Key challenges of adopting artificial intelligence tools in project management in Ghana

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Abstract

Undoubtably, artificial intelligence (AI) has come to stay in all life activities. The last decade has seen a considerable number of studies and policy implementation across sectors aimed at adopting AI tools. However, less studies have explored the barriers to adopting AI tools in project management (PM) in the construction industry in developing economies such as Ghana. Professionals in the construction industry in Ghana handle complex projects which new technologies like AI can assist in improving their performance. But the shift towards this new technology has been met with many obstacles in the PM within the country. Therefore, this study aims at analysing the key challenges confronted by PM professionals in adopting AI tools in project management within Ghana. This study utilised questionnaire survey solicited from seventy-one experienced PM professionals. The following tests were conducted on the data: normality, reliability, mean score and Kruskall-Wallis tests. Findings from the analysis include lack of commitment from the leadership of PM firms to accept and invest in AI gadgets, there is resistance to change among construction workers with the feeling of AI tools taking over their jobs, cultural barriers, and ethical concerns. Although, the study is limited to a handful of PM professionals in Ghana, it provides a checklist of obstacles that must be overcome to facilitate the practical use of AI in PM. The findings will be helpful and supportive to further research on AI in PM.

Keywords: Artificial intelligence, AI, Challenges, Ghana, Project management.

1. INTRODUCTION

Artificial intelligence (AI) is witnessing social media attention together with real policy and practice shifts towards its adoption in all sectors of the global economy (Cubric 2020). With the Industry 4.0 technological and industrial revolution in hindsight, key project management knowledge areas are also shifting to embrace AI (Namian et al. 2021). Globally, the investment in AI tools is projected to increase to US$66.8 billion by 2030 (Choithani et al. 2024). In Ghana, the outlook of the government towards attaining sustainable middle-income status has garnered the interests in digitalization drive (Birikorang and Birikorang 2024). The key gadget in this digital revolution in Ghana is artificial intelligence in major areas of development such as the construction project management. As part of the stimulus economic recovery package released to the country from the International Monetary Fund and other donor agencies, the country is expected to enjoy more than US$800 million funding for smart AI tools (Aloryito and Aloryito 2019). Furthermore, AI in project management such as AI-supported Building Information Modelling software has a myriad of potential importance (Fridgeirsson et al. 2021, Shang et al. 2023). At the pre-construction stage of the project, AI is capable of aiding project teams to conceptualize the designs of the project and plan into management and alteration of designs. AI assists in structural design assessment, detection of potential errors and a management module to handle structural and design challenges together with budgeting (Jallow et al. 2023, Zhu et al. 2022). Further, AI gadgets together with deep and machine learning techniques are instrumental in feasibility studies and prediction of the success of the project (Obradović Posinković and Vlahov Golomejić 2024). It undertakes risk assessment using AI's powerful and complex tools to gather and analyse market, financial and environmental data on projects (Smith and Wong 2022). With the help of AI software, documentation of construction activities become easier and faster to track. There is a trail of documents from the architectural, mechanical, engineering, electrical and concreting which

hitherto were done manually. For instance, natural language processing (NLP) has been helpful in the creation of scope in the areas of architectural designs and electrical works into the various dimensions of construction works (Holzmann et al. 2022, Wijayasekera et al. 2022). AI is also key in contracting and tracking the negotiation, awarding, and suppling of construction materials for the project. Moreover, AI is essential in validating the current building requirements against the approved building codes (Saka et al. 2023). Project integration during the construction and operation phases of the project are facilitated by smart technologies of AI. Structural defects and maintenance, and decomposition of the projects are offered with AI tools to sustain the project performances (Li et al. 2021, Rane 2023). Despite the increased interests and plethora benefits in practice about AI, it remains limited the number of studies focused on project management t(Kar et al. 2021, Shang et al. 2023). The challenges of AI adoption in PM differ from one geographical area to another. According to Barcaui and Monat (2023), there is a gap between the acceptance of AI tools in the built environment in the global south and north. These claims are supported by studies such as Shang et al. (2023) conducted a study in Singapore using primary data of sixty (60) PM professionals. The study identified key barriers to AI of huge costs associated with the implementation and maintenance of AI software together with poor training for PMs to accept AI in project management. In Australia, Regona et al. (2022) found constraints in application of the AI in the public perceptions of the use of AI with much concerns relating to ethical and privacy breaches. Jallow et al. (2023) highlighted safety issues and inadequate exploration of AI in project management data as the major barriers to AI adoption in the United Kingdom (UK). In the global south, Arakpogun et al. (2021) mentioned lack of deliberate policies and contextualisation AI tools to project management. This is because most of the AI tools are developed to function in the advanced environments. In Ghana, very few studies such as Mustapha et al. (2024) and Adinyira et al. (2021) have shown the need for AI adoption in PM, but these studies failed to elaborate on the barriers associated with it with little or no empirical data backing their findings (Darko et al. 2017). Additionally, existing studies on AI in Ghana were conducted in other fields such as manufacturing, tourism, and education with very few studies in the project management field (Adarkwah et al. 2023, Bedu et al. 2024).. Therefore, this study aims at exploring the key challenges in the AI adoption in project management in Ghana. The findings of the study will be utilised in future studies and the study also provides major areas of concerns to overcome in the use of AI for project management. The rest of the article includes empirical literature review, the method of the research, findings, and conclusion.

2. LITERATURE ON BARRIERS TO AI ADOPTION IN PM

Recent literatures on artificial intelligence (AI) on project management explains the challenges of integrating AI in PM activities. For instance, Shang et al. (2023) discussed the financial difficulties involved in securing AI and robotic gadgets for project management. Niederman (2021) and Rane (2023) outlined the problems of AI in PM in relation to the technical and functional lapses with the cost of maintenance. These technicalities promote the need to subcontract the services of IT experts who function outside the organisation. Moreover, Taboada et al. (2023) and Najafi et al. (2024) mentioned the internal challenges of handling AI matters among PMs due to non-existent training modules or poor knowledge about the new technologies. PM organisations have been found to lack comprehensive digital systems and infrastructures to promote the use of Ais. In addition to these challenges, the data gap on AI is overwhelming especially for countries in the global south (Li et al. 2021, Saka et al. 2023). Concerns for safety, ethical and cultural issues have been raised on projects built in culturally diverse communities (Obradović Posinković and Vlahov Golomejić 2024, Vial et al. 2023). Jallow et al. (2023) found that the negligence of project professionals and dependence on robotic machines for PMs are creating fears among construction workers and PMs. The fears are also bordered on trust, and possibility of losing jobs and opportunities (Merhi 2023). In Ghana, AI has been instrumental in the early detection of defects, and fatalities in building projects (Kissi et al. 2023). AI-sponsored wearable sensors have been helpful in the health and safety of PM professionals in major cities of Accra, Kumasi, Tamale and Cape Coast. Currently, Project Management bodies in the country are embarking on sensitising and training PMs to understand the essence and risks with AI adoption (Barcaui and Monat 2023, Mustapha et al. 2024). However, the country's PM field face challenges of slow acceptance of AI tools in the

rural areas with resistance from major players to fund AI tools (Adinyira et al. 2021). Moreover, there is no regulatory guidelines from the construction industry and Parliament of Ghana on AI.

3. RESEARCH METHOD

3.1 Identification and validation of challenges of AI adoption in PM

The first phase of this study involved the identification of key challenges of the adopting AI in project management by undertaking a comprehensive review of existing literature: journal articles, project reports and institutional documents. Following this, search keywords were determined after a preliminary reading of literature relating to this topic. The search keywords included "Artificial intelligence", and "project management" (Owojori and Okoro 2022). These search keywords were input into Scopus, Web of Science, ProQuest, Google Scholar, and EBSCOhost to retrieve relevant studies, reports and documents (Kukah et al. 2021). The outcome of the search was 684 and upon thorough analysis, 58 literatures were further assessed were utilized for this study. Key success factors were extracted after a content analysis of the 58 literatures by selecting, comparing, and examining text data. A list of 32 key challenges on AI (KCA) was produced out of the analysis of the literature.

3.2 Structured survey administration

The questionnaire survey was the data collection instrument for this study, and it was organized into two distinct sections with first portion dedicated to the collection of data regarding the demographic characteristics of the participants. Subsequently, the second section of the study aimed to obtain the perspectives of project managers regarding the confronting challenges in the adopting AI in the management of construction projects. The main characteristics included in the survey include educational status, their experiences in terms of the number of years, the quantum of project managed and job titles. The summary of these demographic characteristics is shown in Table 2. The second section of the survey had the 32 KCAs extracted from the literature review (see Section 3.1). Structured questions were utilized for the statements relating to the KCAs with the measurement scale of 5-Likert scale (Zou et al. 2014). This drafted survey questionnaire was pilot tested with three senior academics and four project managers who are knowledge in construction project management in Ghana with several years of practical experiences. The responses from the pilot testing were helpful in revising the 32 KCAs into 19 statements shown in Table 1.

Table 1: List of items in the questionnaire survey

S/N	Challenges on AI adoption	Source
KCA1	Poor understanding of AI	Aljawder and Al-Karaghouli (2024)
KCA2	Data privacy and trust risk	Kar et al. (2021)
KCA3	Lack of digital infrastructure	Holzmann et al. (2022)
KCA4	Inadequate financial investment	Kar et al. (2021), Najafi et al. (2024)
KCA5	Shortage of AI management skill set	Wijayasekera et al. (2022)
KCA6	Low level of digitization	Akomea-Frimpong et al. (2023a)
KCA7	Fear of AI taking over jobs	Vial et al. (2023)
KCA8	Poor attitude to the use of AI	Alshahrani et al. (2024)
KCA9	Ethical and legal breaches	Rane (2023)
KCA10	Internet connectivity challenges	Li et al. (2021)
KCA11	Insufficient database on AI	Shang et al. (2023)
KCA12	High cost of acquiring AI tools	Fridgeirsson et al. (2021)
KCA13	Lack of bespoke AI tools for Ghana setting	Taboada et al. (2023)
KCA14	Improper regulatory guidelines	Merhi (2023)
KCA15	Resistant to technological changes	Saka et al. (2023)

KCA16	Lack of commitment from project leadership	Jallow et al. (2023)
KCA17	Cultural issues	Obradović Posinković and Vlahov Golomejić (2024)
KCA18	Lack of strategic plan on AI	Vial et al. (2023)
KCA19	Functional and technical errors	Niederman (2021), Zhu et al. (2022)

The distribution of the revised questionnaire survey prompted the search for respondents from the Ghanaian construction industry. The target respondents was project managers (PMs) in Ghana with the search of their titles and details on LinkedIn and other social platforms (Akomea-Frimpong et al. 2021). Direct messages were sent to potential participants in the survey who constitute the population of the study. The criteria for the selection of the survey's participants include a person with a job title of a PM. The PM must also be practising for ten or more years in Ghana with adequate knowledge and practical experiences on AI and project management. A total of 46 responses were received in response to a series of LinkedIn messages that were sent. The 46 potential participants were requested to provide additional email contacts of co-workers who are knowledgeable on this topic. In summary, 82 potential respondents were gathered for the survey administration which took place via Qualtrics Survey links (Kalesnikaite and Baker 2024). Within three months, a total of 71 responses were received representing a response rate of 86.59 percent (see Table 2). Previous studies in Ghana utilised smaller sample size of PMs such as Chan et al. (2018) (43 responses), and Ameyaw et al. (2017)(35 responses) making the 71 responses representative.

Table 2: Basic information about the respondents

Profile	**Category**	**Frequency**	**Percent (%)**
Education status	Undergraduate	27	38.03
	Masters	39	54.93
	PhD	5	7.04
	Total	**71**	**100.00**
Work Experience	10 to 15 years	8	11.27
	16 to 20 years	21	29.58
	21 to 25 years	27	38.03
	More than 25 years	15	21.13
	Total	**71**	**100.00**
PM titles	Quantity surveyor	17	23.94
	Consultant	22	30.99
	IT Manager	18	25.35
	Architect	14	19.72
	Total	**71**	**100.00**
Participation in PM (number)	1-5 projects	21	29.58
	5-15 projects	37	52.11
	Greater or more than 15 projects	13	18.31
	Total	**71**	**100.00**

3.3 Analysis of the data

The Cronbach's alpha testing was undertaken to ascertain the reliability of the responses. The instrument demonstrated a high level of reliability, as indicated by the overall alpha coefficient of 0.853, which aligns with the findings of Ekanayake et al. (2023) and Lourenço et al. (2022). These studies mentioned that a Cronbach Alpha of 0.7 or more is acceptable to show the internal consistency of the reliability of the dataset. Furthermore, the normality of

the dataset was determined with Shapiro-Wilk test and Kolmogorov-Smirnov. The findings of the normality test indicated that the p-value for all 19 variables assessed was 0.000, a value that falls below the required threshold of 0.05 for establishing normality (see Table 3). The implication of this outcome suggests that the collected data does not follow a normal distribution. Thus, this paves way for the Kruskal-Wallis test (non-parametric) test to assess the differences in the data set with subsequent mean ranking of the critical challenges.

Table 3: Test on the normality distribution of the data

Challenges	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
KCA1	0.186	70	0.000	0.895	70	0.000
KCA2	0.352	70	0.000	0.730	70	0.000
KCA3	0.216	70	0.000	0.890	70	0.000
KCA4	0.183	70	0.000	0.898	70	0.000
KCA5	0.337	70	0.000	0.715	70	0.000
KCA6	0.168	70	0.000	0.896	70	0.000
KCA7	0.193	70	0.000	0.889	70	0.000
KCA8	0.337	70	0.000	0.727	70	0.000
KCA9	0.430	70	0.000	0.615	70	0.000
KCA10	0.360	70	0.000	0.719	70	0.000
KCA11	0.161	70	0.000	0.883	70	0.000
KCA12	0.163	70	0.000	0.872	70	0.000
KCA13	0.357	70	0.000	0.723	70	0.000
KCA14	0.323	70	0.000	0.763	70	0.000
KCA15	0.362	70	0.000	0.708	70	0.000
KCA16	0.405	70	0.000	0.577	70	0.000
KCA17	0.463	70	0.000	0.485	70	0.000
KCA18	0.256	80	0.000	0.705	70	0.000
KCA19	0.403	70	0.000	0.557	70	0.000

4. FINDINGS AND DISCUSSIONS

4.1 Critical assessment of the challenges of AI in project management

The critical nature of the challenges was ascertained by first conducting the Kruskal-Wallis H-Test to assess the variations in the responses of the PMs (see Table 5). The null hypothesis established for the analysis stated that no differences exist in the perspectives of PMs on the measurement items (challenges). The findings support this hypothesis apart from KCA6 (low level of digitization). Table 4 presents the order of critical importance of challenges on AI in PM in Ghana.

Table 4. Mean critical ranking of the challenges.

S/N	Challenges	Mean	Std. Error	St Dev.	Ranking
KCA16	Lack of commitment from project leadership	4.75	0.064	0.579	1
KCA15	Resistant to technological changes	4.61	0.056	0.715	2
KCA17	Cultural issues	4.59	0.052	0.803	3
KCA14	Improper regulatory guidelines	4.51	0.073	0.629	4
KCA9	Ethical and legal breaches	4.46	0.068	0.723	5
KCA8	Poor attitude to the use of AI	4.41	0.070	0.783	6
KCA2	Data privacy and trust risk	4.38	0.071	0.799	7
KCA12	High cost of acquiring AI tools	4.38	0.132	0.809	8

KCA5	Shortage of AI management skill set	4.33	0.085	0.955	9
KCA13	Lack of bespoke AI tools for Ghana setting	4.31	0.072	0.824	10
KCA19	Functional and technical errors	3.45	0.056	0.562	11
KCA7	Fear of AI taking over jobs	3.25	0.121	1.356	12
KCA6	Low level of digitization	3.14	0.120	1.343	13
KCA11	Insufficient database on AI	3.11	0.128	1.476	14
KCA10	Internet connectivity challenges	3.03	0.064	1.436	15
KCA4	Inadequate financial investment	2.90	0.120	1.350	16
KCA1	Poor understanding of AI	2.89	0.119	1.334	17
KCA18	Lack of strategic plan on AI	2.82	0.031	1.331	18
KCA3	Lack of digital infrastructure	2.79	0.119	1.335	19

Table 5. Tests results of the Kruskal-Wallis

S/N	AI adoption challenges	Kruskal-Wallis H	Df	Asymp. Sig.	Hypotheses
KCA1	Poor understanding of AI	1.537	3	0.464	Accept NH
KCA2	Data privacy and trust risk	1.172	3	0.557	Accept NH
KCA3	Lack of digital infrastructure	0.185	3	0.912	Accept NH
KCA4	Inadequate financial investment	1.921	3	0.383	Accept NH
KCA5	Shortage of AI management skill set	4.047	3	0.132	Accept NH
KCA6	**Low level of digitization**	**6.181**	**3**	**0.045**	**Reject NH**
KCA7	Fear of AI taking over jobs	1.250	3	0.535	Accept NH
KCA8	Poor attitude to the use of AI	1.926	3	0.382	Accept NH
KCA9	Ethical and legal breaches	1.967	3	0.374	Accept NH
KCA10	Internet connectivity challenges	1.572	3	0.456	Accept NH
KCA11	Insufficient database on AI	0.715	3	0.699	Accept NH
KCA12	High cost of acquiring AI tools	0.396	3	0.820	Accept NH
KCA13	Lack of bespoke AI tools for Ghana setting	1.087	3	0.581	Accept NH
KCA14	Improper regulatory guidelines	4.706	3	0.095	Accept NH
KCA15	Resistant to technological changes	4.121	3	0.127	Accept NH
KCA16	Lack of commitment from project leadership	1.191	3	0.551	Accept NH
KCA17	Cultural issues	0.068	3	0.966	Accept NH
KCA18	Lack of strategic plan on AI	0.550	3	0.287	Accept NH
KCA19	Functional and technical errors	0.467	3	0.715	Accept NH

4.2 Discussions

The results in Section 4.1 demonstrates that lack of commitment from the leadership of PM which hamper the adoption of AI in PM activities in Ghana. Project leaders at the top management level play significant roles in approval of purchase and use of AI machines in project management. The senior management level direct and authorise changes in the project management systems to accommodate new technologies (Birikorang and Birikorang 2024). With the Ghanaian culture where leaders take more autocratic leadership styles in small PM organisations, their lack of commitment is a great deal to the digital transformation drive. Moreover, there is a resistant to change from the top leadership to the PMs with the fear that AI adoption will replace them and lead to early retirement or termination of employment contracts (Kissi et al. 2023). With growing cases of unemployment and economic hardships in the country, PMs are keen on keeping their jobs leaving no chance for AIs to takeover. Cultural sensitivity is increasing being recognised in the Ghanaian PM with the demand to adopt AI tools that are helpful to the marginalised in the society(Akomea-Frimpong et al. 2023b). However, it is difficult to determine which group to satisfy in the IT revolution in the construction sector as complex

projects are being built with little inclusion of diversity policies for stakeholders. These raise concerns for regulatory and ethical guidelines which are currently at play in Ghana. The status of national cyber and data security laws in Ghana is devoid of the mention of rules guiding the adoption and use of AI in the construction industry (Bedu et al. 2024). Moreover, the threats imposed by AI in collecting sensitive data about projects and key stakeholders have been highlighted in the ongoing national discourse to promote or reject the use of AI in all sectors. Further, several PMs were invited to participate in this study, but they declined because they mentioned they have little or no idea about what AI especially in the management of project within Ghana is about. The problem is widespread in the PM organisations in the county where most of the firms have not strategic plans to educate PMs about the usage of AI. As a result, poor management skills on AI hampers its benefits in the construction industry. The cost of AI is still high for an industry which reports meagre profits in the Ghanaian context together with excessive costs of maintenance of the AI tools (Darko et al. 2017). Insufficient database and digital infrastructures are problematic to the transition to AI-inspired project management in a country where there are still cases of erratic power and internet supplies.

5. CONCLUSION

In this article, the challenges confronting the acceptance of artificial intelligence by Ghana's project management professionals has been analysed. The study adopted a questionnaire survey approach in collecting data from PM professionals. The findings indicated that organisational leadership in Ghana's PM firms have shown little commitment to the investment into the AI tools. It was revealed that this leadership posture is due to the heavy cost involved in purchasing and maintaining AI tools. Most of the PM firms in Ghana are small scale organizations with little cashflow to support such an expensive venture. Culturally, new technologies are normally a culture shock for those in the global south inclusive of Ghana. It is evident that it will take some years before the acceptance of new technologies will be incorporated into organisational cultures of PM organisations in the country. Also, it became apparent from the study that there are fears of AI overtaking the jobs PMs do so there is resistance to change. There is difficulty in obtaining data to feed AI mechanisms for project management in Ghana because the country continues to face internal and electric power challenges together with no database and digital infrastructure. The significance of the study is seen in the benefits the AI will bring to all the stakeholders in construction if these challenges are addressed. The study could be a source document to develop measures to overcome the potential constraints that come with AI usage in project management. The results are relevant for regulators, PMs, and policymakers to develop stringent project and industry regulations to overcome the problems associated with AI. The study is relevant for future research as the topic is still unravelling in the PM field. With regards to the study's constraints, the number of respondents (sampling size) knowledgeable on AI in PM is small compared to all the PMs in the country. It was evident from the compilation of the respondents list that few PMs are aware of and with deep knowledge and experiences in the use of AI in project management within the Ghanaian context. Education and training programs for PMs should be prioritised by the PM organisations and the construction industry in Ghana to fill this gap. Additionally, as an emerging area in the PM studies, only the barriers were explored in this study. It is suggested that future studies expand the scope to include other areas of the AI integration in PM research such as drivers, models, etc. Lastly, the study is based on descriptive assessment of the data which is suggested further studies should employ more robust statistical tools.

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