

ADAPTABILITY OF ARTIFICIAL INTELLIGENCE (AI) TECHNOLOGY IN PROJECT MANAGEMENT TASKS: AN EXPLORATORY STUDY OF NORTHERN NIGERIA PROJECTS

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ABSTRACT

The discipline of Project Management (PM) like most other professions evolves with changes in technological advancement. The adoption of Artificial Intelligence (AI) technologies in PM is assuming a phenomenal dimension, but unfortunately low, in Northern Nigeria projects. This study therefore, aims at evaluating the adaptability of AI technologies into PM tasks in the region's projects. This research adopted a mixed research approach involving both quantitative and qualitative research methods, in which a semi-structured questionnaire was issued to 384 respondents made up of Project Management Officers/Directors, Project Managers, Program Managers, Project Officers, Junior Project Managers in North-East, North-West and North-Central geo-political zones of Nigeria, and out of which 241 responded representing 62.80% response rate. Data analysis was by means of both descriptive and inferential statistics. Study results showed that 'tasks prioritization' and 'delivery of untiring objectivity and vigilance' ranked highest amongst identified AI roles, whereas, 'need to build soft-skills on areas of AI deficiency, possession of digital-knowhow, data-science, digital security and privacy knowledge' ranked highest among critical competences that drive the future traits of Project Managers for AI adoption. The study concludes that interface between AI technologies and Project Management would improve project success of Northern Nigeria projects. The study recommends the strengthening of institutional frameworks by government and built environment professional bodies to promote the application of Artificial Intelligence technologies in Project Management tasks.

Keywords: Adaptability, Artificial Intelligence, Northern Nigeria, Project Management

1.1 INTRODUCTION

Artificial intelligence is viewed as one of the most researched and developed technological fields in this digital era. From Smart Personal Assistant (SPA) to the self-driving vehicle (SDV), AI is swiftly making its way into real world application and has progressed at an exponential pace (Butt, 2018). Technology is employed by many human life sectors to achieve efficiency and effectiveness thus, enabling management to be dependable, secure and acquiescent. AI also augments human capabilities by helping project managers in the administration of different projects with limited available resources (Elrajoubi & Minh, 2021). Also, there exists specific Project Management AI software that performs the daily management of project activities and administration without human intervention (Project practical, 2021). Tasks undertaken by AI includes but not limited to speech recognition, computer vision, translation between natural languages, and mapping of inputs. AI has been deployed in special applications to solve specific industry and academic challenges. In sum, AI technology can be likened to computers and electricity and perceived to be a general-purpose technology with numerous application support systems.

The discipline of project management like most other disciplines evolves with changes in technological advancement. Currently, digital technologies of sorts have emerged with emphasis on global megatrends (GM), artificial intelligence (AI), and machine learning (ML) taking over several activities of a nation's economic sub-sectors of which project management (PM) is not an exception. Extent literature has shown a connect between AI and project management in the following ways amongst others, namely decision making in projects, supports problem solving functions, used in project planning, improves efficiency of large volume of data usage in projects, allocation of resources and distribution of tasks, and has the potential to increase project success and mitigate project failure.

1.2 Problem Statement

The need for an intelligent assistant with capacity to analyze vast amount of project data and information, find patterns of association among various elements of project tasks, and make superfast but accurate decisions and predictions is becoming more discerning now than ever before. Project management as a competency in Nigeria is still inundated with many traditional practices despite the numerous revolutionary changes introduced by digitalization in almost all business sectors. The seeming conservative practice of Project management amongst project management stakeholders of several development projects taking place in the mass infrastructure

project provisioning of Northern Nigeria, and the quest for a revolutionary approach towards modernization precipitated by digital technology and other similar factors are the primary considerations that underpins this research. Hence, the need for an exploratory study on the adaptability of artificial intelligence in project management tasks in Northern Nigeria projects.

1.3 Aim and Objectives

The aim of this research is to evaluate the adaptability of Artificial Intelligence (AI) into Project management tasks. While, the specific objectives are:

- i. To access the roles of AI technologies on Project Management in Nigeria
- ii. To examine the traits of future project managers with respect to AI adoption in Project Management in Nigeria.

1.4 Hypothesis of the Study

H₀: There is no significant statistical relationship between the roles of AI Project Management on the traits of future project managers with respect to AI adoption in Project Management.

1.5 Significance of the study

This study is particularly important to project managers working on Construction projects in Northern Nigeria as it fundamentally seeks to explore the applicability of AI in project management tasks in order to enhance project deliverables and their performance.

1.6 Scope of the Study

The scope of this research work is limited to Northern Nigeria where there is a perceived low-level knowledge and adoption of AI in the management of vast project economic and physical projects in the region.

2.0 LITERATURE REVIEW

2.1 Conceptual Review of Artificial Intelligence and Project Management

Artificial Intelligence (AI), is defined as ‘the application of advanced analysis and logic-based techniques, like machine learning, for supporting an automated decision, interpreting events, and taking action’ (Olivia, 2020). Brooks et al. (2020), also views Artificial intelligence as ‘the study of intelligent agents, autonomous non-human entities that can take in information from their environment and act upon their environment in a way that enables them to succeed in their goals’. Interestingly, AI has made tremendous advancement in this digital era especially in the past few years leading to the performance of some human tasks among which are: car driving, booking a meeting for an event, talking on behalf of others on audio calls etc. These are made possible by AI’s subsets and techniques enhancement (Belharet et al., 2020). In a report produced by the Association of Project Management (APM) Research Fund titled ‘Artificial Intelligence in Project Management’, in which empirical data was collected from 280 project professionals with experience of AI technology in the UK, on AI’s usefulness and future considerations for the project profession, the study revealed that AI has a high perceived usefulness in complex projects and a low ease of use. The report findings further indicated the existence of positive correlation between perceived usefulness of AI and a high-level of project complexity. Kockum & Dacre (2021) observed that ‘ever since Alan Turin asked whether machines could think in the 1950s, there has been a discussion on using computers for different areas of decision making.

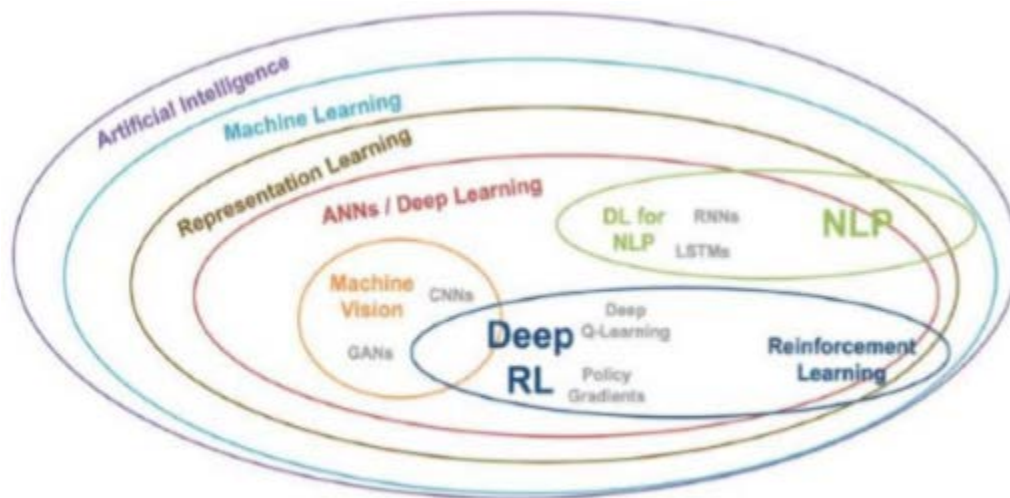


Figure 2.1: Venn diagram representing AI and its subsets. (Deep Learning Illustrated P. 86)

Project management on the other hand is defined as the application of knowledge, skills, tools and techniques to project activities to meet project requirements (PMBok, 2017)

Project management AI is regarded as an incorporated system or a machine that is capable of administering projects without human intervention and/or participation (Elrajoubi,2020). To use

the power of AI, it doesn't entail tasks in an automating form but, making inference from various insights and make recommendation process, project related decisions and revealing insight to the team (Schreck et al., 2018). Among many AI tools that assist project managers to handle and administer critical tasks are: Chatbots, Stratejos, Rescoper, ClickUp, PolyOne, and Clarizen (Lahman, et al., 2018).

3.0 RESEARCH METHODOLOGY

3.1 Research Design

This research adopted a mixed research approach involving both quantitative and qualitative research methods.

3.2 Population of Study

The target population for this study includes the construction professionals that are domiciled within the Northern Nigeria such as the Project Management Officers/ Directors, Project Managers, Program Managers, Project Officers, Junior Project Managers, Project Team Members comprising Architects, Engineers and Quantity Surveyors.

3.3 Sampling Frame and Sampling Size

The sampling frame for this study comprises of the construction professional domiciled in the Northern region of the country including the North-East, North-West and North-Central geopolitical zones of which there exists infinitesimal number of construction professionals compared to the population of the area. Cochran 1977, formula for determining study's sampling size was adopted considering the infinitesimal number of construction professional prevalent in the study region, as similarly adopted by Deinne (2021) and Muhammed et al. (2022a).

$$n_0 = \frac{Z^2 pq}{e^2}$$

Where e = precision level (i.e. the margin of error),

p = the proportion of the population which has the attribute in question,

$q = 1 - p$

$$\text{Thus, } n_0 = \frac{1.96^2(0.5*0.5)}{0.05^2}$$

$$n_0 = \mathbf{384}$$

Therefore, the sample size for this study is **384** respondents.

3.4 Method of Data Collection and Analysis

A semi-structured questionnaire was issued to the target construction professionals using purposive sampling technique. The distribution of the respondents shows that the construction professionals in each region, namely- North-West, North-East and North-Central purposively received 128 questionnaires, making a total of 384. Further breakdown shows that 3 states in each geo-political zone were selected and thus, each state received 43 questionnaires. The selected states in the North-West includes Kaduna, Kano and Kebbi states, North-East comprises of Bauchi, Borno and Yobe states, while The North-Central states consist of Niger, FCT and Kogi states correspondingly. A 5-point Likert scale of multiple responses such as “1-Strongly Disagree, 2-Disagree, 3-Neutral, 4-Agree and 5-Strongly Agree” were adopted to retrieve the study data. The method of analysis includes descriptive statistics of frequency, percentage, mean index score (MIS) and inferential statistics of linear regression analysis which were adopted for the dependent and independent variables analysis.

4.0 ANALYSIS AND RESULTS

4.1 Background of the Respondents

In line with the questionnaire distributed to 384 respondents’, only 241 was properly filled and returned representing 62.8 percent. According to Kothari (2004) cited in Muhammed et al. (2022a), a response rate of 50 percent is posited to be average, 60 – 70 percent response rate is indicated to be acceptable, while 70 and above percent response rate is considered excellent. Thus, the response rate of 62.8 percent of this study is considered acceptable for analysis and drawing of inference.

Table 4.1: Demography of Respondents

Demographic	Value	Frequency	Percentage (%)
Gender	Male	196	81.3
	Female	45	18.7
Age	18 – 24	36	14.9
	25 – 34	62	25.7
	35 – 44	73	30.3
	45 – 54	53	22.0
	>=55	17	7.1
	Profession of Respondents	PMO Director/Managers	29
Project Managers		39	16.2
Program Managers		34	14.1
Project Officers		38	15.8

	Junior Project Managers	36	14.9
	Team Members	35	14.5
	Engineers	30	12.4
Highest Academic Qualification	OND	22	9.1
	HND	73	30.3
	First Degree	79	32.8
	Master's Degree	57	23.7
	PhD	10	4.1
Experience in Project Management	<5 years	48	19.9
	6 - 10 years	76	31.5
	=>11	117	48.5
State of Respondents Domiciliation	Kaduna (NW)	31	12.9
	Kano (NW)	29	12.0
	Kebbi (NW)	21	8.7
	Bauchi (NE)	16	6.6
	Borno (NE)	22	9.1
	Yobe (NE)	27	11.2
	Niger (NC)	33	13.7
	FCT (NC)	35	14.6
	Kogi (NC)	27	11.2
Actual Users of the Project Management Tools and Techniques	PMO Director/Managers	26	10.8
	Project Managers	35	14.5
	Program Managers	33	13.7
	Project Officers	32	13.3
	Junior Project Managers	29	12.0
	Team Members	32	13.3
	Engineers	35	14.5
	Quantity Surveyors	19	7.9
Size of the company in which you work	<10	53	22.0
	10 – 20	68	28.2
	21 – 30	45	18.7
	31 – 40	43	17.8
	>40	32	13.3
Do you know anything about AI systems	Yes	164	68.0
	No	77	32.0
How many years have you being using Project Management Software	< 5 years	97	40.2
	5 - 10 years	111	46.1
	> 10 years	33	13.7
Do you use any AI systems	Yes	203	84.2
	No	38	15.8
Have AI systems been tried in your organization	Yes	38	15.8
	No	203	84.2
Would you like to use AI systems in the future	Yes	194	80.5
	No	47	19.5

Source: Field Survey, (2022)

Table 4.1 depicts the background of the respondents and as the result indicates that 196 respondents are male while 45 are female construction professionals which represents 81.3 and 18.7 percent response rate respectively. This sentiment was echoed in the study of Muhammed et al. (2022b), that stated that the construction sector is largely dominated by male construction professionals due

to the perceived masculine nature of construction activities. The other demographics of the respondents are succinctly stated in table 4.1 above.

4.2 Mean Responses of the Respondents

4.2.1 Roles of AI on Project Management

Table 4.2: Roles of AI on Project Management

FACTORS	MEAN	SD	RANK
Task Prioritization; It is easier for AI to make an assumption with regard to the data at hand and also assists the team to understand their actual priority	4.8299	.37652	1 st
AI (unlike human being), delivers untiring objectivity and vigilance and do not compromise or getting tired in performing project	4.8299	.37652	1 st
AI can enhance visibility for early risk date	4.5560	.49789	3 rd
AI foster safe working environment by detecting invisible warning signs in regards to likelihood of accidents occurring.	4.5394	1.04058	4 th
AI-Enabled project management tools can provide more insights to project managers about the possible outcomes for projects, which will enhance the quality and agility of critical decision-making.	4.4855	1.00871	5 th
AI-Enabled project management tools give greater support and accuracy to the decision making	4.3402	1.25516	6 th
AI and Machine Learning (ML) algorithm support the optimization of project schedules to minimize the total cost base or resource constraints	4.2780	1.26223	7 th
AI assists project managers to sustain a holistic and Nano project management	4.1950	1.34449	8 th
AI supports project managers and can issue them with an automated alerts and work scheduling which is essential for performance of routine procedures	4.1950	1.34449	8 th
Adopting AI to Project Management enhances successful project performance and efficiency	4.1120	1.60465	10 th
AI can provides actionable insight into the project by sorting through and collating from arrays of sources	3.7884	.97939	11 th
Incorporating sophisticated AI powered software can lead to the project cost reduction	3.1826	1.46908	12 th
AI can also provide actionable insight into a multitude of aspects in relation to the project that allows project team to get around complicated problems	3.0498	1.29003	13 th
AI is better and efficient in Analysis, Insights and Prediction far better than human being	2.2614	1.86249	14 th
AI is more accurate than human beings in terms of data crunching and interpretation	2.2614	1.86249	14 th

Source: Field Survey, (2022)

As indicated in the table 4.2 above, the factor with highest mean response is ‘task prioritization of AI seeing as being able to make an assumption with regard to the data at hand and also assists the team to understand their actual priority’ and ‘AI (unlike human being), delivers untiring objectivity and vigilance and do not compromise or getting tired in performing project’ both with a mean score of 4.8299 and ranked 1st. Consequently, ‘AI can enhance visibility for early risk date’, ‘AI

foster safe working environment by detecting invisible warning signs in regards to likelihood of accident occurring’, ‘AI-Enabled project management tools can provide more insights to project managers about the possible outcomes for projects, which will enhance the quality and agility of critical decision-making’, ‘AI-Enabled project management tools give greater support and accuracy to the decision making’, and ‘AI and Machine Learning (ML) algorithm support the optimization of project schedules to minimize the total cost base or resource constraints’ are ranked 3rd, 4th, 5th, 6th and 7th with a mean score of 4.5560, 4.5394, 4.4855, 4.3402 and 4.2780 correspondingly. Similarly, ‘AI assists project managers to sustain a holistic and Nano project management’ and ‘AI supports project managers and can issue them with automated alerts and work scheduling which is essential for performance of routine procedures’ have mean score of 4.1950 and ranked 8th consecutively.

4.2.2 Traits of future project managers with respect to AI adoption in Project Management

Table 4.3: Traits of future project managers with respect to AI adoption in Project Management

FACTORS	MEAN	SD	RANK
AI cannot replace Project managers but rather both AI and project managers (PM) need each other to foster project management	4.5560	.49789	1 st
AI is inoperative without the inputs and added values of skilled project managers. So, in the future digital era, Project managers need to build a soft-skill set that focuses in the areas where AI falls short.	4.2697	1.35933	2 nd
Having strong ‘digital know-how’ and ‘data science skills’, alongside ‘security and privacy knowledge’ are the most important skills a project manager needs to acquire to cope with the future digital era challenges than other mentioned soft skills.	3.7884	.97939	3 rd
Do you agree that AI has the power to change/alter the type of job we do	3.7884	.97939	3 rd
In the presence and future AI era, an organization and project managers need be prepared to collaborate with machines to deliver projects, execute strategies and provide insights to key stakeholders	3.2739	1.34772	5 th
Adoption of AI into project management can help eliminate repetitive administrative task and allow project managers to have more time and energy to focus on the real work	3.1826	1.46908	6 th
Do you agree that AI can replace human mind completely	3.1826	1.46908	6 th
By adopting AI into project activities, AI replaces project managers in the near future	3.0498	1.29003	8 th
Leadership, planning, monitoring management skills, strategic management, budgeting	2.2614	1.86249	9 th

Source: Field Survey, (2022)

Table 4.3 above, shows that ‘AI cannot replace project managers but rather both AI and project managers (PM) need each other to foster project management’ is ranked 1st with a mean score of 4.5560. ‘AI is inoperative without the inputs and added values of skilled project managers. So, in

the future digital era, Project managers need to build a soft-skill set that focuses in the areas where AI falls short' is ranked 2nd with a mean score of 4.2697. Consequently, 'having strong 'digital know-how' and 'data science skills', alongside 'security and privacy knowledge' are the most important skills a project manager needs to acquire to cope with the future digital era challenges than other mentioned soft skills' and 'do you agree that AI has the power to change/alter the type of job we do' with mean score of 3.7884 and ranked 3rd. consequently, 'in the presence and future AI era, an organization and project managers need be prepared to collaborate with machines to deliver projects, execute strategies and provide insights to key stakeholders' is ranked 5th mean score of 3.2739.

4.4 Inferential Statistics

H₀: There is no significant statistical relationship between the roles/impact of AI Project Management on the traits of future project managers with respect to AI adoption in Project Management.

X - Roles/impact of AI Project Management in Nigeria

Y - The traits of future project managers with respect to AI adoption in Project Management

Table 4.4: Correlation between the variables

Correlations			
		Y	X
Pearson Correlation	Y	1.000	.979
	X	0.979	1.000
	Y		.002
Sig. (1-tailed)	X	0.002	
	Y	5	5
N	X	5	5

Table 4.5: Model Summary

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.979 ^a	.958	.944	.22423	.958	68.433	1	3	.004	2.881

a. Predictors: (Constant), X

b. Dependent Variable: Y

Table 4.6: Analysis of Variance

ANOVA^a

Model	Sum of Squares	Df	Mean Square	F	Sig.
1 Regression	3.441	1	3.441	68.433	.004 ^b
Residual	.151	3	.050		
Total	3.591	4			

a. Dependent Variable: traits of future project managers

b. Predictors: (Constant), roles/impact of AI Project Management

Table 4.7: Coefficients

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
(Constant)	.951	.143		6.633	.007					
x	.303	.037	.979	8.272	.004	.979	.979	.979	1.000	1.000

a. Dependent Variable: traits of future project managers

Source: Data Analysis, (2022)

As regard to this result in line with the position of table 4.4 – 4.7, a correlation of +1.00 is an indication that changes in a variable correspond to a change in the other variable while a correlation of -1.00 shows that a fall in one variable posits a negative change in the other variable (Ubani et al., 2015). A close to zero correlation shows that there exists minute linear relationship between the two variables. Decisions are thus made when the corresponding values of X and Y variables incline towards +1.00. In the case of this study, as the independent variable X (roles/impact of AI Project Management in Nigeria) increases, the dependent variable Y (the traits of future project managers with respect to AI adoption in Project Management) increases implying that as the roles and impact of AI project management increases in Nigeria so also does the trait of future project managers with respect to AI adoption in project management increases in Nigeria with a correlation of value of (0.979) as indicated in table 4.4. Consequently, as shown in table 4.5 that

indicates the model summary, the R value of (0.979) shows evidently that there remains a strong linear relationship between the roles of AI Project Management in Nigeria and the traits of future project managers with respect to AI adoption in Project Management.

Furthermore, as indicated in that same table 4.5, R^2 signifying 95.8% shows that variable X contributes largely to variable Y, while 4.2% of the changes experienced is ascribed to the influence of many other factors not explained by the regression function. Similarly, the R^2 value of (0.958) shows the goodness-of-fit of the model as it is very close to 1 while a model of 1 is a perfect fit just as explained in the studies of Zaid (2015) and Verbeek (2017).

4.5 Discussion of Findings

In line with the result of this study as indicated in table 4.2, it is imperative for the construction professionals domiciled in Nigeria to trend the part of AI technology as one of the feature of this systems is on task prioritization. This is emphasized by the fact that ‘task prioritization of AI seeing as being able to make an assumption with regard to the data at hand and also assists the team to understand their actual priority’ and ‘AI (unlike human being), delivers untiring objectivity and vigilance and do not compromise or getting tired in performing project’ (4.8299). According to Wilkens (2020), Glikson & Woolley (2020) and Andres et al. (2021) the task prioritization of AI predicated on the lack of distraction except the ones induced by human error. This is because as the AI system is programmed, so the way it would act unlike humans that are influenced by several factors including natural, social, economic and political factor prevalent in the society. Accordingly, AI can enhance visibility for early risk date’ (4.5560) and ‘AI fosters safe working environment by detecting invisible warning signs in regards to likelihood of accident occurring’ (4.5394). This is consonance with the studies of Javanmardian & Samandari (2019) who also agrees that one the functionalities of AI is predicated on early risk detection and the provision of safe working environment in the workplace.

5.0 CONCLUSION AND POLICY RECOMMENDATIONS

Project in Northern Nigeria is extremely broad with varying level of project management tasks carried out under differing adaptability level and understanding of AI technologies. This study showed positive correlation between the role of AI and Project Management in Nigeria. It also highlighted the traits of future project managers with respect to AI adoption in Project

Management tasks. The study concludes that the more the impact of AI in project management of Northern Nigeria projects, the more will be an increase in the adoption of AI in project management for project success in the region. Arising from the above, this study therefore recommends need for strengthening of all institutional frameworks by way of Governmental policy trusts that would foster seamless provision of requisite supportive AI technologies infrastructures such as electricity, and subsidy of AI technology-based gadgets. The Nigeria tertiary education especially for the built-environment professions curriculum should be constantly reviewed in line with current digital technology skill and applications to promote the acquisition of requisite information technology skills, knowledge of soft-skill sets, and relevant AI operationalization skills necessary for the implementation of AI technologies in Project management tasks.

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