’Vivo 12. We first code all definitions of resilience, the levels of analysis, the theoretical foundations, the digital technologies studied, the nature of each paper (conceptual or empirical), the type of shocks mentioned, the type of methodology. A first skimming through the corpus let us also observe two perspectives on DR (table 4 in [appendix](#)). The coding was first performed by a duo of authors (25% of the corpus) to ensure reliability. From this preliminary coding, we use the grounded theory (Langley & Abdallah, 2015) to see bigger categories emerging from our corpus.

3. Findings

3.1 Meta-analysis of the literature on DR

To get a complete overview of the literature on DR, the 51 papers of our corpus were read and classified into different categories regarding criteria mentioned above. As such, we describe and explain these criteria and categories. This preliminary work offers an comprehensive visual representation of the state of the literature that supports the conceptualization of DR (table 4 in [appendix](#)).

Before going deeper into coding, we begin by organizing the corpus according to a range of potentially relevant information. As the paper type has not been an exclusion/inclusion criterion in the constitution of the corpus, we distinguish each paper between *Empirical* (34/51), *Conceptual* (4/51), *Literature Review* (8/51) or *Call for Contributions* (5/51). We then coded for each paper the type of methodology they used: *Qualitative* (19/34), *Quantitative* (13/34), *Mixed* (2/34) and *n/a* (i.e., *non-applicable*, for non-empirical papers).

Following this stage of organizing the corpus, the papers were classified regarding *shock, perspective, level of analysis and theoretical lens*. First, the concept of resilience is ontologically linked to a shock. Thus, we coded the shocks that were put forward by authors to conduct studies on resilience. We inductively coded the shocks into 4 categories: *Cyberthreats* (6/51), *Natural and man-made hazards (N&M hazards)* (7/51), *Market and technological changes (M&T changes)* (10/51) and *COVID-19* (28/51).

Then, in order to better understand the DR *perspective*, we coded the corpus into two categories: *Resilience “TO” digital* (9/51) and *Resilience “THROUGH” digital* (42/51). It is interesting to note that both perspectives on DR exist in the literature. This work is therefore an opportunity to address the issue: “Are we talking about a resilience *to* digital or a resilience *through* digital?”. We argue that these two perspectives should be considered when talking about DR. For example, we could discuss IT-enabled resilience and resilience against IT. One sees the design, deployment, and use of digital technologies as an opportunity for resilience when the other sees it as a threat. As DR cannot only be a solution to external disruptions, neither can it be the only source of disruption. It is interesting however to note that there is an major representation of the perspective of DR as resilience *through* digital (42/51) rather than *to* digital (9/51). This reflects a certain optimism from the academic IS and management communities towards the future of digital solutions to tackle disruptions. This also confirms a direction taken by the scientific community and likely accelerated by the definition of DR of Boh et al. (2020) in their call for contributions (MISQ).

Finally, it is interesting to compare these data the different *levels of analysis* of DR. Heeks and Ospina (2019), followed by Schemmer et al. (2021), recognize the existence of several levels of analysis in DR. DR may thus concern the entities that constitute the IS (“*IS inputs systems*”, Heeks & Ospina, 2019). In a socio-technical vision of the IS, we consider users of the IS and technologies (softwares and machines) as the IS inputs systems (Schemmer et al., 2021). We also consider the entity that benefits from the exploitation of the IS, in our case, the organization. Drawing on these works, we coded different levels of analysis of DR, namely *resilience of IS users (RIU)* (7/51), *resilience of the technological infrastructure (RITI)* (7/51) and *resilience of “wider” systems (RWS)* (37/51). Considering our search string (coupling *organizational resilience* – i.e., wider system resilience – and *digital*), it is not surprising to find most papers focusing on RWS. Moreover, the main agenda has been resilience of wider social systems (Heeks & Ospina, 2019). Finally, the presence of papers focusing on resilience of IS inputs systems in the context of organizations is interesting. Indeed, these results raise questions on a possible link between RIU and RITI toward RWS (e.g., “Would organizational resilience benefit from increased RIU?”).

Although not always explicitly mentioned, authors have been using different theoretical backgrounds to study DR. After identifying each theoretical background, we coded those into bigger categories (*theoretical lenses*) such as *Resources* (i.e., dynamic capabilities, Business model innovation, Resource-

based view, etc.), *Usages* (i.e., sociomateriality, theory of effective use, etc.), *Culture* (organizational learning, entrepreneurial bricolage, agility, improvisation, etc.), *Context* (communication, sensemaking, enacting, etc.), *Psychology* (broaden-build theory, coping strategy), IT adoption (TAM, UTAUT, etc.). Authors discussing RIU brought theoretical backgrounds from *Psychology*, *Adoption* and *Usage* when RITI was studied under the scope of *Resource* and *Context*. Lastly, most of RWS papers adopted an approach on *Resource*, but also *Culture*, *Usage* and *Context* (table 4 in [appendix](#)).

Thus, the information above offers an overview of the literature on DR. Notably, the two criteria of *level of analysis* and *perspectives* are particularly relevant to grasp a holistic meaning of DR: the concept of DR can be treated under different levels of analysis and different perspectives.

3.2 Conceptualizing DR

We draw on “the triangle of meaning” (Ogden & Richards, 1923) for DR conceptualizing. The authors argue that “*in the analysis of the senses of « meaning », it is desirable to begin with the relations of thoughts, words and things as they are found in cases of reflective speech*”. Dumez (2011) suggests using the triangle of meaning to describe what a concept is, shedding light on three articulated attributes: denomination (i.e., “*words*”), comprehension (i.e., “*things*”), and extension (i.e., “*thoughts*”) (table 2). A concept can thus be explained through each of these elements. Denomination refers to the name of the concept, in our case, Digital Resilience. Comprehension relates to the definition of the concept (table 3 in [appendix](#)). This definition is the result of a synthesis of the definitions of DR (n=7) in the corpus. Lastly, the extension covers the empirical cases to which the concept will (and will not) apply. We give examples from the corpus for each case of DR presented.

Table 2. Towards a conceptualization of digital resilience

Denomination	Digital Resilience (Al-Abdulghani et al. 2021; Boh et al. 2021; Schemmer et al. 2021; etc.)
Comprehension	“ <i>The property of an IS to increase the ability of its wider system, such as the organization, to prevent, anticipate, absorb, and adapt to shocks while satisfying a sufficient resilience of itself and of its input systems</i> ” (table 3 in appendix)
Extension	We acknowledge the existence of different perspectives of DR (<i>resilience “THROUGH” digital</i> and <i>resilience “TO” digital</i>) as well as different level of analysis (“RIU”, “RITI” and “RWS”).

Considering two different perspectives and three different levels of analysis of DR, we recognize the existence of six (i.e., 2 perspectives * 3 levels of analysis) different cases of DR. We illustrate below these 6 cases, naming them regarding their respective perspective and level of analysis. “*TO+RIU*”: Kohn (2020) shows that employees with high digital security resilience perform significantly better in securing and updating devices, generating passwords, and demonstrating a proactive awareness. It emphasizes the importance of DR training in organizations to cope with adverse cyber events. “*TO+RITI*”: Some papers have been identifying and suggesting organizational resources to increase RITI capacity. For example, Annarelli et al. (2021) develop a framework for cyber-resilience from multiple case studies, drawing IT actions at every stage of resilience (planning/preparing, absorbing, recovering, and adapting). “*TO+RWS*”: Parra et al. (2021) argue that social network algorithms can contribute to radicalizing viewpoints within various communities (e.g., fake news during COVID-19). Since these negative effects are counter-productive with a resilient response to crisis, empowering individuals and communities to develop digital critical thinking is crucial. From an organizational point of view, using digital technologies can sometimes be counterproductive as well (e.g., the millefeuille theory, Kalika et al., 2007). “*THROUGH+RIU*”: Kohn (2020b) that digitally resilient employees are better able to deal with uncertainty and change using IS and digital channels. The author focuses on remote work as a capacity that has been developed by employees over the COVID-19 pandemic and will most likely be routinized in the long run, thus enabling a quicker adaptation when potentially facing such disruptive events. “*THROUGH+RITI*”: Schemmer et al. (2021) explains how AI-based SI in the airline industry can be vulnerable to exogenous shocks such as the COVID-19 pandemic by projecting wrong figure forecasts. By using *concept drift detection*, this AI-based IS can quickly detect changes in the data distribution and adjust accordingly. “*THROUGH+RWS*”: is the most represented case in our corpus. For example, the digitization of the channels in the health industry helped these organizations to adapt during COVID-19. Furthermore, it provides new opportunities such as the possibility of big data analytics in the health industry to enable better preparedness and learning (understanding of external context, anticipating changes, identifying best practices) (Shaffer et al., 2021).

The adoption of this unifying conception posits DR as an umbrella, interdisciplinary concept that is to become an important area in the academic literature in a digitized and uncertain world.

4. Discussion and Research Outlooks

In this article, we conceptualize DR in order to offer clearer overview on this notion. Our corpus analysis revealed different levels of analysis on DR. We recognize the resilience of the IS inputs (RIU and RITI) and the resilience of the IS wider systems (RWS). Furthermore, we distinguish two perspectives on DR which are resilience *through* digital and resilience *to* digital. In line with these preliminary findings, we discuss additional points.

As it has been presented in this paper, IS inputs (IS-users and IT infrastructure) face disruptions that justify the necessity of building a resilience for these actors. Future research could further explore the individual coping mechanism linked to the introduction of new digital infrastructures and processes using IT adoption theories (eg. TAM4; TTF; Innovation diffusion). Indeed, only one paper in our corpus used this theoretical background. On another matter, other IS inputs than IS user and IT infrastructure could influence DR as well. Future studies could explore the role of resilience of data in time of crisis (eg. how to respond to a decrease or an overflow of data collected? How to digitize new or unknown data? etc.).

Furthermore, the distinction made between RIU, RITI and RWS questions a possible link between the levels of analysis of DR. In other words, do IS-inputs resilience have an impact on OR? This issue could be addressed qualitatively and quantitatively. In a qualitative method, one could for example, in a longitudinal case study, look at how the *RIU* have affected the organization capacity to prevent, absorb, recover, and adapt from a particular shock. We emphasize as well on the need for more quantitative research on DR. DR does not have a well-known and recognized model to be measured. Future research could exploit previous works of conceptualization to build a model for measuring DR. One could for example reuse attributes of DR (e.g., Heeks & Ospina, 2019; Tim et al., 2020; Al-Abdulghani et al., 2021) and apply scales on them. This also raises issues on what is a good indicator of a resilient organization. Should one look at economic or social indicators? Should these indicators be moderated by the scores of other organizations in the same sector?

The present work recognizes differences in terms of DR level of analysis and acknowledges the existence of two different perspectives of DR. Our proposition of distinguishing DR regarding these two criteria (*level of analysis* and *perspectives*) address the problem of a sporadic literature and offers a clearer overview on this concept to the academic IS and management community. Scholars studying DR could use this frame to posit their future work in the literature.

We highlight the over-representation in our corpus of the perspective of DR as resilience *through* digital as opposed to resilience *to* digital. While it is not surprising considering the direction given by the latest calls for contributions (Boh et al., 2020; Rai et al., 2020b), we argue that both perspectives of DR are necessary and resilience *to* digital could draw more attention in the academic community. There is indeed a risk to not considering the challenges and threats that digital technologies applications represent (security, privacy, biases, ethics). The IS academic community should address these issues and demonstrate critical thinking toward the deployment and use of these technologies. It was also insightful to note most papers are treating DR to the scope of the COVID-19 pandemic. While this dramatic event represents an opportunity for research and has been driving studies on resilience (Sein, 2020), we also suggest applying existing knowledge to new scenarios we can expect to face in the future (e.g., climate change and its consequences).

5. Conclusion

In this paper, we addressed the recent calls in IS research for a better understanding of DR. We are getting deeper into a conceptualization of DR, drawing upon existing works (Heeks & Ospina, 2019; Schemmer et al., 2021) and classifying the literature on DR according to a range of criteria. On an ontological level, we first acknowledged explicitly the role of DR toward wider systems (i.e., organizations, communities, society) but also toward systems at the entry of the IS such as resilience of the IS-users and the IT infrastructure. Two perspectives on DR are acknowledged: a resilience *through* the design, deployment and use of digital technologies and a resilience *to* digital disruptions. On a theoretical level, this paper helps scholars to position their work and provides a clear overview of the existing literature.

Our review does not come without limitations. First, the literature on DR is quickly growing. Therefore, periodic systematic reviews will be necessary to apprehend this concept over time. Second, we contribute to the conceptualization of DR in this paper. For matter of length limitations, we did not present any state of knowledge nor any guidelines for practitioners regarding DR. We will later mobilize the selected set of papers above to complete this work with more insights. Lastly, for our methodological approach, we chose to identify selective search strings that focus on DR within organizations. However, other research could adopt a different focus (e.g., individuals, governments, etc.).

The COVID-19 pandemic has greatly pushed forward the digitalization of organizations and research on digital toward resilience. As mentioned earlier, the

COVID-19 pandemic was a catalyst to DR building processes for many organizations. IS, technology scholars, and practitioners should not wait for the next black swan (i.e., major disruption) to explore DR. Instead, we must continue to study this concept and apply new knowledge to contexts other than the pandemic.

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