Trust and Risk Management Interplay: A Review in the Digital Context

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Risk.

Abstract: This paper provides a comprehensive overview of previous studies on the relationship between trust and risk management in the digital environment, highlighting multiple ways trust elements can enhance risk

management practices. PRISMA 2020 methodology was used to perform this analysis, and 281 papers retrieved from Scopus and Web of Science databases were examined. 45 papers selected based on specific

inclusion and exclusion criteria formed the foundation of this study.

The main research findings are: 1. A strong, mutual relationship exists between trust and perceived risk. Increased trust reduces perceived risk and leads to more user adoption and engagement with digital services. In turn, higher perceived risk lowers trust and discourages the adoption. 2. Trust integration into assessments for decision-making improves risk management by enhancing accuracy, fairness, and uncertainty handling in online environments. 3. Since the trust is dynamic by its nature, its regular reassessments are important. 4. Furthermore, even when cooperating with trusted services and platforms, it is necessary to continuously monitor providers to avoid over-reliance risks.

1 INTRODUCTION

The relationship between trust and risk has long been a research subject, highlighting their inherent relationship (Jøsang & Presti, 2004). This was also confirmed by a search using the keywords "risk management" AND "trust" limited to article titles, abstracts, keywords and articles and conference papers in the Scopus (Elsevier, n.d.) database in July 2024, which provided 2068 papers meeting these criteria. According to the analysed documents, interest in the topic started to appear in the early 1990s, with a wave of growth in 2004 and increased interest since 2020, as illustrated in Figure 1.

In recent years, the European Union has increasingly emphasised regulatory measures to enhance risk management in the digital environment (European Commission, 2022b, 2022a). However, the effectiveness of the risk management system within the European context remains a relevant question (Ghazieh & Chebana, 2021), raising the issue of an effective risk management framework (Luther et al., 2023). At the same time, with increased

cybersecurity threats, traditional risk mitigation actions are losing their effectiveness (Aslan et al., 2023).

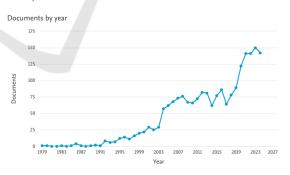


Figure 1: Identified publications distribution by the years.

Therefore, the research on the possibility of enhancing risk management practices in the digital environment by incorporating the trust element is becoming actual. This study aims to provide a comprehensive overview of the previous studies on the relationship between trust and risk management in

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the digital environment. To fulfil this aim, the following research questions were formulated:

RQ1: What industries are studied within the scope of trust and risk management relationships in the digital environment?

RQ2: What is the main focus of the research on trust and risk management in a digital environment?

RQ3: What are the main findings on the relationship between trust and risk management in the digital environment?

RQ4: How can trust elements be incorporated into risk management practices?

2 RESEARCH DESIGN AND METHODOLOGY

A systematic literature review was conducted following the PRISMA 2020 (Page et al., 2021) methodology to analyse the relationship between trust and risk management in a digital environment.

Scopus (Elsevier, n.d.) and Web of Science (WoS) (Clarivate, n.d.) - two leading scientific databases (Pranckutė, 2021; Zhu & Liu, 2020) - were used for this research to ensure that the latest sources are covered and to avoid indexation bias. The search included the keywords trust AND "risk management" AND ("digital" OR "online" OR "cyber"). It was limited to paper titles, abstracts, keywords, and document types such as articles and conference papers. The search based on these parameters was conducted on 30.06.2024 in Scopus (n=272) and on 07.07.2024 in WoS (n=55). Removing the duplicates, 281 unique papers were identified for further review.

The first relevance check phase included reading and reviewing the abstracts, using the following inclusion criteria: discussing risk management and trust correlation in a digital, cyber, or online environment. In turn, the exclusion criteria were a focus on trust as a technical element of the solution and a trust management topic from the perspective of computer science.

Based on these criteria, 85 papers qualified for the full-text paper review. Out of this scope, nine papers were unavailable to the author, and 31 papers were excluded from the analysis based on the previously described criteria. As a result, 45 papers (22 conference papers and 23 journal articles) were included in further bibliographical and contextual analysis.

3 RESEARCH FINDINGS

3.1 Bibliometric Analysis Results

A total of 141 authors from 21 countries (based on their affiliations) have shown interest in risk management and trust in digital settings. The most represented countries are the United Kingdom (n=9), the United States of America (n=8), China (n=7), India (n=4), and Tunisia (n=3).

The bibliographical analysis identified an increased interest in the topic by two authors: Lifen, L.(Lifen, 2008a, 2008b), who published two conference papers, and Youssef, S.B.H., and Boudriga, N. (Hadj Youssef & Boudriga, 2021; Youssef & Boudriga, 2022), who contributed with a conference paper and a scientific article. Furthermore, two journals were notable for their contributions to the topic: *Online Information Review*, which published three articles, and *Computers in Human Behavior*, which published two articles.

Author keywords (n=171) from the identified papers were analysed. Focusing on the keywords that appeared three or more times, the most common were, as expected, "trust" (n=19) and "risk management" (n=11). Other frequently appearing keywords included "electronic commerce" and "ecommerce" (n=7), as well as "perceived risk" and "risk perception" (n=6). The keywords "privacy", "cyber-physical systems", and "cybersecurity" each appeared three times. Such distribution provides insights into the most popular research sector, highlights the previous research focus on the correlation between trust and risk perception and emphasises cyber security as a component of digital trust.

Afterwards, VOSviewer software (*VOSviewer*, n.d.) was used to perform a full-count co-occurrence keyword analysis and identify clusters. 24 keywords appearing more than twice were included in the study, resulting in six identified clusters depicted in Figure 2, each with a distinct focus:

- Green: Focuses on risk management in contexts where human factors, security, and privacy are critical.
- **Yellow**: Connects perceived risk with user adoption and behavioural intention frameworks like UTAUT2 (Unified Theory of Acceptance and Use of Technology).
- Red: Centres on cyber risks in the context of social media and broader cyber security concerns.

- Purple: Focuses on cyber-physical systems and their associated information security risks, emphasising risk analysis.
- **Blue**: Explores the intersection of risk management and emerging technologies like blockchain, particularly in e-commerce.

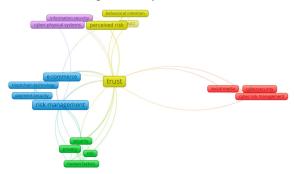


Figure 2: Keywords co-occurrence clustering results.

3.2 Context Analysis Results

Further context analysis was applied to the selected studies to address the formulated research questions.

3.2.1 Industries Studied Within Trust and Risk Management Relationship Scope in the Digital Environment

Based on the previously conducted keyword analysis, one of the most researched areas is e-commerce. Nevertheless, context analysis revealed a different proportion of such studies.

The financial industry was reviewed the most, with ten papers devoted to the research of trust and risk management. The general focus was on digital services, often with a more narrow focus on payment solutions (Hadj Youssef & Boudriga, 2021; Youssef & Boudriga, 2022), investments (Putri et al., 2022; Sun et al., 2016), banking (Kaur & Arora, 2021; G. Liu et al., 2008), and lending (Amalia et al., 2019).

E-commerce was the focus of nine articles, for example (Chang & Chen, 2008; Chong & Abawajy, 2007; San Martín & Camarero, 2009).

Four papers each concentrated on information technology (Mollazehi et al., 2024; Rogers et al., 2016; Shaytura et al., 2021; Terry Morris et al., 2020) and different aspects of social media (Abdul-Rahman & Hailes, 2000; Hansen et al., 2018; M. Liu et al., 2021; X. A. Zhang & Cozma, 2022). Two papers examined trust and risk management from an agricultural sector perspective (Carter, 2022; Y. Zhang et al., 2016), and one focused on healthcare (Ksibi et al., 2023), maritime (Larsen et al., 2022), oil and gas (Oudina et al., 2024), communication

(Tehrani et al., 2020) and hospitality (Hong & Kim, 2024). The other eleven articles were not concentrated on any particular industry.

3.2.2 Main Focus of the Research on Trust and Risk Management in a Digital Environment

Five groups can be identified when analysing the research focuses of the papers. The papers' distribution between the groups is based on their primary focus. Nevertheless, it is subjective since the thematic aspects discussed are often interrelated.

1. Research on perceived risk, trust, and consumer behaviour. This largest thematical group (n=15, 33%) focuses on how perceived risk and trust influence consumer behaviour, technology acceptance, and decision-making in online environments such as ecommerce, online banking, social media, and digital platforms.

For example, the research of J.M. Hansen, G. Saridakis and V. Benson (2018) examines how perceived risk, trust, and the interaction between elements of the Technology Acceptance Model (TAM) and Theory of Planned Behavior (TPB) influence consumers' intentions to use social networking services for transactions.

2. Research on trust management models, frameworks, and assurance. The main focus of this group (n=14, 31%) is on developing and analysing models and frameworks for trust management, risk management, and assurance across various systems, including e-commerce, cyber-physical systems, and virtual communities. These studies aim to enhance the reliability and security of digital systems by proposing methodologies to manage trust and reduce vulnerabilities.

As an example, the study by Li et al. (2023) establishes a novel conflict-eliminating framework with a dynamic trust risk management mechanism to manage trust risks and promote consensus.

3. Research on trust and risk in emerging technologies. The aim of these papers (n=7, 16%) is to study the impact of emerging technologies like blockchain, artificial intelligence, and digital transformation on trust and risk management practices. They analyse how these technologies can enhance security, reduce risks, and build trust in digital transactions and infrastructures.

As an illustration, the study by Shaytura may be mentioned (Shaytura et al., 2021) since it aimed to analyse the possibilities of using blockchain technology to ensure technogenic safety and risk management.

4. Research on human factors in cybersecurity and trust. This group (n=6, 13%) explores how human factors, such as individual differences, social engineering, and behavioural aspects, affect trust and risk-taking in cybersecurity contexts.

For example, the goal of Bishop et al. (2020) was to determine which specific individual differences influence cybersecurity behaviours to create tailored interventions that can be used within businesses to mitigate human susceptibility to cyber threats.

5. Research on privacy concerns and trust. This smallest category of papers (n=3, 7%) investigates privacy issues and their relationship with trust and risk in digital environments. As an illustration, the paper of Oudina et al. (2024) examines trust concerns. It identifies the key trust-related fears and needs that have shaped the development of trust quality in cyber-physical systems from the early design phase.

3.2.3 Main Findings on the Relationship Between Trust and Risk Management in the Digital Environment

Analysing the results and conclusions of the analysed papers, one of the main findings is that trust and perceived risk are closely interrelated and mutually influence each other. Increased trust mitigates perceived risk, enhancing user acceptance and positive behavioural intentions toward digital services (Aldás-Manzano et al., 2009; Ksibi et al., 2023; San Martín & Camarero, 2009). Opposingly, high perceived risk can reduce trust levels, slowing down adoption (Putri et al., 2022).

Furthermore, the findings suggest that individuals are more likely to engage in risk-taking behaviours when they trust the source, advisor, or platform. Trust influences decisions in financial investments, social engineering contexts, sharing economy platforms, and information sharing on digital platforms (Hansen et al., 2018; Mollazehi et al., 2024; Sun et al., 2016).

An important identified aspect is that excessive trust in systems, suppliers, or advanced technologies can result in overconfidence, less attention to risks, and greater vulnerability. This overreliance may lead individuals to underestimate potential threats and neglect necessary precautions (Bishop et al., 2020; Larsen et al., 2022; Terry Morris et al., 2020).

In the analysed papers were numerous positive confirmations of adopting assurance frameworks and emerging technologies like blockchain to enhance trust by reducing uncertainties and transaction risks. These were confirmed to improve risk management practices across various sectors (Ghaffarian et al., 2023; Hampton et al., 2021; Shaytura et al., 2021).

It was proven that providing transparent, explainable information and engaging in effective risk communication enhance trust and help manage public risk perceptions (Ghaffarian et al., 2023; Windelberg, 2016). When trust is low, individuals adopt risk-averse strategies, such as avoiding new or complex tasks, technologies, or interactions (McInnis et al., 2016; Setty, 2018).

Incorporating trust assessments into decision-making processes and identifying trust concerns enhance the effectiveness of risk management models. Trust-based approaches lead to more accurate predictions, fairer systems, and better handling of uncertainties in online environments (Oudina et al., 2024; Yuan et al., 2010).

Finally, an important finding confirmed in a digital environment is that social, cultural, and individual factors significantly affect trust development and risk perceptions. Effective risk management requires understanding these influences and customising approaches to different cultural contexts to build trust and address specific concerns (Bhattacharya & Saha, 2004; Windelberg, 2016).

3.2.4 Trust Element Incorporation into Risk Management Practices

Previous studies reveal numerous ways to incorporate trust into risk management practices in the digital environment. As a service provider, building and demonstrating trust in a digital environment helps to address the risk concerns of the customer or user. It can be achieved through:

- Strengthening security protocols and safeguarding user data (San Martín & Camarero, 2009).
- Openly sharing information about risk management practices and system capabilities (Ghaffarian et al., 2023; Tehrani et al., 2020).
- Tailoring communication to align with different user groups' cultural norms and expectations (Bhattacharya & Saha, 2004).
- Enhancing transparency and explainability in the data management (Li et al., 2023) of used technologies.
- Involving individuals in developing and improving digital services to build trust and address their concerns (McInnis et al., 2016; Y. Zhang et al., 2016).

In turn, the trust element might be integrated into the organisation's internal risk-management practices:

 Trust metrics might be integrated into risk assessment practices using trust scoring systems that evaluate partners, suppliers, and users (Abdul-Rahman & Hailes, 2000; Yuan et al., 2010).

- These metrics could be supported with independent audits and certifications to verify the security and reliability of services or systems (Hafver et al., 2021).
- The usage of services that include trusted emerging technology by design, such as blockchain, might be considered (Shaytura et al., 2021).

While integrating these trust elements into internal risk management practices, it is essential to regularly re-assess the trust levels, as trust is dynamic (Oudina et al., 2024). Even with trusted services and platforms, it is essential to keep monitoring the providers and not over-trusting them (Larsen et al., 2022).

4 DISCUSSION AND CONCLUSIONS

The results of the industry analysis previously studied in the context of trust and risk management relationships are unsurprising since the topic of trust and trustworthiness in the financial sector has been crucial for decades (Litovtseva et al., 2022), and interest in the subject within the digital environment seems natural.

The research on trust as an element of the risk management framework is not dominating in the selected papers' range, keeping this topic relevant for future research. Nevertheless, the findings of these papers already prove the possibility of using trust and its assessed level to enhance risk management frameworks in a digital environment. Moreover, this study summarises overall directions that might be considered while integrating the trust element into the organisation's risk management practices.

Further research on this topic might be devoted to developing a risk management framework and standardised decision-making processes, including integrated trust metrics, and exploring the methods for assessing and constantly monitoring trust levels in the digital context.

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Since the author's first language is not English, the paper's text was proofread using the Open AI GPT-40 model (OpenAI, 2025) and Grammarly (Grammarly, n.d.) to ensure it had no orthographical or grammar mistakes. After applying these services/tools, the text was reviewed, and the author took full responsibility for the publication's content.

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