The Digital Transformation of Crisis Management: Visions of the Future

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ABSTRACT

Digital technologies have a transformational impact on society, organizations, and individuals. Crisis management is not immune to such transformational changes either. However, digital transformation of crisis management is still in its early stages and often occurs within the boundaries of individual institutions and organizations. Current research and practical work on the topic tend to emphasize the role of digital technologies for specific crisis management processes and tasks, rather than envisioning what the outcomes of such a transformation might entail for crisis management as a discipline or, in other words, what 'being digital' means in a crisis management context. Hence, in this study, we identify different visions of the future through a series of semi-structured interviews with crisis professionals in The Netherlands. Importantly, we tease out three tension spaces among such alternative visions that open up a range of questions that warrant attention today. By engaging with divergent visions of the future and the questions they raise, we can identify novel concepts, concerns, and implications we may face and that require proactive action today.

Keywords

Crisis management, Digital transformation, Digital futures, Speculative foresight, Tensions

INTRODUCTION

The emergence and widespread adoption of digital technologies have resulted in fundamental transformations across nations, industries, and organizations. Through combinations of different digital technologies, such as the cloud, social media, and artificial intelligence, novel paths of value creation and ways of working emerge that challenge existing *modus operandi* (Baiyere et al., 2023; Vial, 2019). Within crisis management, digital technologies are widely used to facilitate collaboration and coordination among multiple actors, contributing significantly to shared situational awareness (e.g., Tzavella et al., 2024). Recent research suggests that such initiatives primarily reflect small-scale improvements to existing ways of working that may gradually and slowly result in system-level transformations, rather than envisioned, deliberate, and collective endeavors (Fischer-Preßler et al., 2024).

Despite the benefits of such small-scale digital initiatives, this approach may ultimately fall short. The trajectory of how digital innovations unfold and what implications they have are difficult to predict (e.g., Scott & Orlikowski, 2022), leading to reactive responses to unanticipated consequences as they arise. Moreover, when a shared vision is lacking across institutions, digital initiatives risk becoming fragmented, inconsistent, and not aligned with societal expectations. Only when we engage with possible futures and collectively decide on desirable and undesirable futures can we take proactive measures today. For instance, futures in which agentic technologies replace human labor may be seen as less desirable than futures in which such technologies support human labor. Hence, recent work in the information systems (IS) literature calls for stronger engagement with the future, not only to anticipate novel risks and concerns, but also to actively co-create digital futures that reflect shared values and aspirations (Hovorka & Mueller, 2025; Schlagwein et al., 2025).

Responding to these calls, we adopt a speculative foresight approach (Hovorka & Mueller, 2025), drawing on a set of semi-structured interviews with crisis management professionals in The Netherlands to identify shared and conflicting visions of the future. Our preliminary findings highlight situated awareness, humanness, and societal engagement as three interrelated tension spaces (i.e., conflicting visions of the future) that raise a range of questions that require deliberation. We discuss such questions around the themes of accountability, expertise,

public safety, and reliability.

The rest of this work-in-progress paper is structured as follows. First, we will provide background literature to set the scene for our study. Then, we introduce our research approach and our preliminary findings. We conclude by discussing these findings and outlining our plan for the continuation of this study.

BACKGROUND

Digital technologies, largely characterized by their flexible, editable, and recombinatorial nature (e.g., Faulkner & Runde, 2019; Kallinikos et al., 2013), are rapidly emerging, evolving, and becoming part of our daily lives. Contrary to more traditional, enterprise-centric information technologies (IT), such technologies are consumer-centric and shift control over their use to end users (e.g., Harris et al., 2012), making the trajectories of their unfolding and their impact on society hard to predict. Prominent examples of such technologies include social media, clouds, blockchain, and (generative) artificial intelligence. Digital transformation, then, can be defined as a process through which combinations of digital technologies lead to fundamental changes in various properties of an entity, creating novel paths of value creation and capture (Baiyere et al., 2023; Vial, 2019). Importantly, these transformational changes are not necessarily strategic or intentional but can equally represent corollary effects that are difficult to predict and coordinate (Scott & Orlikowski, 2022).

In the context of crisis management, various digital technologies are adopted to enhance coordination and shared situational awareness. Examples include the active use of social media platforms to communicate with affected communities, gathering information, and mobilizing resources (e.g., Bubendorff et al., 2021; Shahbazi & Bunker, 2024), the deployment of drones by crisis management professionals and individuals from the community to take images of affected areas (e.g., Vanderhorst et al., 2021), and discussions around and experiments with AI show promise in terms of enhanced decision-making, resource allocation, and communication (e.g., Harika et al., 2024). Despite benefits, the use of such technologies has also shown how novel risks and concerns emerge. Increasing amounts of mis- and disinformation can interfere with crisis response, for instance, leading to anxiety and challenging institutional credibility (e.g., Wang et al., 2022). Recent work has demonstrated that digital initiatives in crisis management mainly resemble incremental rather than fundamental change, with attempts at digital transformation primarily taking place within the boundaries of individual organizations (Fischer-Preßler et al., 2024). The absence of collective, forward-looking efforts may leave crisis management actors vulnerable to unexpected implications of digital innovations occurring in society, as well as not meeting societal expectations around digital innovation and the management of crises.

METHODOLOGY

Futures Research: Speculative Foresight

It is increasingly recognized within the (IS) literature that actively studying the future can elucidate important questions, ethical considerations, and implications that require deliberation in the present. Digital futures as a research approach *"studies multiple possible long-term futures with a specific focus on digital technologies, their societal implications, and the future realities they create, and typically sees those as amendable by human actions and technological design"* (Schlagwein et al., 2025, p. 4). The 'digital' refers to the equal importance and relevance of technological, economic, social, societal, and political aspects (Baiyere et al., 2023). Importantly, it is recognized that futures are plural rather than singular (Hovorka & Peter, 2021; Schlagwein et al., 2025). Hence, digital futures research is typically skeptical of assumptions that current expectations will materialize and instead explores how and why such assumptions may not hold.

We ground our work in speculative foresight as an approach to studying the future, aiming to understand what crisis management may look like when *being digital* (Hovorka & Mueller, 2025). In other words, we explore what the future of crisis management could look like in a world where digital technologies are a mundane part of everyday practice. For instance, the use of e-mail exchanges is no longer seen as extraordinary or strange; it has instead become an integrated element of work practices. By focusing on *being* rather than *becoming* digital, speculative foresight invites active consideration of the potential outcomes of digital transformation processes and their consequences, enabling the identification of novel (ethical) concerns and opportunities (Hovorka & Mueller, 2025). Whether or not visions of the future materialize is not the matter of interest here; instead, it is what such visions reveal about the world we might be living in and what we should or should not do today. As a first step of our speculative foresight study, we have interviewed crisis management professionals to interrogate their visions of the future. Here, we approach visions as both hopes and fears for the future, or utopian and dystopian visions of what the future may look like.

Data Collection and Analysis

As part of a broader study, we have conducted a series of semi-structured interviews with 19 crisis management professionals. To recruit interviewees, we adopted a purposive sampling strategy (Thornhill et al., 2009) with the aim of reaching a heterogeneous group of professionals. Our interviewees have different roles, tenures, and work for different (crisis management relevant) organizations or research institutes. More specificly, we selected interviewees with management roles, who are responsible for digital strategies and investments in digital technologies, as well as interviewees in operational roles in emergency preparations and response. These people interact with technology in their work, as well as contribute to bottom-up innovation. These 'practice based' perspectives were further enriched with expert interviews, who delivered state of the art visions of digitalization. While not having a fixed number of interviewees in mind, we utilized our network to identify relevant interviewees and paused data collection once we reached saturation around common themes. The next step of our work would be to further interrogate these different themes. The choice for including different interviewees was deliberate, as a means to identify differences and similarities across different organizations, work practices, and tenure periods. An overview of interviewees can be found in Table 1, where 'code' refers to the pseudonym given to the interviewees. As reflected in Table 1, one interviewee participated in two interviews, while two interviews included two interviewees rather than one interviewee. Our interviews took place via Microsoft Teams, allowing for recording and automated transcript generation with our interviewees' permission. The interviews lasted 60 minutes on average and were conducted in the native language of the interviewees and researchers. After transcriptions were completed, all audio recordings were deleted.

Table 1. Overview of interviewees

Code	Job description
I1	Advisor Information Provision Emergency Dispatch Center [2 interviews]
I2	Manager National Crisis Management Provision
I3	Innovation Manager
I4	Program Manager Information Driven Safety
I5	Professor of Innovations in Crisis Management and Societal Resilience
I6	Task Commander Fire Services
I7	Deputy Commander Fire Services
I8	Advisor Information Provision; Information Manager
I9	Information Manager
I10a	Crisis Manager
I10b	Head of Crisis Management Department
I11	Information Manager & Lecturer in Information Management
I12	Product Manager
I13	Information Manager
I14	Advisor Crisis Management & Civic-Military Cooperation
I15	Policy Coordinator for Cybersecurity Knowledge and Innovation
I16a	Trainer Information Management
I16b	Trainer Information Management and Advisor
I17	Directory Safety Region

While the interview addressed a range of topics, we asked interviewees whether they believe a digital transformation is occurring or will occur, and what crisis management might look like after such a transformation. The semi-structured nature of our interviews allowed interviewees to elaborate on topics and facets they considered important, yielding a range of insights into future visions, risks, and opportunities. We analyzed the interview data using NVivo software, paying particular attention to interviewees' visions of the future. After initial rounds of coding to identify different (facets of) visions of the future, as well as deviations from crisis management at present, we continued with a set of 'what-if' questions to provoke our imagination and identify emerging questions related to the alternative future visions shared by our interviewees. Finally, we critically interrogated

interviewees' visions of the future, elucidating what they resemble and how they came to be.

PRELIMINARY FINDINGS

Our interviews reveal that there are high hopes when it comes to the future of crisis management. We have identified a largely shared ideology in two facets. First, interviewees articulated a vision of moving to the 'front of the crisis', in which crisis management centers on proactive prevention and societal continuity rather than reactive responses to unfolding situations. In this utopian vision of the future, crises can be identified, understood, and responded to more efficiently and effectively. Given that crisis management is, in essence, a reactive activity and crises have generally been understood as impossible to predict, such a utopian vision can be seen as radical. This vision potentially puts pressure on the performance and accountability of crisis management organizations. If crisis managers, with all the information from different sources at their disposal, are unable to avert future threats as expected by society, this can undermine their credibility and legitimacy. Additionally, it impacts ideas and visions of public safety. With more and better information, are we moving in the direction of 100% safety? And what happens when technologies fail? We further elaborate on such issues in the discussion section.

Second, our interviewees expressed a vision of and hope for increased centralization and collaboration between safety regions and other organizations: *"I think we should embrace that crisis management is a national system in which everyone has a role. But where, from an IT perspective, we should move towards a national […] connected system. One system, and it does not mean that everything has to be integrated, right? It does not have to be one mega-system for everything, but where we at least have a coherent system. […] We need to make very good agreements about standardization, coupling, and avoid that we do things double. And that also leaves you with extra money to do one thing really well. If you do the same thing twice, it's inefficient, but it also costs a lot of money."* (I2). Combined, our interviewees share a vision of the safety regions operating as a central space for information gathering, analysis and sharing between network partners, acting as an intelligence hub for public safety, resilience, and societal continuity. Some implications of this vision are rising societal expectations regarding collaboration between safety regions and accountability issues towards civilians and inspection agencies when expectations do not align with reality. For instance, why are these expert organizations unable to collaborate and bring together scarce resources for digital innovation? The discussion section further zooms in on these issues.

As expected, however, we also identified various, sometimes conflicting, visions of the future, shared both implicitly and explicitly by our interviewees. Implicitly, interviewees shared their worries or hopes for the future without being directly asked to do so, while explicitly, they sketched an image of what the future of crisis management might look like. We identified three interrelated tension spaces among different narratives of the future, all centered on crisis-management tasks to be performed by humans, technology, or combinations of the two. These tension spaces reflect different conceptions of what *'being digital'* might entail or, in other words, what materializes when we no longer explicitly notice the technological aspects around us. The identified tensions in our case resemble differences between utopian, dystopian, or hybrid visions of digital futures. Our interviewees primarily discussed the mundaneness of agential technologies, or systems that can autonomously operate with limited human intervention.

A first tension space centers on the enhancement or erosion of *situated awareness.* As aforementioned, some envision a future in which crises are more easily detected, more data is readily available to design better responses, and physical boundaries to knowledge gradually disappear. We refer to this as a *data primacy* vision. Human cognitive capacities are no longer a limitation, as technologies can process large volumes of data. Human crisis professionals or their technological counterparts make final decisions based on thorough, accurate analyses conducted by technological collaborators. It is envisioned that this will significantly enhance the efficiency and effectiveness of crisis management. In most cases, this is resembled as a 'collaboration' between humans and technology: *"We need to make a shift, not preparing for disasters and crises and doing everything for that, but becoming an important actor in the network to ensure the continuity of society. And then you need different kinds of sensors. The actual [technological] sensors, but also human sensors. That requires very different collaborative processes, but also a completely different way of processing information, because you can't do everything yourself. So, you're very dependent on bringing everything together all the time, and bringing everything together makes the work better"* (I4).

Others, however, envision a future in which contextual information is lost, decision-making speed overtakes quality, and situational awareness becomes a probability rather than an observed reality. We refer to this as a vision of *contextual obscurity.* Such visions imply that the use of technologies to gather and analyze information has further obviated the need for 'people on the spot'. Instead, there is a fear that in the future, most crisis management work will occur behind a desk and screen, with limited negotiation and discussion between human crisis professionals. It is envisioned that readily available, easy-to-digest conclusions presented by technology encourage rapid, hasty decision-making at the expense of high-quality decisions in which all stakeholders are

adequately informed, engaged, and on board: *"If you're not careful, you'll be ahead of the troops while the content of the information may be good"* (I6). Humans are envisioned to become lazy: *"People are lazy and they just want to make a decision as quickly as possible. And if that gives them a good feeling, then it's fine. They stop thinking. So, I think that is a risk, that you need to keep thinking and that the more pretty it [technology] becomes, the lazier you become"* (I2). Others expressed a dystopian narrative in which the mundane reliance on technology has resulted in an erosion of expertise while concurrently leading to blind spots and vulnerabilities that could result in crises. The most notable example that receives significant attention today is a large-scale power outage that disrupts system and data access: *"We are very vulnerable. And it could be a terrorist attack, it could just be a power outage, and then all your IT falls away."* (I14)

A second tension space relates to the importance, maintenance, and meaning of *humanness*. Some perceive that 'being digital' means 'being less human' (a vision of *dissolving humanness*), while others believe that it opens up space to exhibit 'more humanness' (a vision of *liberated capacity*). Regarding the former, some envision a future in which human crisis professionals become complacent and allow technology to take the lead. There is a fear that human interpretation, empathy, and compassion will make way for technology-mediated interactions. In terms of the latter, it is envisioned that technology takes over some tasks currently performed by human crisis professionals, such as gathering information about similar incidents in the past, granting them more time to excel in other (more meaningful) tasks, such as contextual interpretation. Crisis communication was a frequently mentioned example here. In digital futures, such communication can be tailored to the needs of different stakeholders, making it more effective without the need for additional human resources. Concurrently, automated and personalized communication, while potentially efficient, would negate human empathy deemed necessary for the effectiveness of crisis communication: *"We always get people on the phone who are experiencing some level of stress and who want something that is not just a technical matter. […] If you see people hanging from the proverbial gutter, then there's also some emotion involved, adrenaline, and you start doing strange things, so to speak. […] I think if you want to make an emergency call to 112 about something that really affects you, so to speak, then I think there are a lot of people who would still like to talk to someone who can reassure them. […] The question is, can a computer do that? Probably it can. But the question is, are we going to do that and do we want that to be the kind of world we end up in?"* (I1).

A third tension space centers on *societal engagement.* Some interviewees expressed a vision in which the community is a more active participant in crisis management, empowered by the mundane use of technology: *"If we say, we need to do it together, resilient society, then you also need to give that society access, in quotation marks, right? To the information that enables them to play a role in relief efforts rather than saying […] 'just trust us'. […] I think this is where [we are heading] and technologically it is very feasible."* (I11). We refer to this as a vision of *technological empowerment.* Others fear that, in a world where more crises are prevented or resolved more quickly, unrealistic societal expectations about the ability to prevent all kinds of crises prevail. More time is being spent answering questions from the public. Such fears are rooted in observations of the present, where interviewees share the pressure they experience in terms of *'should have knowns'* given the availability of data: *"There is a risk that there is always someone that says: you knew this? It was somewhere in a database or AI would have given you that answer, or however that works in the future."* (I7). Consequently, questions around accountability and stress among first responders may be more pressing issues than they are today. We refer to this as a vision of *illusory control.* Additional concerns were expressed about the extent to which citizens are surveilled in such digital futures.

DISCUSSION

As one of our interviewees (I7) put it, the digital transformation of crisis management is fundamentally about interrogating the role humans will play in futures in which technologies can make decisions for us. As the future is multiplicitous and can unfold in myriad ways, this transformation is still 'contested'. It means that the future shape of crisis management is not yet clear; it can move in different directions and have severe implications for crisis governance, the expertise of personnel, and the way public safety is constructed. Collectively, the divergent visions we identified raise new questions about accountability, expertise, the nature of public safety, and the reliability of emergency and crisis management services. Further exploring these (and other) emerging questions is important to get a better understanding of the potential transformation of crisis management and take proactive action. For instance, a vision of data primacy in terms of situated awareness may correspond to a vision of liberated capacity, while concurrently may be related to a vision of dissolving humanness. If we take all these visions equally seriously, what do we need to do today to actively work towards desirable futures and avoid undesirable ones? Without aiming to be exhaustive, we present some emerging research questions around accountability, expertise, public safety, and reliability in Table 2.

Table 2. Emerging questions

Theme	Exemplary research questions
Accountability	In a future where decisions are made by technological collaborators, who is accountable for the outcomes of such decisions? Who should receive credit for beneficial outcomes? Who should be blamed for detrimental outcomes?
	In a future where communities place higher expectations on crisis management actors due to the widespread availability of digital technologies, how can we protect crisis management professionals from additional burden and stress? How can we ensure that the community is and remains appropriately informed about the capabilities of technology?
	In a future where communities become active participants of crisis management, to what extent can they be held accountable for their (lack of) contributions?
	What mechanisms, policies, and channels should be in place in futures where technology autonomously acts and decides?
Expertise	How do we understand expertise in a digital world and to what extent is expertise a necessity for crisis management? Can expertise be shared by humans and technology, or is expertise inherently human?
	How do we understand 'context' and how much contextual knowledge and interpretation is required to adequately respond to crises?
	In a future where decisions are made autonomously by technology, what role will crisis managers fulfil?
	What new roles and skills should we develop in crisis management today to meaningfully engage with technology in the future?
	How, if at all, can we experiment with new technologies during active crisis situations?
Public safety	To what extent is it ethical to let technology autonomously make decisions in situations where (public) safety is at stake? To what extent is it ethical to not let technology autonomously make decisions in situations where (public) safety is at stake, if such decisions frequently outperform those made by humans?
	To what extent is it ethical and responsible to let technology respond to calls from humans in distress?
	In a future where agential technologies can act autonomously, (how) do individuals' perceptions of safety change?
	Given the probabilistic nature of artificial intelligence, to what extent will we be able to identify and respond appropriately to novel kinds of crises that may occur in the future?
Reliability	How do we understand 'reliability' of technology in digital futures?
	What mechanisms can we put in place to ensure that we understand technologies and their implications for crisis management?
	What fallback options do we have at our disposal, or should we develop, in case technologies fail or are not available?
	To what extent will we be able to rely on crisis management institutions in futures where expertise and conventional crisis management knowledge is lost?

Our work responds to calls in the recent IS literature to take futures seriously (e.g., Hovorka & Mueller, 2025; Schlagwein et al., 2025) and contributes to the broader discourse around digital transformation and innovation in crisis management (e.g., Fischer-Preßler et al., 2024). Rather than succumbing to fragmented, reactive, and short-term digital initiatives, our work promotes active engagement with the future and encourages collective action between crisis management actors. The tensions we bring forward in this work in progress reveal open questions and concerns that require deliberation today. Through such deliberations and subsequent actions, crisis management institutions can actively contribute to shaping a digital future that is deemed desirable (Schlagwein et al., 2025). Importantly, while our interviewees share dystopian and utopian visions of the future, we explore the tensions between these two opposing narratives to identify questions and potential pathways for shaping better futures that recognize both dystopian and utopian outcomes of digital innovation (Chatterjee & Sarker, 2024). Indeed, all identified visions are equally valid and represent hopes and fears that live amongst crisis professionals.

We are mindful of the factors that may shape our interviewees' visions of the future. For instance, we recognize that many of the hopes and fears raised by our interviewees align with current debates in the public media and

beyond. Most interviewees brought up agential technologies when discussing the future, while other technologies, such as quantum computing, were only mentioned sparingly. While acknowledging fears about some part of the work being replaced by technology, our interviewees did not foresee any future in which there are no human crisis managers anymore. Moreover, it was interesting that interviewees did not reflect on potentially different types of crises in the future, largely assuming that the broader crisis management landscape would remain the same. We encourage future research to explore these aspects of the future that did not receive any attention in our study.

In a sense, we were surprised by the shared ideology of our interviewees regarding centralization and collaboration in digital innovation. In practice, we observe that such collaboration is complex to realize, given differences in work practices, a need for autonomy, and a lack of technical knowledge. Moreover, our interviewees mention 'centralization' and 'collaboration' as broad terms, yet do not specify what exactly should be centralized (e.g., digital innovation processes, technical infrastructure, development etc.). Hence, we encourage future research to further explore this, focusing on the question of the extent to which centralization of digital innovation is necessary for resilient, digital crisis management.

As a next step of this research project, we aim to develop speculative foresight scenarios based on the gathered insights that are subsequently presented to crisis professionals in a focus group setting. As aforementioned, we realize that people, by nature, develop narratives of the future that are grounded in current practices, terminology, and examples. Hence, by further developing the presented insights into speculative foresight scenarios, we can further distill what futures may be (un)desired and what actions can be taken today. Future research could also apply other approaches, such as artefacts-from-the-future (Maciejko & Lecuna, 2025; Peter et al., 2020), to tease out further implications.

CONCLUSION

This paper presents preliminary findings from a study of visions of digital futures for crisis management, exploring the mundane use of digital technologies. Drawing on semi-structured interviews, we identify how tensions between conflicting visions of the future and bring forward three contested tension spaces: situational awareness, humanness, and societal engagement. These tension spaces reflect how the future could unfold in multiple ways, and open up research questions around accountability, expertise, public safety, and reliability that we need to address today actively contribute to shaping a desirable future. Hence, we are hopeful that crisis management professionals draw on our preliminary insights to actively engage with digital futures and collectively help shape a desirable future.

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