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Transforming Construction Risk Management through Digital Tools: A Case Study from Ghana

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Abstract

The construction industry increasingly recognises digital tools' transformative potential in managing and mitigating risks. Like many developing countries, Ghana's construction industry has various risks, including health and safety hazards, technological failures, and supply chain disruptions. These risks can lead to project delays, cost overruns, and safety incidents. While digital tools offer a promising avenue for mitigating these risks, their adoption and impact in Ghana remain under-researched. This study investigates the potential of digital tools in mitigating construction risks in Ghana, focusing on the perceptions and experiences of construction professionals in the Cape Coast region. A purposive sample of 78 construction professionals in Cape Coast, including project managers, site engineers, and safety officers, was surveyed using a close-ended online questionnaire. Data were analysed using descriptive statistics and the Relative Importance Index (RII) to rank the significance of various factors and benefits using Microsoft Excel and Statistical Package for Social Sciences (SPSS) software. The study identified "health and safety risks" and "technological failures" as the most critical concerns for construction professionals. Using digital tools was perceived as highly influential in completing projects on time and within budget. Improved regulatory compliance and productivity were identified as the most significant benefits of digital tools, while improved worksite safety, though acknowledged, ranked lower in priority. The findings underscore the potential of digital tools to revolutionise construction risk management in Ghana and the need for greater awareness and education regarding the safety-enhancing capabilities of these tools. It is recommended that stakeholders invest in digital solutions, prioritise training programs, and consider cost-effective options suitable for the Ghanaian context. Future research could expand the geographical scope and include more diverse perspectives to refine further and implement digital risk management strategies in the construction sector.

Keywords: Digital tools, risk management, safety, Ghana

1.0 INTRODUCTION

The construction industry, inherently hazardous, poses significant risks to its workforce, underscoring the critical need for effective risk management strategies (Maqbool et al., 2022). Construction Risk Management (CRM), a systematic approach to identifying, assessing, and mitigating risks, is crucial for cost-effectively achieving safety and security goals (Aminbakhsh et al., 2022). The advent of the digital age has revolutionised how stakeholders manage construction risks, with a growing reliance on digital tools, processes, and systems to enhance data collection, risk analysis, real-time monitoring, communication, and automation (Liang et al., 2022).

While existing research has explored the adoption of digital technologies in construction (Schönbeck et al., 2021), often highlighting their potential benefits in data collection, analysis, and communication (Darko et al., 2020; Liang et al., 2022). However, these studies tend to focus on the general digitalisation trends, leaving a crucial gap in our understanding of the specific digital tools utilised for CRM and the factors influencing their successful implementation. This gap is particularly pronounced in regions experiencing rapid growth and transformation, such as the Cape Coast Metropolis in Ghana.

The Cape Coast Metropolis is undergoing significant urbanisation and infrastructure development, leading to a surge in construction activity. This context presents unique challenges and opportunities for CRM as stakeholders grapple with a rapidly changing risk landscape and the need to adapt their strategies accordingly. Understanding how digital tools are utilised in this dynamic environment is crucial for developing tailored solutions that address the specific needs and constraints of the region.

This study aims to bridge this knowledge gap by investigating the digital tools employed for construction risk management within the Cape Coast Metropolis. By identifying the prevalent tools and examining the factors influencing their adoption and effectiveness, this research will offer valuable insights for industry practitioners and policymakers alike. The findings will inform best practices for digital CRM implementation in similar contexts and contribute to a broader understanding of how digital technologies can enhance safety, efficiency, and resilience in the construction industry.

■2.0 LITERATURE REVIEW

2.1 Construction Risk Management

Construction projects are inherently complex and fraught with many potential risks and hazards that can derail even the most meticulously planned endeavours (Yu et al., 2019). These risks encompass a broad spectrum, including errors in design and planning, financial fluctuations, legal and regulatory compliance issues, supply chain disruptions, health and safety hazards, environmental concerns, labour shortages, technological failures, geotechnical uncertainties, and even political instability (Rajat et al., 2020).

Managing construction-related risks is a dynamic and multifaceted process requiring continuous identification, assessment, mitigation, and monitoring throughout the project lifecycle (Manta et al., 2023; Sackey et al., 2018). Successful risk management strategies often involve a combination of approaches, including robust contractual agreements, comprehensive risk assessments, innovative project planning and monitoring technologies, transparent communication among stakeholders, and the ability to adapt to changing circumstances (Rajat et al., 2020).

Prioritising risk management is not merely a precautionary measure but a strategic imperative for construction companies. By proactively addressing potential risks, these organisations can minimise financial disruptions, optimise project outcomes, safeguard investments, and ultimately ensure successful project delivery within the established constraints of time, budget, and quality (Yu et al., 2019).

2.2 Limitations of Traditional Risk Management Practices

While widely applied across various industries, traditional risk management practices have been identified as inadequate for addressing the complexities of modern systems and environments. These practices often rely on analysing individual system components and may not effectively account for system interactions that can lead to emergent risks (Kaya, 2021). Additionally, traditional methods may struggle when there is a lack of knowledge and information, leading to uncertainties that are not well-represented (Tegeltija et al., 2017). Construction projects have a recognised need to improve risk management practices, particularly in areas such as decision trees and risk response planning (Sayegh, 2014). Furthermore, despite the recognition of Enterprise Risk Management (ERM) frameworks, their limitations have been highlighted, and the role of IT governance in overcoming these limitations has been emphasised (Rubino, 2018).

While risk management is a critical component in software-reliant systems, preventable failures continue, suggesting weaknesses in risk management practices (Alberts & Dorofee, 2018). A gap between actual and expected risk management practices has been identified in the telecommunications sector, indicating room for improvement (Abidin et al., 2019). The limitations of traditional risk management practices have created a pressing need for innovative solutions that can leverage the power of digital technologies to enhance risk identification, assessment, and mitigation. Digital tools offer the potential to streamline processes, improve data analysis, enable real-time monitoring, and facilitate collaboration among stakeholders, thereby unlocking new levels of efficiency and effectiveness in construction risk management.

2.3 Digital Tools and Their Significance in Construction Risk Management

Digital transformation is reshaping the construction industry, offering innovative solutions to address the risks that can arise during project execution (Rajat et al., 2020). The development of digital worksite risk management plans and a heightened focus on safety have significantly contributed to reducing construction-related risks and ensuring worker well-being (Rajat et al., 2020). Construction digitalisation encompasses many tools and processes, including digital tools for risk assessment and management, process automation, and digital project communication (Ghobakhloo, 2018; Khosrowshahi, 2019; Zhong et al., 2021). This integration of digital technologies has led to improvements in infrastructure and quality of life (Manta et al., 2023; Sackey et al., 2018).

Various factors influence the integration of digital technologies in construction risk management. Waqar et al. (2023) identify key elements such as Adaptability, Operation, Management, Reliability, Integration, and Knowledge as critical constructs for the successful implementation of AI in health and safety management systems, which can be extrapolated to broader digitalisation efforts in risk management (Waqar et al., 2023). Sayegh (2014) and Bahamid et al. (2022) highlight the need for improved risk management practices and the barriers to their implementation, suggesting that understanding and applying suitable risk management methods are essential for digitalisation (Bahamid et al., 2022; Sayegh, 2014). Additionally, Alshehhi (2024) emphasises the importance of effective risk management strategies and their direct link to project success, which can be enhanced through digitalisation (Alshehhi, 2024). Moreover, while Liu et al. (2023) focus on the digitalisation of construction projects through a project governance model, it underscores the importance of stakeholder, lifecycle, and knowledge integration, which aligns with the constructs identified in Waqar et al. (2023) (Liu et al., 2023). Bajpai and Misra (2022) further support the notion that selecting appropriate digital methods and techniques is crucial for digitalisation success in the construction industry (Bajpai & Misra, 2022).

A notable example of digitalisation's impact on risk management is the development of a non-invasive sensor-based fatigue assessment model utilising computer vision to monitor the whole-body fatigue of construction workers (Yu et al., 2019). This innovative approach leverages 3D model data from motion capture algorithms and biomechanical analysis, showcasing the potential of intelligent safety systems in the construction industry. Furthermore, Building Information Modeling (BIM) software has emerged as a valuable tool for identifying and mitigating safety risks during construction projects' planning and design phases (Marefat et al., 2019). By creating a virtual representation of the project, BIM allows for the early detection of potential hazards, facilitating proactive risk mitigation strategies.

In addition to BIM, other digital tools such as risk-centric project management software, safety compliance inspection tools, project management software, quality assurance software, and drones are increasingly being employed to enhance construction risk management (Darko et al., 2020; Zhang et al., 2020). These tools offer various benefits, including improved worksite safety, enhanced reporting and hazard prevention efficiency, increased site visibility, more accurate risk analysis, enhanced team communication and collaboration, improved regulatory compliance, enhanced reputation, real-time monitoring of activities, more efficient and more straightforward construction processes, improved environmental performance of buildings, and faster workflows through automated processes (Maqbool et al., 2022; Rajat et al., 2020).

Case studies serve as valuable references for understanding the application of digital tools in construction risk management. Zou et al. (2018) illustrate the use of Building Information Modelling (BIM) to manage and visualise risk information with case studies, including a highway project in Finland and a footbridge in the UK. These cases demonstrate BIM's ability to enhance communication and transparency of risk information among multi-disciplinary teams (Zou et al., 2018). Similarly, Zhang (2024) presents the application of a Risk Management Plan (RMP) to the Grand Paris Express metro construction project, showcasing how RMPs can identify, quantify, and mitigate technical risks in a complex urban environment (Zhang, 2024).

Contradictorily, while these examples highlight successful digital tool applications, Shojaei and Haeri (2019) emphasise a gap between literature and practice, suggesting that project managers often rely on experience over analytical tools. However, it also proposes a comprehensive supply chain risk management approach, validated through a real-world case study, which underscores the practical applicability of such digital tools (Shojaei & Haeri, 2019).

■3.0 METHODOLOGY

The research population targeted construction professionals directly involved in operatives' safety on Cape Coast construction sites. These professionals included project managers, site engineers, and safety officers. While the total population size was undefined due to the dynamic nature of the construction industry, a purposive sampling technique was employed to select participants. This technique was chosen because it was suitable for targeting specific individuals with the required knowledge and experience relevant to the research objectives. Based on resource constraints and the anticipated response rate, an initial sample size of 80 was identified. After accounting for two partially completed questionnaires, the final sample size was 78, representing a 97.5% response rate. This sample size, exceeding the minimum of 30 recommended by the Central Limit Theorem, was deemed sufficiently representative of the target population (Cranier, 2022). Data collection was conducted in August 2023 using a close-ended online questionnaire. This format was chosen for its efficiency in gathering standardised data from a geographically dispersed sample, allowing for faster analysis and minimising the risk of misinterpreting open-ended responses. The questionnaire was designed to elicit responses related to construction risks, factors influencing the digitalisation of risk management, and the significance of digital tools in this process. A 5-point Likert scale (ranging from "strongly disagree" to "strongly agree") was used to capture the respondents' level of agreement or disagreement with each statement.

Furthermore, while efficient, a close-ended questionnaire may limit the depth and nuance of responses compared to open-ended questions. However, the Likert scale format allowed for the capture of a range of opinions and the quantification of the data for statistical analysis. The purposive sampling criteria were based on the respondents' (i) knowledge and understanding of safety practices in the Cape Coast construction sector and (ii) involvement in safety management training and communication activities on construction projects. This selection process aimed to ensure that the respondents possessed the expertise to provide accurate and insightful data. While purposive sampling facilitated the selection of informed participants, it may introduce potential bias due to the researcher's judgment in the selection process. The selection criteria were explicitly defined and documented to mitigate this, ensuring transparency and minimising subjectivity. The high response rate (97.5%) also contributed to the sample's representativeness.

Responses were meticulously edited and coded to ensure data quality and consistency. Subsequent analysis was performed using Microsoft Excel and SPSS software. Descriptive statistics, including frequencies, mean values, percentages, and the Relative Importance Index (RII) for ranking, were calculated to summarise and present the findings in tabular form.

The chosen methodology aimed to balance efficiency, representativeness, and collecting relevant data to address the research objectives. The approach's limitations were acknowledged and considered during the interpretation of the findings.

■4.0 RESULTS AND DISCUSSION

The demographic information in Table 1 reveals several key characteristics of the survey respondents. The majority (84.6%) were male, suggesting a gender imbalance in the construction professionals involved in site safety within the Cape Coast region. This could be a point for further investigation in future studies. The most prevalent age group was 31-35 (44.9%), indicating that relatively young professionals are actively engaged in safety roles. Regarding educational background, a substantial proportion of respondents held Bachelor's degrees (39.7%), followed by those with Higher National Diplomas (29.5%). This indicates that a well-educated workforce will likely possess a strong technical and theoretical knowledge foundation. This is particularly relevant when considering their perceptions of digital tools in risk management. Professionals with higher educational qualifications may be more receptive to adopting new technologies due to their familiarity with digital concepts and potential to enhance efficiency and decision-making. Regarding job roles, Safety Officers and Site Engineers were the groups with the most representation (each at 32.0%). This is significant as these roles are directly responsible for implementing and overseeing safety measures on construction sites. Their perspectives are precious in understanding the challenges and opportunities of digitalising risk management. The relatively low proportion of Experienced and Skilled workers (14.2%) among respondents might indicate that the questionnaire may not fully capture the viewpoints of this group, which could have different

experiences and perspectives on safety practices compared to their more educated counterparts. This could be a limitation to consider when interpreting the findings. The demographic data provides an essential context for understanding the survey results. The predominance of young, educated professionals in key safety roles highlights the potential for leveraging digital tools to enhance risk management practices in the construction sector. However, the underrepresentation of experienced workers suggests further research to ensure their perspectives are adequately considered when developing and implementing digital risk management solutions.

Table 1 Demographic information of respondents

	Frequency	Percent (%)
Gender		
Male	66	84.6
Female	12	15.4
Age Range		
20 – 25 years	10	12.8
26 – 30 years	29	37.2
31 – 35 years	35	44.9
36 – 40 years	4	5.1
41years and above	-	-
Highest Educational Qualification		
Diploma	8	10.2
Higher National Diploma	23	29.5
Bachelor's Degree	31	39.7
Master's Degree	11	14.2
PhD	5	6.4
Position in the Organization		
Project Manager	19	24.3
Safety Officer	25	32.0
Site Engineer	23	29.5
Experienced and Skilled worker	11	14.2
TOTAL	**78**	**100**

The analysis in Table 2 revealed, "health and safety risks" as the most critical construction-related risk (mean = 4.205), followed by "technological failures" and "environmental concerns" (means = 4.141 and 4.051, respectively). "Interruptions in the supply chain" were considered the least significant risk (mean = 3.731). While the high ranking of health and safety risks aligns with the industry's emphasis on worker well-being, the prominence of technological failures as the second-highest concern is noteworthy. This finding may reflect the growing reliance on digital tools and automation in construction, potentially increasing vulnerability to technical malfunctions and cyber threats. Additionally, the relatively lower concern regarding supply chain disruptions contrasts with recent global events, highlighting the vulnerability of supply chains across industries. This may indicate a need for increased awareness and preparedness for such disruptions within the construction sector. The findings reinforce the literature's emphasis on the importance of risk management in construction, particularly in addressing health and safety hazards (Rajat et al., 2020). The high ranking of technological failures aligns with the growing recognition of the need for robust cybersecurity and contingency planning in the digital age (Maqbool et al., 2022). While unexpected, the lower concern about supply chain disruptions may reflect a lack of awareness or underestimation of the potential impact of such events. This finding underscores the need for further research and education on supply chain risk management in the construction industry. The results suggest that while construction professionals are attuned to certain risks, there may be blind spots or areas requiring heightened attention, particularly regarding technological vulnerabilities and supply chain resilience. This highlights the ongoing need for comprehensive risk management strategies that adapt to the evolving landscape of the construction industry.

Table 2 Construction-related risks

Factor	Frequency					Mean	Rank
	1 (Strongly Disagree)	2 (Disagree)	3 (Neutral)	4 (Agree)	5 (Strongly Agree)		
Health and safety risks	1	2	15	22	38	4.205	1st
Technological failures	0	6	11	27	34	4.141	2nd
Environmental concerns	0	5	19	21	33	4.051	3rd
Errors in design and planning	6	0	14	24	34	4.026	4th
Legal and regulatory compliance issues	2	4	16	25	31	4.013	5th
Changes in finances	4	1	18	25	30	3.974	6th
Labour shortages	1	7	15	30	25	3.910	7th
Geotechnical uncertainty	3	5	17	31	22	3.821	8th
Political instability	5	5	21	18	29	3.782	9th
Interruptions in the supply chain	3	9	20	20	26	3.731	10th

The findings in Table 3 show the multifaceted nature of digitalisation in construction risk management, with several factors emerging as influential. Notably, the most significant factor was the "utilisation of technology to complete projects on time and within budget" (RII = 0.828). This aligns with Maqbool et al. (2022) and Rajat et al. (2020) emphasis on the efficiency gains and cost reductions offered by digital tools in construction. Similarly, the factors "a profound change in economy and society due to the innovation of the fourth revolution" (RII = 0.792) and "change in how construction companies address and manage risks" (RII = 0.800) resonate with the transformative potential of digital technologies highlighted by Rajat et al. (2020) and Sackey et al. (2018). These findings suggest that the construction industry recognises the disruptive nature of digitalisation and its capacity to revolutionise risk management practices. Moreover, "better ways of gathering and mobilising crucial data regarding projects" (RII = 0.713) ranked less important than other factors. This could indicate that while data collection is acknowledged as essential, the industry may prioritise the direct impact of digital tools on project outcomes, such as timeliness and cost-effectiveness. The findings also reveal a disparity between the perceived importance of "being able to check and get assignments, documents, and reports through mobile devices" (RII = 0.751) and "effective management of equipment and resolving logical issues" (RII = 0.738). This suggests that while mobile accessibility is valued, the industry may not fully grasp the potential of digital tools in optimising equipment management and problem-solving. An unexpected finding was the relatively low ranking of "ease in the operation and better labour and material management" (RII = 0.751). Given the labour-intensive nature of construction and the potential of digital tools to streamline resource management, this finding warrants further investigation. It could suggest a lack of awareness regarding the capabilities of digital tools in this domain or a resistance to change in traditional labour management practices.

Table 3 Factors influencing the digitalisation of construction risk management

Factor	Frequency					RII	Rank
	1 (Strongly Disagree)	2 (Disagree)	3 (Neutral)	4 (Agree)	5 (Strongly Agree)		
A profound change in economy and society due to the innovation of the fourth revolution	0	5	19	28	26	0.792	5th
Rigorous attention to risks and effective management	3	6	20	27	22	0.751	11th
Efficient organisation and structuring of immense volumes of data via cloud computing	1	3	30	18	26	0.767	9th
Change in how construction and engineering companies address and manage risks	1	0	26	20	31	0.805	2nd
The innovation of digital and cloud storage and computing	2	0	27	31	18	0.762	10th
Creation of a digital work site and safety management plan	0	6	19	27	26	0.787	7th
Better ways of gathering and mobilising crucial data regarding projects	2	1	36	29	10	0.713	15th
Change in how construction companies address and manage risks	0	4	17	32	25	0.800	3rd
Improving productivity and profitability	1	2	18	33	24	0.797	4th
Utilising technology to plan projects more effectively	1	3	23	27	24	0.779	8th
Utilising technology to complete projects on time and on a reasonable budget	3	4	14	15	42	0.828	1st
Being able to check and get assignments, documents, and reports through mobile devices	4	7	19	22	26	0.751	11th
Effective management of equipment and resolving of logical issues	2	9	21	25	21	0.738	14th
Ease in the operation and better labour and material management	0	7	20	36	15	0.751	11th
The feeling of being left in the dust by the professionals who bring more value to the clients with high-quality works	0	0	22	38	18	0.790	6th

RII: Relative Importance Index

The findings in Table 4 highlight the multifaceted significance of digital tools in construction risk management. The high ranking of "improved regulatory compliance" (RII = 0.844) and "improved productivity at all stages" (RII = 0.826) aligns with the literature emphasising the need for enhanced risk management practices and the link between effective risk management and project success (Alshehhi, 2024; Sayegh, 2014). The perceived value of "enhanced reporting and hazard prevention efficiency" (RII = 0.805) and "enhanced team communication and collaboration" (RII = 0.805) reflects the importance of information sharing and collaboration highlighted in studies on digitalisation in construction (Ghobakhloo, 2018; Liu et al., 2023).

However, while "improved worksite safety" (RII = 0.767) is acknowledged as significant, it ranks lower than other factors. This could indicate that while safety remains a concern, the respondents perceive other benefits of digital tools, such as efficiency and compliance, as more immediate priorities. The relatively lower ranking of "more efficient, simpler processes in construction" (RII = 0.738) and "improved budget management" (RII = 0.751) might be surprising given the literature's emphasis on these aspects (Bajpai & Misra, 2022; Rajat et al., 2020). This could suggest that while these benefits are recognised, they may not be as readily apparent or easily quantifiable in the respondents' experiences. The findings highlight the diverse benefits of digital tools in construction risk management, ranging from improved safety and efficiency to enhanced communication and compliance. However, the specific ranking of these benefits provides nuanced insights into the priorities of construction professionals in the Cape Coast context. This suggests that successfully implementing digital tools in risk management requires a tailored approach that considers stakeholders' specific needs and perceptions.

Table 4 Significance of using digital tools in construction risk management

Factor	Frequency					RII	Rank
	1 (Strongly Disagree)	2 (Disagree)	3 (Neutral)	4 (Agree)	5 (Strongly Agree)		
Improved worksite safety	1	3	30	18	26	0.767	14th
Enhanced reporting and hazard prevention efficiency	1	0	26	20	31	0.805	5th
Increased site visibility	1	1	28	30	18	0.762	16th
More accurate risk analysis	0	6	19	27	26	0.787	10th
Enhanced team communication and collaboration	2	4	13	30	29	0.805	5th
Improved regulatory compliance	0	0	16	29	33	0.844	1st
Enhanced reputation	2	0	19	27	30	0.813	4th
Real-time monitoring of all activities	3	1	22	25	27	0.785	12th
More efficient, simpler processes in construction	1	6	23	34	14	0.738	20th
Improved environmental performance of buildings	0	3	20	22	33	0.818	3rd
Faster workflows through automated processes	2	0	27	30	19	0.764	15th
Improved communication and regulatory compliance	1	3	23	27	24	0.779	13th
Improved productivity at all stages	3	2	16	18	39	0.826	2nd
Improved budget management	4	7	19	22	26	0.751	19th
Enhanced addressing and management of construction-related risks	2	5	24	22	25	0.762	16th
Shorter project completion time	0	7	20	36	15	0.751	18th
Seamless integration of multiple solutions	3	4	10	33	28	0.803	7th
Improvement of infrastructure and jobs act	1	2	21	25	29	0.803	8th
More accurate risk analysis	0	0	27	24	27	0.800	9th
Automation –minimising the risk of error and accidents by humans.	2	0	23	29	24	0.787	10th

RII: Relative Importance Index

■5.0 SUMMARY OF FINDINGS

The study reveals a predominantly young, well-educated male workforce (84.6%) in Cape Coast construction sector safety roles. "Health and safety risks" were identified as the most critical concern (mean = 4.205), followed by "technological failures" (mean = 4.141), emphasising the need for robust risk management strategies in these areas (Rajat et al., 2020). Digitalisation is viewed as transformative, with the "utilisation of technology to complete projects on time and within budget" considered the most influential factor (RII = 0.828), aligning with the emphasis on efficiency gains (Maqbool et al., 2022; Rajat et al., 2020). The most significant benefits of digital tools were perceived to be "improved regulatory compliance" (RII = 0.844) and "improved productivity at all stages" (RII = 0.826), reflecting the industry's focus on efficiency and adherence to standards (Alshehhi, 2024; Sayegh, 2014). However, while "improved worksite safety" (RII = 0.767) is acknowledged, it ranks lower than other factors, potentially indicating a need for greater awareness of the safety-enhancing capabilities of digital tools.

■6.0 CONCLUSION AND RECOMMENDATIONS

This study concludes that digital tools offer significant potential to transform construction risk management in Ghana, particularly by enhancing efficiency, regulatory compliance, and productivity. The findings underscore the importance of utilising technology to achieve project goals within time and budget constraints, aligning with the industry's growing emphasis on digitalisation. However, the relatively lower prioritisation of worksite safety improvements through digital tools suggests a need for greater awareness and education in this area. This study is limited by its focus on the Cape Coast region and the potential underrepresentation of experienced workers. Future research could expand the geographical scope and include more diverse perspectives to provide a more comprehensive understanding of the challenges and opportunities of digital risk management in Ghana. Based on the findings, it is recommended that stakeholders in the Ghanaian construction industry actively invest in and adopt digital tools, particularly those focusing on risk identification, mitigation, and communication. Training programs and workshops should be conducted to educate professionals about the benefits and effective use of these tools, especially regarding safety enhancement. Additionally, considering the potential resource constraints in Ghana, cost-effective

and user-friendly digital solutions should be prioritised. The study's contribution lies in providing empirical evidence to support the use of digital tools in risk management, thereby contributing to a safer and more efficient construction sector in Ghana.

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