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Authors	Alshamrani, Abdullatif;Treacy, Stephen;Rowan, Wendy;O'Flaherty, Brian;England, Andrew
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Perceived risk and mitigation of AI-supported clinical decision-making among radiologists: an exploratory study

Abdullatif Alshamrani [a], Stephen Treacy [a], Wendy Rowan [a], Brian O'Flaherty [a] and Andrew England [b]

[a]Business Information Systems, University College Cork, Cork City, Ireland; [b]Medical Imaging & Radiation Therapy, University College Cork, University, Cork City, Ireland

ABSTRACT

Artificial intelligence (AI) promises to revolutionise radiology practices. However, the AI implementation to support clinical decision-making relies on radiologists' understanding of associated risks, as it has a pivotal role in providing outstanding healthcare outcome delivery. This study aims to explore the perception of risks related to AI and how to mitigate them from radiologists' perspective via semi-structured interviews for more in-depth information. Preliminary findings indicate that most of the literature for the most part focused on attitudes and beliefs. As a work in progress, it is significant to bridge gaps in terms of the limited of empirical studies on risk perceptions of AI and insufficient theoretical grounding. This Research-In-Progress paper has provided a research framework, methodology and anticipated contributions while also seeking insightful critique to strengthen the research argument and its significance.

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KEYWORDS
Artificial intelligence; behaviour; clinical decision making; mitigation; perception of risk; radiologists; TEO Framework

Introduction

The emergence of Artificial Intelligence (AI) as a concept was initiated at the Dartmouth summer research project in 1955 (McCarthy, 2006). This principle has evolved to articulate that any aspect of learning and intelligence can be simulated by a machine to solve problems (McCarthy, 2006). Since that time, AI has revolutionised several sectors such as finance, healthcare, supply chains, retail and logistics (Aldwean & Tenney, 2024). The AI integration into clinical decision-making has presented an unclear vision in understanding opportunities and challenges (Alanazi, 2023). Hosny et al. (2018) believe that AI, particularly in radiology, will have a substantial impact in terms of enhancing diagnostic accuracy and workflows as the massive amount of imaging data can be used in AI models. Moreover, Hosny et al. (2018) emphasise the necessity of evaluating AI generalisability and reproducibility by establishing protocols and standards that are unified to assess patient outcomes effectively. While the existing literature on AI has discussed obstacles and identified issues related to interoperability, data quality, transparency, algorithm bias and privacy, the literature in the field has limited knowledge regarding the surrounding factors that may influence radiologists' perceived risk when using AI in practice (Hosny et al., 2018; Najjar, 2023; Pesapane et al., 2018; Rajpurkar et al., 2022). Therefore, it is significant for key stakeholders in healthcare institutions to understand contextual factors that impact radiologists' perception of risk regarding its usage. Given the black-box nature of AI, particularly diagnostic medical imaging, it becomes critical to explore factors that impact perceptions of risk and mitigation during AI utilisation, as the existing literature mostly concentrates on beliefs and attitudes and has substantiated a limited theoretical foundation and scant empirical findings in this area (Arkoh et al., 2025; Wenderott et al., 2025; Yang et al., 2022). Thus, it is crucial to address the scarcity of knowledge in this domain in real environments and bridge the gap, aligning AI solutions with radiologists' expectations and needs. The aim of the current research is to explore contextual factors by applying multiple lenses, including technological, organisational, environmental

CONTACT Abdullatif Alshamrani 122110878@umail.ucc.ie Department of Business Information Systems, University College Cork, Cork T12 K8AF, Ireland

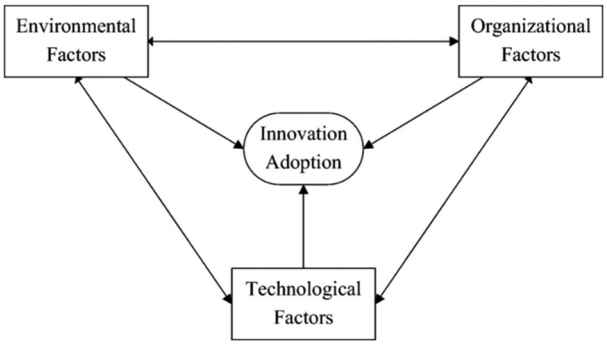
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and behavioural, not solely for awareness of hazards but rather to stimulate proactive actions to mitigate risks. This study will provide novelty to the current literature by seeking answers to the following research questions:

- RQ1: What contextual factors affect radiologists' perception of risk when using AI to support clinical decision-making?
- RQ2: How do behavioural and cognitive factors affect radiologists' perception of risk when using AI to support clinical decision-making?
- RQ3: How does perception of risk impact radiologists when using AI to support clinical decision-making?
- RQ4: How do radiologists mitigate AI risks in clinical decision-making?

Literature review

AI has promised a significant transformation to healthcare by improving clinical practice. In radiology, the literature on AI suggests that it offers several enhancements to diagnostic accuracy, workflow experience and service outcomes (Bhandari, 2024; Najjar, 2023). Despite all AI promises, current literature highlights several perceived challenges that can hinder AI deployment and influence risk perception among radiologists. For example, the technological dimension may include an issue such as AI compatibility with current systems (Tejani et al., 2024), which in turn requires seamless integration with electronic health records (EHRs). This can prevent resistance to AI adoption among radiologists. Furthermore, lack of interoperability is a critical issue, as radiology departments tend to acquire systems from different vendors that result in a burden for radiologists (Tejani et al., 2024). In addition, there is relevant literature that raised concern over bias, privacy, security, transparency and accountability (Kelly et al., 2023; Marey et al., 2024; Reyes et al., 2020; Topol, 2019). For example, automation bias is a key risk that unfolds when the AI model is insufficiently trained or specifically trained on non-representative datasets that could lead to incorrect medical decisions (Ueda et al., 2024). This example draws attention to the behavioural side of AI's use. For instance, 'algorithm aversion' is a significant phenomenon that appears when there is distrust and hesitation towards AI, which tends to be associated with AI algorithm reliability, transparency and regulations (Koçak et al., 2024). Together, these aspects can generate a complex risk horizon, particularly for radiologists' understanding of the contextual implication of AI in their practice. Therefore, despite all the perceptions regarding AI-associated challenges in the radiology field, there is a lack of a holistic approach that addresses risks and proposes mitigation. Previous literature indicates a limited empirical understanding of contextual factors that affect radiologists' perception of risk, as there is limited evidence in real environments, pointing to the importance of considering contextual presence when perceiving AI (Hua et al., 2024; Lawrence et al., 2025). While most existing studies have limited theoretical foundations and follow a quantitative approach, focusing on attitudes and perceptions towards AI adoption (Arkoh et al., 2025; Wenderott et al., 2025), there is a suggestion that more qualitative studies can facilitate in-depth exploration of elements influencing AI implementation (Yang et al., 2022). Moreover, the majority of studies' frameworks overlooked human factors that are associated with AI use, which can impact radiology professionals' practice, as AI encapsulates sets of complex behavioural and cognitive elements that may influence perceived risk and safety that require further research (Chen et al., 2023; Hua et al., 2024; Yu et al., 2024). Furthermore, previous systematic literature indicated several issues, including limited implementation, with seven out of 140 studies, failure in AI systems due to deficient acceptability, and AI literacy (Arkoh et al., 2025; Hua et al., 2024; Lawrence et al., 2025). Therefore, this research aims to employ an extended theoretical framework that combines technological, organisational and environmental (TOE) by Tornatzky and Fleischer (1990) with a behavioural lens to provide a rich understanding of AI in the radiology field, as there is limited experience with AI in real settings (Lawrence et al., 2025). This extended (TOEB) framework will provide a holistic understanding of AI-related risks from radiologists' perspectives.



TOE framework (Tornatzky & Fleischer, 1990).

Research design/methodology

This study is anchored to the interpretivist paradigm, which is based on the assumption that reality is subjective and acquired through social constructs within the phenomenon's context (Klein & Myers, 1999). A qualitative approach will be adopted to enable exploration of participants' in-depth experiences and perceptions regarding the phenomenon, which cannot be fully captured via quantitative indicators alone (Creswell, 2014, p. 4). This approach was selected to provide flexibility in addressing the research questions, allowing interviewees to elaborate on their views freely and even supporting probing questions (Kvale & Brinkmann, 2009). Semi-structured interviews of 20 radiologists in both private and public hospitals in Saudi Arabia. Furthermore, emerging themes will be categorised and coded to provide a comprehensive understanding of the phenomenon.

Theoretical and practical contribution

This study seeks to contribute to literature in the domain of AI and medical imaging by presenting a theoretical framework that bridges the theoretical gap and draws a clear understanding of risk perception that is associated with AI use to support clinical decision-making in radiology. This study is unlike previous research that mostly depends on descriptive approaches or uses technology acceptance models TAM that focus on attitudes or future usage intentions (Davis, 1989), whereas neglecting the perceived risk that is associated with behaviours. This study relies on a theoretical framework founded by Tornatzky and Fleischer (1990) that explores technology integration via three constructs: technological context, including internal and external IT capabilities relevant to the institution. The organisational context involves a list of components such as organisation's size, resources and management (Baker, 2012). The environmental context mirrors external influences like regulations, competitiveness and institutional norms (Oliveira & Martins, 2011). This framework was extended to encompass behavioural construct that recognise healthcare professionals' actions and responses that are influenced by the specific training and identity in the workplace (Patey et al., 2023).

The study contribution is manifest in clarifying that risk perception does not only stem from personal or technical sources. Instead, risk is rooted in multiple dynamic interactions that relate to technological, organisational, environmental and behavioural factors. In addition, this study will extend the role of the TOE model and employ it as an analytical instrument for risks that can introduce a new theoretical foundation, particularly to AI's radiology literature. In terms of practical contribution, the investigation's result can provide a significant conceptual ground for contextual factors affecting AI's perceived risks that could influence both healthcare institutions and radiologists.

Conclusion

This is a work-in-progress paper that aims to provide a significant contribution in understanding the implications of leveraging AI in clinical decision-making in radiology. It seeks to investigate the perception of the risks associated with AI and the mechanism for mitigation, offering novel insights that reflect the AI–human interaction in actual clinical decisions in practice. This study employs an extended TOE framework to explore the perception of risks and mitigation actions from radiologists' perspectives via semi-structured interviews. As this paper is in

progress, the next step will be obtaining ethical approval for the data collection phase, which anticipates yielding rich insights drawn from empirical evidence and opens new research arenas related to AI in radiology.

Author contributions

CRediT: **Abdullatif Alshamrani:** Conceptualization, Funding acquisition, Investigation, Methodology, Project administration, Validation, Writing – original draft, Writing – review & editing; **Stephen Treacy:** Supervision, Writing – review & editing; **Wendy Rowan:** Supervision, Writing – review & editing; **Brian O'Flaherty:** Supervision, Writing – review & editing; **Andrew England:** Supervision, Writing – review & editing.

Disclosure statement

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ORCID

Abdullatif Alshamrani http://orcid.org/0009-0004-0977-064X
Stephen Treacy http://orcid.org/0000-0002-3980-5565
Wendy Rowan http://orcid.org/0000-0001-8941-1508
Brian O'Flaherty http://orcid.org/0000-0003-2395-4950
Andrew England http://orcid.org/0000-0001-6333-7776

Data availablity statement

This study is under progress. Data will be available when the research is completed.

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