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Resilience Against Crises: COVID-19 and Lessons from Natural Disasters

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Resilience Against Crises: COVID-19 and Lessons from Natural Disasters

Abstract

Pandemics and natural disasters – what do they have in common? Both disrupt social and organisational practices. Both call for resilience in society. Information systems can foster and enhance the resilience of people, communities and organisations by strengthening their ability to adapt to uncertainty, enabling a transition towards an appropriate restoration of order in society. COVID-19 has caused significant disturbances at all societal levels. The impacts range from national lockdowns to social distancing and self-isolation. Everyday practices and business processes are severed or have been halted. Resilience is needed. But how can we foster resilience in the face of a pandemic? What lessons can we learn from other crises like natural disasters? The purpose of this brief communication is to identify important insights from a study of the Great East Japan Earthquake of 2011 and illustrate how they are relevant to the current crisis. We identify the role of information systems in fostering resilience against crisis, and suggest some recommendations regarding transformation for resilience more generally.

Keywords: Pandemics, COVID-19, Coronavirus, Resilience, Natural Disasters

Introduction

We write these words in a state of national lockdown and cannot help but notice the damage caused by the novel Coronavirus disease or COVID-19. As of writing, the EU/EEA and the UK have been reported over 1 million (1,229,640) confirmed cases and 145,561 deaths (ECDC, 2020). Globally, there are over 4 million (4,038,747) confirmed cases and 279,468 deaths; the numbers are increasing every day.

COVID-19 has thrown many into a crisis. Entering crises like pandemics is, in many ways, like entering a new country. Previously unknown norms and regulations govern this country. It is difficult to foresee how one might adjust to this entry and how one should navigate and circumvent the problems in these new, uncertain situations. Previous studies show that technology is central to making sense of crises (e.g., Madon, 2005; Payton and Kiwanuka-Tondo, 2009). Indeed, the ongoing inquiry into understanding COVID-19 suggests that the effective management of such pandemics relies heavily on digital and data-driven solutions and resilient systems (e.g., Chen et al., 2020; Herrera et al., 2020; Djalante et al., 2020; Nembhard et al., 2020; Ting et al., 2020).

Pandemics can be seen as a form of natural disaster (at least in most cases). But what do other natural disasters and pandemics have in common? Indeed, they are more alike than different (Klemetti, 2020). For example, natural disasters equally affect businesses and society. Like pandemics, the everyday lives of people are severely disrupted by natural disasters such as hurricanes, floods, earthquakes, tsunami (Gulati et al., 2014) and fire (Hattar and Geary, 2017). Crises can also be in the form of catastrophes caused by human error (Spector, 2019). Nonetheless, the impacts of crises, disasters and other extreme events are "sudden, inconceivable, damaging, sensitive, and unique," requiring unconventional methodologies and practices (Buchanan and Denyer, 2013, p. 205) such as moving from a relief centric to a proactive approach. This allows the development of people's capacity in humanitarian operations (Goldschmidt and Kumar, 2016). This move is important because crises affect people and impair their practices (Bosher et al., 2019). Access to physical infrastructure is affected. People are displaced, uprooted or confined to certain places. In crises, it becomes difficult for governments and organisations to help communities and restore the previous order. In the current situation, some countries have been through or are still in a national or city level lockdown (e.g., UK, Italy, Spain, France, and many others). In a lockdown state, where possible, all non-essential business is to be conducted online, and people are to work from home. Many small and large organisations, including academic and research organisations, are forced to go partially or fully online. In the UK, the House of Commons made the historic move towards virtual proceedings (Parliament, 2020). In these uncertain times, the role of information systems is paramount (Rudra et al., 2018).

Resilience is required to deal with crises. The dominant paradigm of resilience asks for optimisation of parts of a system in order to make it robust (Walker and Salt, 2006). It falls short of grasping the dynamic complexity and precarity of systems, and thus risks failing to achieve resilience. Often there is a focus on making one aspect of society resilient while overlooking others – the weakest part of society is generally left out of discussions about resilience. More than a rebound, resilience is a person or system's ability to deal with disturbances while maintaining their core practices and goals (Walker and Salt, 2012). A general resilience thinking approach needs to be developed. Such a perspective sees resilience as a community condition that understands the world, comprises diverse systems (such as social, technological, spatial, and political) and accepts the precarity as given (Aldrich and Meyer, 2015).

In what follows, we first show how and what we can learn from natural disasters. We then draw insights from a previous study of the Great East Japan Earthquake of 2011 and discuss the role of digital technologies to foster resilience in crisis. We conclude with some recommendations and suggestions for future directions of pandemics-related studies in our field.

Crisis and Resilience

Natural disasters can throw societies into a crisis. On one hand, crises related to natural disasters, such as earthquakes and tsunami, cause powerful but short-term impacts that need immediate intervention; for example, the physical destruction of living and working places; issues related to access and mobility; and health-related problems. Elsewhere, we have discussed the issues surrounding the restoration of workplaces after a natural disaster (reference suppressed). On the other hand, crises like climate change and pandemics require long-term intervention. The impact of increased flooding, sea level rises, heavy rain and drought affects social conditions. An ultimate goal of long-term intervention is to mitigate potential risks or the vulnerability of geographical, physical infrastructure and social components, thus taking steps towards a more sustainable society (Marana et al., 2019).

In any crisis, socially and ecologically resilient systems are required to restore order. Natural disasters comprise complex ecological problems and lead to novel societal issues (Perrow, 1984). Often they require new and innovative solutions. Expected solutions are different as situations, damages and people's needs are unique owing to the local context (Sakurai et al., 2014). For instance, when earthquakes caused widespread destruction in Nepal in 2015, volunteers working in remote areas created a digital map showing the location of damaged areas (Poiani et al., 2016). During the 2010 Haiti Earthquake, data from Twitter and other social media was used to map and organise information about the affected population and regions (Earle, 2010).

The task of resilience is to reduce shocks and stresses on a certain system and increase capability to adapt to uncertainty (Barrios, 2016; Olsson et al., 2015). Conventionally, resilience is defined as a system's capacity to rebound to its original state, which suggests that resilience is a property of a system (Heeks and Ospina, 2019). This view is concerned with questions of the resilience of 'what', such as resilience of stakeholders or infrastructure. Examples include the building of resilience through training staff to prepare for pandemics (e.g., Aiello et al., 2011; Brown et al., 2019; Maunder et al., 2008), public–private collaborations (Boin and McConnell, 2007) and using communication to enhance specific resilience (Longstaff and Yang, 2008). Social and traditional media can increase communication and collaboration during crises (Palen and Hughes, 2018; for a study related to the Ebola crises, see Uzuegbunam et al., 2016). With an aim to optimise certain parts of a system, previous studies of pandemics have overlooked long-term adaptability and transformation, focusing on preparation for or mitigation of expected risks.

Other scholars have argued that resilience can be best seen as a community condition; resilience thinking suggests focusing on adaptability and transformation beyond mere rebound (Folke et al., 2010; Walker and Salt, 2012). It requires more than returning to the original state. The original state was unable to cope with immediate shocks and long-term stresses. Going back to that state would mean returning to the same uncertain position, albeit with gained knowledge of crises. For example, when Typhoon Hagibis hit Japan in October 2019, the existing communication structure only functioned for Japanese communities, not for foreigners (Nakagawa et al., 2019). Essential information that guided life-saving actions was not provided in the English language. Local knowledge is embedded in people's everyday practices, which inform evacuation procedures or who to consult. This local knowledge enables people or communities to adapt to an emerging

situation, whereas people outside local communities remain isolated. In a crisis, existing social system structures should be transformed by a new perspective, a way of resilience thinking.

Lessons from the Great East Japan Earthquake of 2011

We offer examples from our previous work related to the Great East Japan Earthquake of 2011 to illustrate the value of fostering resilience in a crisis (references suppressed). Looking back at what happened during this particular crisis, there are important lessons to be learnt, and many of its problems are similar to those in the current COVID-19 situation.

The first and foremost lesson is about resilience thinking. This requires going beyond efforts to restore order vis-à-vis rebound to the original state. In 2011, when the tsunami destroyed the physical buildings in the city of Rikuzentakata, resilience was seen as a knee jerk reaction to return to the previous non-crisis state. Officials quickly built a temporary office from scratch. They decided to relocate administrative functions elsewhere, but that caused further issues related to the destruction and the availability of resources for relief work. Thus, a recovery as returning to the pre-disaster state was not enough; resilience requires going beyond rebound, and must encourage adapting to the existing crisis and then transforming.

The second lesson is about adaptability, which is vital to enacting resilience in practice. A crisis impairs both the practices and their context. Resilience is required to adapt these practices to a crisis context. From this perspective, a system that cannot adapt to stress and absorb shocks is not a resilient system – it cannot adapt to the affected practices. We found many examples where cities and municipalities turned to a frugal approach to adapting to the disaster. Rikuzentakata, Kesennuma, Higashimatsushima, Iwaki, Minamisoma, Otsuchi, Futaba and Namie – all these cities developed their systems using basic existing digital tools, like Microsoft Excel, to organise and manage relief efforts in place of the national system. A related point is that it is possible that there is no original state to return to. In every case we studied, the disaster management operations were quite different from ordinary operations. The previously known stable state was no longer fit for purpose. The need to identify and verify the status of residents, open evacuation shelters, manage relief goods, and update information sharing emerged as priorities. This is generally accomplished using a local disaster management plan that defines the roles and actions of each local government department during an emergency. We observed in all cases that the plans often did not explain how to restore the associated information systems. Hence, the restoration was incomplete and did not fully meet the needs of crisis management.

The third lesson is about preparedness. Physical infrastructure, like buildings, communication networks and electricity, is generally taken for granted. When a combination of earthquake and tsunami cut off the power and damaged communication networks, most work had to be done manually. In some cases (e.g., cities of Minamisanriku and Rikuzentakata), the authorities had to resort to pen and paper to record data. In other cases (e.g., Minamisanriku), workers had to travel by foot to reach and report from the affected areas. Without resilient infrastructure, any effort towards restoration will face significant challenges and take longer to complete, if even possible. Preparedness must be addressed at all levels: local, regional and national. Disaster management often involves working with new structures that only emerge during or after a disaster. Hence in a crisis, a business continuity plan does not mean continuing *business as usual*; all levels of governments need to carefully consider relief operations while sustaining existing administrative and societal functions. This is also important because available resources are scarce during and after a disaster situation.

The fourth lesson is about information. This involves a) the availability of good data to build meaningful information and b) the quality, reliability and transmission of information to the concerned stakeholders. After the devastation caused by the tsunami, most residents of Minamisanriku were evacuated. Evacuation shelters were opened in multiple places. Some of those locations were not designed to be used in a crisis and were not connected to each other. The fragmented nature of these locations resulted in fragmented information sharing, which led to poor, unreliable or inconsistent data-related practices. For example, collected data included sensitive personal data, such as home addresses and phone numbers. Due to a difference in standards, in the city of Tono, the municipal government disclosed personal information to family or friends; but in other cases, the data was not shared. A policy on how to treat personal information under a crisis needs to be streamlined.

The fifth lesson is about engagement with the community. Without community involvement, resilience cannot be fully actualised. During relief work in Tono, regional staff worked with the local community, such as coordinating volunteers from around the nation, significantly improving the relief effort. Public–private collaboration played a central role in effective engagement with the community. In the case of Rikuzentakata and others, IT business operators helped cities to set up ICT environments suitable and necessary for business continuation. Local knowledge and familiarity also contribute to resilience. In the cities of Minamisoma, Kesennuma, and the towns of Futaba and Namie, when the existing digital infrastructure was destroyed, the managers relied on existing digital knowledge of workers to build tools for the management of disaster relief.

The sixth and final lesson is to focus on societal needs in an ethical manner. Societal needs do not necessarily change during a crisis. A crisis highlights the needs that are central to any functioning system. The earthquake affected local transport systems and communication networks, thus isolating a large number of inhabitants. Some people had to walk a long distance on foot to seek help. For example, a man from Otsuchi walked 45km to Tono for medical assistance and food. This simple but powerful example shows that basic societal needs present before crises become ever more visible and must be considered when enacting resilience.

Recommendations and Suggested Directions

Natural disasters expose the weakest points in people, communities and social infrastructures. A crisis reveals the weak connections among key stakeholders. These include issues related to information sharing, vulnerable communities such as the elderly and expectant mothers, and ageing infrastructures. We observe the same types of issues in the current COVID-19 situation. Following a natural disaster, many of us are forced to change our everyday and work practices. As of the time of writing, in most affected parts of the world, there is confusion and no consensus over when and how to move from a lockdown state to a post-COVID-19 world. Both mitigation of the short-term impact and long-term intervention are necessary to maintain social functions and begin a transition to smooth recovery (Osterholm, 2005).

While the novel Coronavirus presents new health challenges, the challenges associated with the controlling of pandemics and the effective use and management of technology in crises are not entirely new. One problem is that some scholars dismiss the role of information systems as *hype* (Galaz, 2009). This is a dangerous attitude, which must be changed. Pioneers in our field have been raising red flags for a while. For example, in a series of articles addressing the need to focus on technological solutions to prepare for the next wave of pandemics, Bill Gates (2015, 2018, 2020) reminded the scientific community that "good technology and training have not been available and there are no clear rules regarding making data accessible" (Gates, 2015, p. 1383). We

agree with Gates but go further to suggest that *good resilient technology* is needed. To that end, resilient thinking based approaches to research are required.

An important question to consider is: how can we improve established IS theories and frameworks to include resilience? Based on our reflections and lessons learnt from the empirical case, we offer some specific recommendations for the scholarship and all stakeholders involved in the management of COVID-19 and future pandemics. Our hope is that these recommendations will provide some insight into how we can transform for resilience (Table 1).

Lessons	*Recommendations and suggested directions*
General resilience thinking	A fundamental critique of resilience should be developed. New ways of understanding and enacting resilience using information technologies should be considered. New conceptual and philosophical frameworks of resilience should be developed and considered.
Better adaptability	A turn to frugal information systems is needed. A frugal view can contribute to better adaptability by encouraging improvisation in the use of technology to sustain critical functions of society using minimal available resources. The idea of frugality is an essential yet under-explored area of research.
Preparedness	We need to invest in technologies that will allow us to strengthen local knowledge and familiarity with local conditions. A serious effort is required to foster resilience in new ways in the post-Coronavirus digital world in order to be better prepared for future pandemics and crises.
Reliable data and information	To develop reliable information, in addition to big data and open data, we need *good* data. Frameworks to develop and collect good data should be developed and should be the foundations of data-driven solutions.
Engagement with the community	We should promote accessibility to the consistent information amongst local communities. We should also encourage stronger engagement within the community to allow the development of solutions to meet societal needs.
Ethical guidelines	We need to revisit research and practices pertaining to resilience and crises, and ensure appropriate ethical principles are in place. Crises cannot be used as opportunities to embed surveillance or harvest data for the sake of data collection. Issues related to the exercise of political powers, profiling, privacy and data leakage should be seriously considered.

Table 1 Lessons and Recommendations

General Resilience Thinking. Our journals are rightly and timely asking to conduct research into building resilience (e.g., Ågerfalk et al., 2020; Rai, 2020). Overall, we extend the rapidly emerging literature on building resilience against COVID-19 and the role of technology in crises (e.g., Djalante et al., 2020; O'Leary, 2020; Wu et al., 2020). Narratives and stories have started to emerge that show how COVID-19 is exacting "the emotional and physical toll" and highlight

issues related to "struggles, resilience and reflection" in the everyday practices of key workers and ordinary citizens (Yarrow and Pagan, 2020, p. 4). While the effects of online tools and social media on building self-resilience (at the level of an individual) are being recognised (Chen et al., 2020), less is known about how communities and organisations (at the level of the group and social structures) use technologies during a crisis (Mirbabaie et al., 2020), even less is known about the ways in which we can go about developing general resilience thinking.

Better Adaptability. Adaptability is still not fully acknowledged in the digital transformation to build resilience. A lesson from natural disaster management is to prepare an environment that enables local communities to create their solutions with whatever they have available. An organisation or community needs to allow improvised and frugal responses in dealing with changing situations (Watson et al., 2013). A recurring theme in the emerging COVID-19 literature is the dominance of the belief that more efficient systems must be built that will help organisations to *bounce back to normality* (e.g., Currie et al., 2020; Kuckertz et al., 2020; Wang et al., 2020). To be efficient is good, but a sole focus on increasing perceived efficiency is problematic (Vardi, 2020). Take for example the case of the UK's National Health Service or NHS: Bryce et al. (2020), in their scathing critique, note that the NHS ignored previous warnings to move their focus from efficiency to *adaptability* and *preparedness*. Like Yarrow and Pagan (2020), we also observe that an increased focus on efficiency overlooks the problems of inequality of risk in crisis; for example, black and ethnic minorities are arguably more likely to be affected by the crisis in work as well as everyday situations (Hooper et al., 2020). As research is slowly emerging, we strongly encourage the IS scholarship to engage with social issues related to adaptability in the broader context of resilience.

Preparedness. Organisations should take the COVID-19 pandemic as an opportunity to redesign digital processes for better and equal preparedness. Appropriate training mechanisms should be placed at all levels. Trained professionals are an integral "part of the early warning systems that alert the world to potential outbreaks" (Gates, 2020, p. 2). But how do we do it? One interesting example is of a telemedicine system using physical testing with the help of local knowledge (Hollander and Carr, 2020). But the ongoing response to the current COVID-19 pandemic shows that often organisations take a top-down approach where action is taken first and justified later (Viner et al., 2020; Wong et al., 2020). These are obsolete methods of management where training and preparation is on ad-hoc basis and comes after a crisis. Examples including management reacting swiftly to make sweeping changes from physical actions (e.g., limiting physical access to infrastructure) to organisational practices (e.g., changing the nature of work, going fully or partially online). Many organisations (including government and education institutions) have suddenly started to develop guidelines on working from home. With the exception of IT firms, many organisations have little to no experience working and managing remote work. An obvious concern is that many organisations are seeking short term solutions to address the current problem. While the management's intention to mitigate crisis is often good, a critical problem is that such management approaches are knee-jerk reactions that are often detached from the ground reality (see Yarrow and Pagan, 2020 for a withering critique of COVID-19 management and associated gender inequalities at the frontline health work).

Reliable Data and Information. Studies of issues surrounding data and information in times of crisis are much needed (Plasek et al., 2020; Rowe, 2020). Like Xie et al. (2020) we also warn that COVID-19 brings forth a crisis of reliable information and data. The related *infodemic*, however, is not a result of COVID-19 but an existing ongoing problem related to the management of information (Rai, 2020, p. iii; WHO, 2020). The spread of misinformation or fake news undermines

the efforts to foster resilience and thus should be mitigated. Good data and reliable information are integral to enacting resilience. Unreliable data and information have become an ongoing issue for many organisations. In a crisis, a community is uprooted or confined to certain areas (as is the case in COVID-19 related lockdowns), and the ways information is spread can make or break resilience. For example, a study reported that spreading misinformation regarding COVID-19 using social media can lead to problems such as panic, distress, and anxiety (Depoux et al., 2020). We recommend that digital strategies should be developed in a way that aid coping in crisis and help promote resilience (Van Bavel et al., 2020).

Engagement with the Community. COVID-19 offers opportunities for reflection. While our recommendations can be used to take steps to foster resilience, absolute resilience cannot be built in advance. Resilience is not a fixed goal that one can achieve by doing certain things. There are no blueprint requirements. Rather, continuous engagement with the community is required in order to design, implement, and improve support responses continually. The problem of fostering resilience is about more than coordinating people or information sharing (Mirbabaie et al., 2020; Pan et al., 2020). These issues highlight an under-explored area of research: the epistemological aspects of resilience and how technologies can be used to disseminate and strengthen local knowledge and practice (Heeks and Ospina, 2019). We suggest that practitioners and researchers should conduct studies to learn from local knowledge of communities in developing solutions to mitigate the effects of the crisis.

Emerging studies of the social issues surrounding the COVID-19 pandemic reveal a dark picture showing communication failures between citizens, the scientific scholarship and governments. In the US, the UK, and Europe, policymakers overlooked warnings from scientific communities, ignored issues related to everyday lives (e.g., ethnic and racial disparities, inequality of risk), resulting in a delay of initial responses and questionable outcome related to treatment of marginalised and vulnerable populations (e.g., Collins et al., 2020; Dzigbede et al., 2020; Sibony, 2020; Yarrow and Pagan, 2020). Therefore, a resilient approach is needed, which should be built by questioning, critiquing, and addressing the social inequalities as well as physical risks associated with a crisis.

Ethical Guidelines. Emerging studies show disturbingly little appetite to engage with moral issues surrounding COVID-19 and the use of technology (Lewnard and Lo, 2020). Hence the development of appropriate ethical guidelines is immediately required. To this end, critical research is a useful way to understand the dynamics of community engagement and how it contributes to a fuller understanding of the management of pandemics. Pandemic management tools have recently emerged, such as contact tracing apps (Boulos and Geraghty, 2020). While they are useful, some scholars have raised concerns regarding privacy, surveillance and data mining (Rowe, 2020). This is largely unexplored territory, and essential questions remain unanswered: what are some of the ethical principles of resilience and what are their implications in a digital world? How might we include sensitive topics (such as race, ethnicity, and gender) and marginalised populations (such as people with disabilities, sexual and gender minorities, and Indigenous peoples) to develop pluralistic frameworks of resilience? We hope that our recommendations can help develop digital frameworks and related policies in a way that fosters resilience, decreases the levels of surveillance, and addresses the issues related to marginalisation (French and Monahan, 2020).

Table 2 provides a summary of contributions in terms of the current thinking on resilience in the context of crisis management, and the implications of this study to resilience-related information systems research and practice.

Current thinking and trends	Implications of this study
The literature lags in describing and providing a more in-depth discussion of resilience that goes beyond treating resilience as a property of a system.	• Researchers and policymakers need to pay attention to the broader social needs and communal aspects that can help develop an understanding of general resilience thinking.
Most studies have focused on developing resilience in terms of increasing efficiency or optimising a system and failed to note that resilience fundamentally calls for developing capacities to address unexpected calamities or events.	• Researchers and practitioners should investigate social aspects of vulnerabilities and how to develop solutions that transform a system to handle unexpected crises. • There is a dire need for frugal approaches to resilient transformation, i.e., by using whatever resources available at hand and move toward an understanding of resilient adaptability.
Many organisations continue to take a top-down approach to managing a crisis, and mistakenly interpret resilience as a fixed immutable goal that one can develop on-demand.	• A crisis calls for a bottom-up approach which integrates the local conditions of crisis, involving inclusive approaches and learning from communities. • Local conditions should be explicitly acknowledged and integrated into the discussions of resilience.
As practitioners and organisations react to novel crises and seek new solutions, in many cases, the focus is wrongly set on the quick solution rather than a deeper understanding of the problem.	• Practitioners, researchers, as well as policymakers, should consider long-term proactive approaches. • Public-private collaboration can be a useful role in active and sustained engagement with the community.
Most studies have examined misinformation only from a technical (e.g., the mechanism of spreading misinformation) or factual (true or false) perspective and no study has provided critical social implications of misinformation (e.g., panic, anxiety, depression).	• Researchers should pay attention to the societal consequences of misinformation. • General panic or anxiety caused by misinformation among citizens can seriously undermine appropriate responses to resilience, and should be studied carefully.
There is no research that has focused on developing a guideline to address the inclusion of sensitive information in the design of resilient systems.	• Researchers should take the COVID-19 pandemic as an opportunity to explore how technologies, such as tracing apps, use sensitive information and their implications.

	•	New guidelines for ownership of people's sensitive data and its management are required.
Little to no guidelines are available on ethical and moral principles for designing and developing resilient crisis management technologies.	•	There is a need for creating ethical principles of resilience in information systems research.
	•	With COVID-19, due to the absence of ethical principles of resilience, it remains to be seen how apps and other applied technologies will deal with ethical and moral issues (e.g., surveillance, profiling, equity, liberty, justice).

Table 2 Summary of contributions

Our article has some specific limitations. First and foremost, the recommendations are based on a fieldwork in which the crisis-related data was collected with the help of city officials and the examined issues related to a natural disaster only. Second, we revisit the original study and approach the topic of crisis with a view that there are more similarities (than differences) between natural disasters and pandemics. It allowed us to extract recommendations based on those similarities. While others like Mirbabaie et al. (2020) share our position, we would also encourage scholars to look at the differences between natural disasters and pandemics and what can be learnt from those. Third, while there are clear similarities and differences between natural disasters and pandemics, the two are not mutually exclusive: it is possible a pandemic breaks out during a natural disaster, or vice versa – the 2020 Kyushu floods in Japan, during the COVID-19 pandemic, provides catastrophic examples[1]. While this article is an important but baby-step towards building resilience, our recommendations should not be applied haphazardly to any crisis.

Concluding Remarks

Crises are a test of resilience because they affect society in unforeseen ways. COVID-19 shows that resilience needs to be fostered in all parts of society. A crisis like COVID-19 challenges our preoccupation with business and commerce issues, such as tasks, efficiency, performance and money, and forces us to reflect on the commerce of everyday life and human values, i.e. what matters and how technologies can be used for good. We should avail of this opportunity and reflect on the fundamental challenges facing society. Interdisciplinary approaches should be developed to build bridges that facilitate the flow of knowledge to and from diverse areas (Chughtai et al., 2020). Some fifteen years ago, Madon (2005) called for "developing academic expertise in the areas of epidemiology" in order to effectively use technology in the management of crises (p. 414). Her call remains mostly unanswered. Hence, we are compelled to conclude on a similar call. There is a severe lack of studies on pandemics and epidemics in the IS literature. Digital technology should be used in a productive and ethical way to develop long-term resilience in society. Much more effort is required to bring information technology to the centre of contemporary debates on resilience and crisis.

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[1] See https://www.japantimes.co.jp/news/2020/07/09/national/kyushu-rain-hot-springs-coronavirus-pain/

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