Research Article

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Towards the Digital Risk Society: A Review

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Abstract: Digitalization is often associated with optimistic grand narratives about a future society in academic discourse. While the word is frequently linked with hopes and expectations of societal rebirth and beneficial changes for societies and organizations, there has been little attention given to systematically investigating the risks associated with digitalization. This paper aims to investigate the relationship between digitalization and risk, thereby characterizing "the digital risk society." By conducting a narrative summary and thematic analysis of 34 academic papers three aggregated themes were outlined: First, in the digital risk society, intangible technologies serve as solutions while simultaneously introducing new risks. Second, as an increasing number of tasks are delegated to machines with opaque inner functions, society is suffering from dehumanization. Third, scholars are calling for new approaches to govern these technologies, spurred by concerns over their potentially harmful use.

Keywords: digital transformation; digitalization; risk; risk society

1 Introduction

In 2019, it was revealed that the Dutch tax agency had been using self-learning algorithms for 6 years to detect and penalize childcare benefits fraud. As a consequence, several thousand families were, often wrongfully, penalized and fined based on a discriminatory system without any checks and balances. This case is an example of an event with negative consequences involving the use of digital data and technologies. This use has accelerated in the last decades, and our society is increasingly characterized by intensified digitalization. Brennen and Kreiss (2016, p. 1) defined

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digitalization as "the way many domains of social life are restructured around digital communication and media infrastructures". As noted by Schou and Hjelholt (2018), the discursive landscape of digitalization is characterized by stories of societal rebirth and large-scale changes. However, less attention is given to systematic approaches to the societal risks associated with this development. Mouthaan et al. (2023) argue that scholars tend to adopt optimistic views on digitalization and these authors request more critical and systemic perspectives on the topic. To address this issue, in this paper, an analysis of a corpus of literature devoted to digitalization and risk informs an emerging notion of "the digital risk society." As digital technologies constitute the way we "do" things in our daily lives they increasingly mediate contemporary risks (Lupton, 2016) and it is vital to accumulate knowledge of these risks, especially on a societal level. As an example, Sadowski and Andrejevic (2020, p. 655) describe how, in responses to injustices associated with the use of artificial intelligence (AI) and machine learning, "ethicists have shown up like emergency responders at the scene of an accident. They try to patch up the harm that has already occurred — only to soon be called away to address another accident elsewhere." As noted by these authors, there is a need for more critical analysis of these issues, including an assessment of the power relations and social structures that cause them.

Against this backdrop, the purpose of this paper is to investigate the relationship between digitalization and risk by posing the following research question (RQ):

How is the Digital Risk Society Characterized in Academic Literature?

To address the RQ, this paper analyzes a corpus of literature on digitalization and risk. This paper proceeds as follows. Section 2 provides a theoretical background. The methodology and results are presented in Sections 3 and 4, respectively, followed by a discussion in Section 5. Concluding remarks are presented in Section 6.

2 Theoretical Background: Technology in the Risk Society

To generate a starting point for an analysis of the digital risk society, this paper is positioned within two literature streams, namely (a) the works of Beck (1992) and Giddens (1999) on the risk society, and (b) works on how the development of technology is tightly connected with societal development, making these two entities inseparable (Ellul, 1964; Winner, 1978). Together, these two research streams inform an epistemological break with everyday conceptions of technology

(Sterne, 2003) and serve as a theoretical foundation for analyzing literature on digitalization and risk.

Shifts in risk perceptions occur in line with societal development over time. As Bernstein (1996) noted, Enlightenment ideas proposed that men and women are not passive subjects of nature but masters of risk and probabilities. However, World War I and radical transformations in art, literature, music, and science (along with the introduction of relativity theory and Freud's idea of irrationality as a natural human condition) changed world views as the certainty provided by the scientific method of the Enlightenment was replaced by increased uncertainty. The allied victories of World War II caused an increased enthusiasm for the rational project, and the use of mathematics and measurement, especially in economics, flourished, at least until the oil crisis of the 1970 s.

According to Beck (1992), society has undergone a transformation from an industrial era to the risk society of today. In the risk society, risk is manifested through reflexive modernity – we reflect on the uncertainties generated by modernization. Ekberg (2007, p. 343) explains that the risk society is characterized by "an omnipresence of low probability – high consequence technological risks." These risks resemble the notion of "systemic" risks, which are non-linear, characterized by high complexity and uncertainty (see, Renn, 2008).

The risk society is tightly entwined with ideas of modernity (Beck, 1992). The first age of modernity was characterized by optimism and belief in linear progress, upheld by bureaucracies that acted in the context of national states, scientific knowledge, and the control of nature. In the second modernity, many of these institutions are questioned as risks become global and borderless. Here, there is a shift in emphasis from natural to technological risks, from a realist to a constructivist perspective on risk, and between actual and perceived risks. The reflexive conditions of the second modernity play a central role, as "this is a process in which modern society confronts itself with the negative consequences of (simple) modernization" (Brey, 2003, p. 42). Here, as noted by Giddens (1999), risks are largely manufactured, being consequences of the use of technology, rather than natural (e.g. earthquakes, non-human induced weather catastrophes, famines, hardships associated with manual labor, etc.), as few aspects of the physical world are untouched by human intervention. It is this pervasiveness of technology that Ellul (1964) referred to in the Technological Society and that Winner (1978) referred to as "autonomous," as we have lost control over it. Technology plays a key role in the risk society, as it has concentrated decision-making power and generated an authoritarian technocracy (Beck, 1995). Moreover, technology creates manufactured risks of which history provides little guidance of how to manage (Giddens, 1999). Consequently, these manufactured uncertainties cannot be solved in a simple manner by scientific advances alone. As technologies generate forms of life (Winner, 1978), injustices

brought about by them cannot be seen as just mere side-effects, but as a product of their design (Masiero, 2023) and rationality (Ellul, 1964). As technological progress is often synonymous with social progress, those who hold the production means of producing technology also gain wealth and power. Thus, risk and digital technologies become increasingly entangled in imbricated relationships (see, Ciborra, 2006) as digital artifacts increasingly display ambivalence properties and reside in a constant state of "flux" (Kallinikos et al., 2013), subject to "drift" as unintended uses and consequences are created in their wake (Ciborra, 2006; Winner, 1978).

3 Research Approach

This paper builds on a literature review of 34 papers. The methodological approach builds on the following steps:

1. First, a search for relevant literature was performed in the SCOPUS database, which is "the largest abstract and citation database of peer-reviewed literature" according to Elsevier (https://scopus.com).
2. Second, irrelevant papers were removed according to criteria described below.
3. Third, the remaining sample was subject to narrative and thematic analysis to inform a review of the digital risk society.

3.1 Sampling

Three terms were used in the search: "risk" and "digitalization" (plus its alternative spelling with an "s") and "digital transformation". To ensure the included articles focused on risk and did not just mention it briefly in the abstract, Sundberg's (2019) approach was adopted, where only articles with the term in the title were included. However, "digitalization" and "digitalisation" (Brennen & Kreiss, 2016, pp. 1–11) and the related term "digital transformation" (Vial, 2019) were scanned for in the title, abstract, and keywords. To ensure quality and timely relevance of the sample, the following delimitations were used:

– Only include journal papers in English.
– Temporal limitation: 2018-present (May, 2023).

The search generated a total of 263 documents in SCOPUS. These documents were downloaded and the following criterium was used to determine if a paper was to be included in the analysis: *does the paper concerns the topic of risk and digital technology on a societal level of analysis* (compared to papers that discuss risk and risk management for organizations)? This is an important delimiter as the unit

of reference of the paper, as explained in the previous section is on a societal level, and not the use of individual technologies in organizational settings. By using this delimiter, it is possible to aggregate the findings to enable a discussion with literature on the technological risk society (Beck, 1992; Ellul, 1964, see also Bijker, 2009). This process resulted in a sample of 34 papers.

3.2 Analytical approach

To gain a deeper understanding of the subject matter, the papers were subjected to a narrative summary (Dixon-Woods et al., 2005) and thematic analysis (Braun & Clarke, 2012). An understanding was generated through dialogue between the researcher and the texts in an iterative process in line with interpretative approaches to literature reviews (Boell & Cecez-Kecmanovic, 2014). In the results section, summaries of the included papers are presented under three aggregated themes. These themes are then further discussed in relation to the background section. The corpus included in this review is, of course, a modest part of the literature on digitalization and risk. However, the aim is not to generate an exhaustive overview but rather a sample that enables a discussion about the digital risk society.

4 Results

Three themes were unveiled during the analysis, namely (a) The layered risk society, (b) Dehumanization, and (c) Calls for systemic governance. These themes are summarized in Table 1, and further described below.

4.1 The Layered Risk Society

While researchers call for global efforts to tackle climate change (e.g. using social media data as an early warning system for flooding (Henriksen et al., 2018), pandemics, etc.), they are also concerned about the new risks introduced by the technologies used in such efforts (e.g. blockchain, AI, machine learning) (Wilford et al., 2021). As exemplified by Zio (2018, p. 176), digitalization constitutes potential countermeasures to many risks, but these measures come with a trade-off introduced by “the complexity of cyber-physical systems.”

Galaz et al. (2021) describe systemic risks associated with automated decision-making and predictive analytics through AI: (a) algorithmic bias and allocative

Table 1: Themes in the literature.

Findings	Theme
New risk management approaches via digitalization (Henriksen et al., 2018; Wilford et al., 2021).	The layered risk society.
Digital technologies form new risks as they are introduced (Eling & Lehmann, 2018; Galaz et al., 2021; Lüthi et al., 2021; Sandvik, 2021; Sobrino-García, 2021; Zio, 2018).	
Ambivalent stories about the benefits of digitalization (Aseeva & Budanov, 2021; Pang et al., 2019; Tomczyk, 2021; Vinichenko et al., 2021).	
Digital divides (Busemeyer & Sahm, 2021; Fernández Da Silva et al., 2022; Gomes & de Meneses Sousa, 2022; Karpunina et al., 2021; Olsson et al., 2019), and ignorance of local conditions (Zemtsov et al., 2019).	Digitalization as dehumanization.
Loss of individualization in the wake of digitalization (Clarke, 2019; Curran, 2018; Mitrushchenkova, 2022; Todolí-Signes, 2021).	
Changes in power relations (Dubosson et al., 2019; Palumbo & Cavallone, 2022; Regin, 2022; Schultz & Seele, 2019; Volodenkov & Fedorchenko, 2021, 2022).	Calls for systemic governance.
Calls for new modes of risks governance (Ienca & Vayena, 2018; Körner et al., 2022; Ngwenyama et al., 2023; Ratman et al., 2020; Rewizorski, 2021; Sovacool et al., 2022).	

harms, (b) unequal access and benefits, (c) cascading failures and external disruptions (due to complex interactions between humans and machines, but also between machine actors), and (d) trade-offs between efficiency and resilience. The authors (2021, p. 67) note that "Many of the risks discussed here are tentative and difficult to quantify with precision. Systemic risks that evolve out of complexity and poorly understood system interactions between humans, machines, and ecology are particularly challenging. Additionally, the fact that both the development and use of these technologies are nascent makes it difficult to assess to what extent the risks identified are intrinsic to AI and associated technologies themselves." Sobrino-García (2021) explores risks with AI in the Spanish public administration. The author notes, in addition to the benefits of using AI, that the technology introduces risks such as opacity, legal uncertainty, biases, or breaches of personal data protection. Without a clear definition of AI, legal systems have difficulties addressing these risks. Similarly, Sandvik (2021) describes how the law may be "displaced" by digitalization, highlighting the need for lawyers to keep up with technological changes.

As noted by Vinichenko et al. (2021), AI can increase our quality of life, while at the same time, these technologies pose dangers as we become over-reliant on a "digital environment." Lüthi et al. (2021) note that during the development of

algorithms to make assessments in areas such as crime, new tensions arise between developers and users. These authors propose guidelines based on value-sensitive design to address these tensions. Eling and Lehmann (2018) show how organizations are seeking to be insured against cyber security risks that may be "uninsurable" due to difficulties in predicting them. The authors question whether the benefits of digitalization (better risk calculation, fraud detection, etc.) in the insurance domain outweigh the investment costs. Pang et al. (2019) highlight how youth become "ambivalent prosumers" of technology, as they express both concerns about sharing their data and concerns about "being left out" if they are not using, for example, health technologies. As shown by Aseeva & Budanov (2020), the debate surrounding the digital, post-pandemic society is polarized, oscillating between utopian visions of the development of a networked civil society and dystopias where digital technologies are used to exercise total control over the population. Tomczyk (2021) notes how many studies on digitalization are unidirectional: they either adhere to a paradigm of opportunity or a paradigm of risk, causing polarization rather than creating nuances.

4.2 Digitalization as Dehumanization

Karpunina et al. (2021) identify three risks associated with digitalization on a societal level: digital divides (see also Olsson et al., 2019), degradation of human relationships due to intense digital consumption, and loss of self-identity. Similar findings from the healthcare domain are presented by Fernández Da Silva et al. (2022, p. 1): "A high percentage of vulnerable people at risk of social exclusion are not receiving adequate healthcare due to the digitalization of the system and the implementation of scarcely inclusive health web portals." Gomes & de Meneses Sousa (2022) note how these risks intensified during the use of remote communication techniques during the COVID-19 pandemic. In a study of the digitalization of the welfare state, Busemeyer & Sahm (2022) note that commonly suggested efforts to counteract the negative effects of intensified digitalization, such as educational efforts, may not actually be favored by certain groups of individuals. Instead, these groups seem to prefer more redistributive compensatory measures. Todolí-Signes (2021, p. 449) argues that "as a society, we should not allow people to become mere commodities (human "resources") handled in a dehumanizing way by an omnipresent and omnipotent machine/software, and even less so without the necessary controls to prevent harm." Mitrushchenkova (2022) mentions changes to a person's "self" from philosophical and legal perspectives and highlights threats to human rights, using the Metaverse as an example.

Clarke (2019) raises concerns about the development of the digital economy, referring to the notion of the "digital surveillance economy" where the information society, surveillance society, the surveillance state, and surveillance capitalism are combined. The common denominator across these phenomena is the use of vast volumes of personal data, with "users" inclined to provide their data at a minimal cost. This development poses threats to individuals, organizations, and societies, and the author argues that values associated with individualism and humanism risk being lost in the current development. In addition to effects on individuals, Zemtsov et al. (2019) note how technologies such as AI reinforce vast regional differences, with some poorly developed regions displaying high social risks and low adaptivity.

Curran (2018) uses Beck's theory of risk society to bridge digital economies with the sociology of risk. As the widespread adoption of digital technology has led to the development of tech giants such as Facebook, Amazon, and Google, digitalization permeates the daily lives of many people. The author identifies three risks: (a) the remaking of interpersonal co-presence and solitary life (e.g. people favor communicating over digital platforms above physical interactions), (b) increased unemployment and inequality from the use of AI, and (c) environmental impacts due to an "always on" and "always upgrade" logic. These are "lived-with" risks resulting from certain configurations of capitalism, the state, and science that escape democratic evaluation, with seemingly no one in control.

4.3 Calls for Systemic Governance

Scholars note how digitalization leads to changes in power relations (Dubosson, 2019; Regin, 2022). As an example, Palumbo and Cavallone (2022) describe how digitalization recontextualizes organizational dynamics and disrupts social exchanges at work. The authors highlight how intensified use of new technologies entails implications beyond the loss of certain jobs.

Ngwenyama et al. (2023) note the lack of strategies among public officials to manage the societal risks of digitalization. As societal systems become increasingly complex, the calculation and understanding of uncertainty become more challenging (Ratman et al., 2020). For example, Körner et al. (2022) highlight how the decentralization of electricity systems in Europe has led to increased efficiency and robustness, but it has also introduced additional interdependencies and complexity, resulting in higher systemic risks where local failures can rapidly spread throughout the system. The authors argue that policymakers need to address these issues by adopting global perspectives, promoting cooperation, data exchange, and utilizing new technologies.

In addition to the call for new approaches to tackle complexity, scholars emphasize that digitalization brings about shifts in existing governance structures. For instance, corporations expanding into the political arena raise concerns (Schultz & Seele, 2019). Volodenkov and Fedorchenko (2022) express concerns about the "hybridization" of political regimes, where government institutions become increasingly entangled with technological corporations. These authors (2021) also highlight how digitalization may blur the traditional relations between states and elites, with intermediaries in the form of digital corporations (e.g. Google, Apple, Huawei, and Yandex). This development presents contradictions, as digitalization enables network effects, crowdfunding, and democracy, but it also increases the potential for "benign dominion" even without explicit government abuse.

Rewizorski (2021) problematizes the notions of global versus national governance, where digitalization acts as an enabler for "hyperglobalization." The author argues for a balanced approach between these forms of governance, emphasizing the need for international cooperation to manage systemic risks. Ienca and Vayena (2018) discuss the concept of "dual use," where scientific advancements intended for beneficial purposes can easily be misapplied for harmful ends. These authors present a scenario that cannot be effectively governed through top-down approaches by centralized authorities. Instead, they advocate for global and distributed governance mechanisms that encompass multiple levels and employ bottom-up strategies. Sovacool et al. (2022) exemplify how scholars need to embrace holistic measures to approach complex risks. These authors adopt a "whole systems" approach, where they combine corporate benchmarking data with qualitative interviews to study the impacts of the implementation of data centers in the Arctic region.

5 Discussion

In this section, the three themes presented in the results section are discussed in relation to the theoretical background, to address the RQ of this paper.

Industrial society was, in many ways, a response to "natural" risks as it provided us with countermeasures against weather, heat, cold, famine, and other hazards. However, this society also introduced several risks related to these countermeasures, the most obvious being threats to environmental sustainability. Similarly, digitalization is now introduced to solve problems produced in the industrial society. Here, digital systems create new risks such as cybersecurity issues, reckless use of AI, and digital divides, to name a few. These risks are not only systemic (Renn, 2008), they are also manufactured (Giddens, 1999), and reflective in the sense that they are responses to previous uses of technology: the risks associated with digitalization are often caused by, and therefore "reflect" (Beck, 1992), features of modern society.

In short, technology is used to solve problems caused by the use of technology. Hence, the digital risk society is layered – the additional layer of technology adds to the complexity and is subject to additional measures to deal with the risks caused by the previous layer. As noted by Ciborra (2006, p. 1339), "risk representations become more calculable and formalized [through the use of digital infrastructures for risk management], but this is obtained at the price of an incalculability of the risks of the infrastructure itself." Thus, we have shifted from industrially self-generated risks (Beck, 1992b) to a more rapidly developing form of digital-self generated risks. A difference here is that industrial technologies such as steam engines and machines could be "touched," while digital technologies are less tangible due to their miniaturized and networked nature.

Meanwhile, digital technologies require the standardization and homogenization of digital data to function correctly. This results in increased formalization in areas where digitalization prospers, such as education and health care. Consequently, while people increasingly engage with digital artifacts and formal procedures, scholars warn of an increased "dehumanization" as we become reduced to "users" of technology. Winner (1978) noted how technologies require other technologies to work, becoming the ways through which we think and act. In addition to concerns about mass unemployment, scholars express concern about the loss of individualization and ignorance of regional differences. Thus, the digital risk society relies on principles of mainstreaming and data processing as we delegate more tasks to intelligent techniques, such as AI. These techniques have replaced many functions previously occupied by humans, and much of our contemporary surroundings will be populated by machines that build on opaque algorithms to perform their tasks.

As digitalization becomes more pervasive in our daily lives, the amount of personal data used by organizations increases, and scholars mention the need for governance structures to account for this use. As we trust governments with our data and to make regulations, we also set the stage for centralized control and an emerging surveillance society. Privacy concerns go beyond cybersecurity issues and stretch into the domain of surveillance and governance in the wake of new technologies where rulers have access to full insight into all areas of society. In the digital risk society, digitalization dictates our living conditions as they become "forms of life" (Winner, 1978). Here, the differences between those who hold the production means of technology and those who use them determine the societal power structures. The digital economy is characterized by a concentration of power and closely resembles Beck's (1995) notion of an "authoritarian technocracy."

Here, it is important to acknowledge the idea that the tools and methods needed to address and research risks in the digital risk society may differ from traditional approaches. Rather than relying on technological solutionism, efforts to promote the

testing of diverse ideas may be more fruitful, together with narratives that frame and facilitate understanding of risks and values (Lüthi et al., 2021). These principles also apply to the next generation of risk mitigation efforts and risk research, as scholars explore ways to understand the digital risk society (Sovacool et al., 2022).

6 Concluding Remarks

In this paper, literature on digitalization and risk was studied to inform a characterization of the digital risk society. The following research question was posed:

RQ: *How is the digital risk society characterized in academic literature?*

The analysis unveiled three overarching themes. The digital risk society is:

- Inhabited by intangible technologies that act as solutions while simultaneously introducing new risks.
- Suffering from dehumanization as more and more tasks previously performed by humans are conducted by machines with opaque inner functions.
- Difficult to govern due to the ambivalent nature of digital artifacts. Scholars are calling for new approaches to govern these technologies, spurred by concerns over their potentially harmful use.

This society is partially implemented today, and previous notions of how society loses control over technology are still relevant in our time. Ellul (1964, p. 339) expressed concerns about the development of the technological society, noting that "unfortunately, it is a historical fact that this shouting of humanism always comes after the technicians have intervened; for a true humanism, it ought to have occurred before." Similar concerns are raised by contemporary scholars, as the digital risk society concerns "more than a few bad apps": it requires inquiries into the political structures of digitalization (Masiero, 2023; Sadowski & Andrejevic, 2020).

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