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Determinants of Artificial Intelligence Adoption in Project Management: The Case of Ethiopian Airlines

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Abstract

The global economy's expansion has intensified project management challenges, necessitating the integration of Artificial Intelligence to automate repetitive tasks. Despite AI's benefits, there remains a significant research gap regarding its implementation and adoption, particularly in organizational and managerial contexts. This study investigates AI adoption in project management at Ethiopian Airlines, employing the Diffusion of Innovation (DOI) and Technology Acceptance Model (TAM) as theoretical frameworks. The research employs both descriptive and explanatory research designs, incorporating qualitative methods. Multiple linear regression along with correlation analysis was used to analyze the relationships between independent variables (compatibility, complexity, management support, relative advantage, and perceived usefulness) and the dependent variable (decision of adoption). The study surveyed 156 individuals from Ethiopian Airlines' infrastructure, engineering, and IT divisions, yielding 142 usable responses (91.03% response rate). Correlation and multiple linear regression analyses revealed that compatibility, management support, relative advantage, and perceived usefulness are key determinants of AI adoption, while complexity does not significantly affect adoption decisions. The findings suggest significant AI usage among respondents, with growth potential and rapid adoption anticipated within two years. However, barriers such as cost, time, and AI solution immaturity must be addressed for broader adoption. This research provides valuable insights for Ethiopian Airlines and other organizations seeking to leverage AI for improved project outcomes and competitive advantage in the global economy.

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1. Introduction

The rapid expansion of global economies has brought about an increase in both the quantity and complexity of projects, resulting in project management becoming a challenging and intricate task (Davahli, 2020). Sources of challenges are wide ranging and have fundamental effects on projects and the project management body of knowledge. These challenges are not limited to specific industries, and include scope management, information technology, team dynamics, customers' satisfaction, lean management, seamless integration of rapidly advancing technologies, meeting ever-growing stakeholder expectations, communication, innovation and quality (Roa Baez & Igbekele, 2021). To alleviate these challenges, advanced analytical techniques have been employed, with artificial intelligence (AI) emerging as a prominent solution. With its ability to provide greater control to project managers and enhance project management practices.

AI holds significant potential to improve the quality of project management. Human error by project managers represents a fundamental challenge in project management, as it can lead to project failures (Maphosa, 2022). To address this issue, project managers frequently utilize AI tools and techniques such as Chatbots, Stratejos, ZiveBox, Rescoper, ClickUp, Clarizen, and PolyOne to enhance their tasks (Munir, 2019). These tools assist managers in team formation and project assignment, streamlining the project execution process and more.

AI is transforming project management by automating repetitive tasks, improving decision-making through data analysis, and mitigating risks through predictive capabilities. By addressing limitations of traditional methods, AI enhances efficiency, productivity, and overall project success. Organizations are increasingly adopting AI to gain a competitive advantage and achieve superior project outcomes.

Despite the growing recognition of AI's potential in project management, significant gaps remain in understanding its implementation and adoption, particularly in developing countries like Ethiopia. While existing research primarily focuses on AI techniques and applications, there is a lack of studies on the organizational and managerial factors that influence AI adoption.

A recent study by Elrajoubi (2019) found that 56% of organizations have already developed a digital transformation strategy that incorporates AI. Furthermore, the PMI Pulse of the Profession study reports that over 80% of respondents believe their firms are experiencing an impact from AI. However, despite these promising statistics, there is a notable lack of research on AI adoption in specific sectors like aviation and in developing countries like Ethiopia.

This study aims to address this gap by investigating the factors affecting AI adoption in project management within Ethiopian Airlines. By examining the current implementation and exploring the challenges and opportunities associated with AI adoption, this research seeks to provide valuable insights for organizations looking to leverage AI to enhance their project management practices and achieve superior outcomes.

The Research questions are:

1. To what extent has AI been adopted and integrated into various project management processes.
2. How does compatibility affect the adoption of AI in project management?

3. What is the impact of management support on the adoption of AI in project management?
4. How does the complexity of AI systems influence their adoption in project management at Ethiopian Airlines?
5. How does the relative advantage of AI impact its adoption in project management?
6. What is the effect of perceived usefulness in the adoption of AI in project management?

The general objective of this study is to examine the determinants of AI adoption in Project Management within Ethiopian Airlines.

2. Litrature review

2.1 Artificial Intelligence

Artificial Intelligence (AI) is a vital component of computer science, focused on developing intelligent machines to enhance human capabilities and improve various aspects of life (Alshaikhi & Khayyat, 2021). The definitions of AI are diverse, reflecting the varied perspectives of researchers and the ongoing debates surrounding its meaning, particularly in project management, where the Project Management Institute defines it as a combination of tools, techniques, skills, and knowledge necessary to meet project requirements (Raymond & Bergeron, 2008). This complexity highlights AI's multifaceted nature and dynamic character within the technological landscape. The evolution of AI has been significantly influenced by advancements in Information and Communication Technology (ICT), leading to the emergence of smart environments, such as intelligent monitoring systems in project management. As AI applications continue to proliferate, organizations can expect improved efficiency and effectiveness in their project activities, setting the stage for a transformative future in the field.2.2 Artificial Intelligence in Project Management

Artificial Intelligence (AI) is transforming project management by enhancing performance, reducing costs, and improving efficiency. Historically, project methodologies in the 1990s relied on expert systems and simulations, but recent advancements have introduced tools like neural networks, fuzzy logic, and hybrid models (Holzmann et al., 2022). While earlier research focused on quantitative aspects such as risk management and scheduling, there is a growing trend towards exploring qualitative areas like procurement processes and stakeholder management. This shift indicates AI's increasing sophistication, enabling it to support complex decision-making processes. As organizations adopt AI technologies, project managers can expect to transition from administrative tasks to strategic roles, ultimately leading to improved project outcomes and a more agile approach to management.

2.3. Technology Adoption Theories, Frameworks and Models

Considering the importance of artificial intelligence for enhancing project management and driving economic growth, researchers have defined various theories, frameworks, and models to understand technology adoption in organizations and at the individual/user level. Table 1 presents some of the most well-known technology adoption theories and models that can be applied to understand AI adoption in project management.

Table 1: Relevant theories and models for the technology adoption.

Theory	Technology Adoption	Reference
Diffusion of innovation (DOI)) Theory	Diffusion process with multiple stages: understand innovation, intention to innovate, decision to innovate, implementation and usage. Main factors: innovation characteristics (relative advantage, compatibility with existing infrastructure, complexity, possibility to observe and try it), communication, time and social environment.	(Rogers, 1962)
Technology Organization Environment (TOE) framework	Main factors of the adoption ability: organizational learning (knowledge barriers knowledge diversity, etc.), other environmental, and organizational and technology characteristics, such us: market competitiveness, firm size, financial soundness, technology complexity.	(Tornatzky, Fleischer & Chakrabarti, 1990)
Technology Acceptance Model (TAM)	TAM uses two factors (usefulness and ease of use) in order to explain the computer usage intention and behavior.	(Davis, 1986)
Unified Theory of Acceptance and Use of Technology (UTAUT)	It includes additional predictors for the acceptance intention: the effort and performance expectancy, social influence and facilitating conditions. Other four variables were identified as moderating the relationships between different variables of the model: gender, experience, age and voluntariness of use.	(Venkatesh & Morris, 2000)
Theory Of Planned Behavior (TPB)	Three factors determine the adoption intention: attitude, subjective norms and the perceived control behavior. Decomposed TPB	(Taylor & Todd, 1995)

In this study, the DOI, and TAM theories formed the theoretical foundation to determine correlations between various constructs that influence AI technology adoption. This phenomenon is elaborate in the next few sections.

2.4. Theorethical Foundation of the study

To explore key factors influencing technology adoption. DOI outlines stages such as awareness, persuasion, and implementation, emphasizing the roles of organizational innovativeness, leadership traits, and management support. The research identifies constructs like Relative Advantage, Compatibility, Complexity, and Management Support as crucial for understanding AI adoption. TAM focuses on Perceived Usefulness and Perceived Ease of Use, suggesting that positive user perceptions enhance adoption likelihood. By integrating the DOI and TAM frameworks, the study provides a comprehensive view of how organizational context and individual perceptions shape the successful implementation of AI technologies.

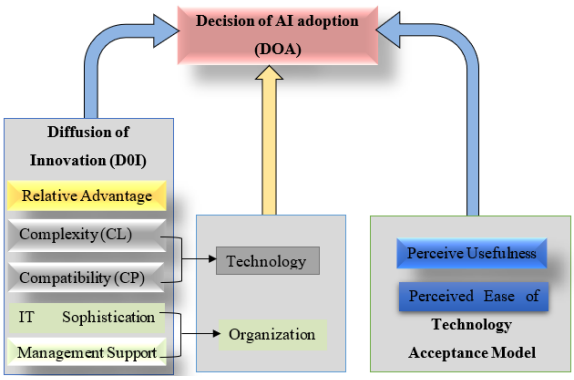

Figure 1: Theoretical foundation of the study.Source: (Weil, 2018).

The choice to utilize the DOI and TAM in this study is grounded in their relevance and effectiveness for understanding AI technology adoption in project management. DOI offers a comprehensive framework that addresses the multi-stage process of innovation adoption, focusing on key factors such as innovation characteristics, communication, and organizational dynamics, which are vital for successfully implementing AI in Ethiopian Airlines. Its emphasis on stages like awareness and utilization aligns well with the complexities of AI adoption. Conversely, TAM provides insights at the individual level by highlighting Perceived Usefulness and Perceived Ease of Use, which are critical for understanding user intentions. The integration of these models allows for a nuanced analysis that captures both organizational and individual influences, making them more suitable than other frameworks like UTAUT or TOE, which may not fully encompass the specific dynamics relevant to this context. This combined approach thus establishes a robust theoretical foundation for exploring the factors influencing AI adoption in project management settings.

2.3 Conceptual framework of the Study

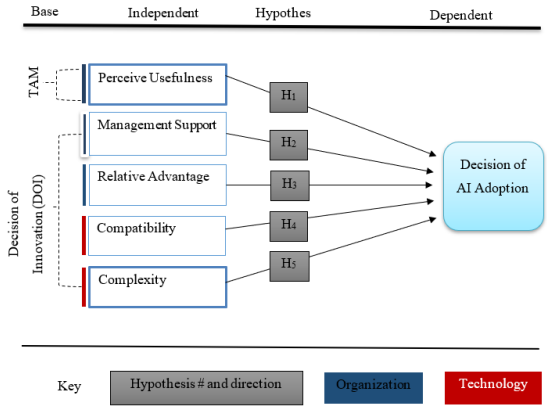

Figure 2: Conceptual framework of the study. (source: own research 2024).

3. Materials and Methods

This research employs both descriptive and explanatory designs to investigate the adoption of Artificial Intelligence (AI) in project management at Ethiopian Airlines. The descriptive research focuses on characterizing the current level of AI adoption and its future perspectives through demographic data and structured questionnaires. In contrast, the explanatory research utilizes correlation and multiple linear regression analyses to explore relationships between independent variables such as compatibility, complexity, management support, relative advantage, and perceived usefulness and the dependent variable, which is the decision to adopt AI.

A quantitative research methodology is adopted to analyze statistical correlations among these factors. Primary data is collected through closed-ended questionnaires, while secondary data sources include relevant documents and academic journals. The questionnaires were distributed via Google Forms and mass mailing applications like Microsoft Outlook to ensure broad reach while maintaining confidentiality.

The target population includes individuals from various sections of Ethiopian Airlines, such as Group Infrastructure Planning and Development, Engineering and Construction Works, and IT Application Design & Delivery. A simple random sampling method was employed to select approximately 156 participants from a total population of 255 employees.

Data analysis involved descriptive and inferential statistical techniques using SPSS software ver-

sion 27. Descriptive statistics summarized demographic variables, while Pearson correlation analysis assessed relationships between independent and dependent variables. This comprehensive methodology ensures a robust examination of factors influencing AI adoption in project management at Ethiopian Airlines, contributing valuable insights into the dynamics of technology implementation within organizations.

4. Results and Discussion

4.1 Assumption tests

Before conducting regression analysis, it is essential to ensure that the fundamental assumptions of multiple regression models are met, as these assumptions underpin the validity and reliability of the results. Various diagnostic tests are employed to assess these assumptions, including examining the linearity of relationships between independent and dependent variables, assessing the normality of residuals, verifying the absence of multicollinearity among predictors, evaluating homoscedasticity (constant variance of residuals), and scrutinizing the independence of residuals.

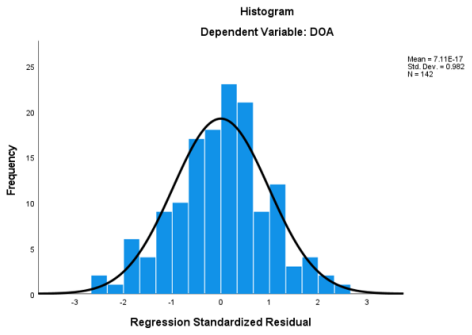

Figure 3: Conceptual framework of the study.
(Source: Analysis of Survey data SPSS 27).

Each test is crucial for confirming that the data adheres to the essential requirements of multiple regression analysis, thereby ensuring that subsequent analyses yield accurate and reliable insights into variable relationships (Field, 2009; Osborne & Waters, 2002).

The normality test is guided by the central limit theorem, which states that with a sample size of 30 or more, the distribution of sample means approximates a normal distribution. In this study, a sample size of 142 respondents meets this criterion. Visual methods like histograms and normality plots are utilized to inspect the distribution's normality before regression analysis (Tabachnick & Fidell, 2007). Additionally, linearity is assessed through

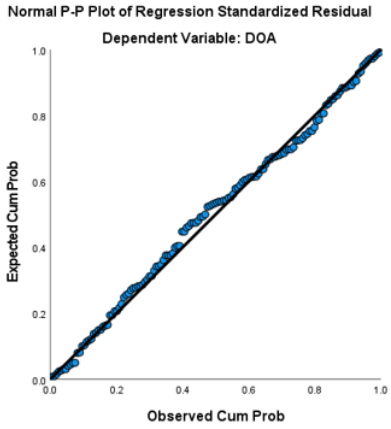

Figure 4: Probability plot of regression standardized residuals.
(Source: Analysis of Survey data SPSS 27).

residual plots to confirm that the relationship between dependent and independent variables is linear; deviations from linearity can bias regression estimates (Keith, 2006). Multicollinearity is evaluated using Variance Inflation Factor (VIF) analysis, with results indicating no significant issues in this dataset (Asthana & Bhushan, 2016). Finally, homoscedasticity is verified through scatter plots of standardized residuals against predicted values, ensuring that errors are uniformly distributed across all levels of independent variables (Osborne & Waters, 2002). This comprehensive approach to validating assumptions enhances the robustness of the regression analysis.

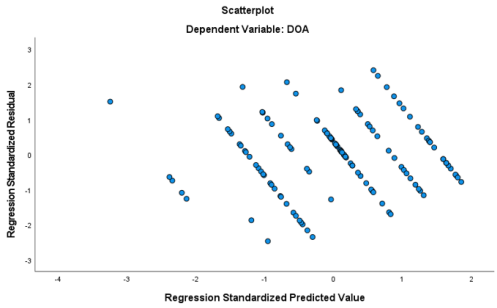

Figure 5: Scatterplot of standardized residuals.
Source: Analysis of Survey data SPSS 27

4.2. Correlation Analysis

An investigation was conducted to determine whether a correlation exists between each of the five independent variables and one dependent variable. To address the research questions, the Pearson coefficient test was performed. The Pearson correlation test is employed to understand the strength of the correlation between two variables. It is noted for its ease of execution and straightforward analysis of results when testing for probable correlations (Wagner, 2016; Ruxton & Neuhäuser, 2018; Frankfort-Nachmias & Leon-Guerrero, 2016).

Table 2: Correlation analysis

Correlations							
		CP	MS	CL	RA	PU	DOA
CP	Pearson Correlation	1					
MS	Pearson Correlation	.401**	1				
CL	Pearson Correlation	.222**	.097	1			
RA	Pearson Correlation	.456**	.359**	-.012	1		
PU	Pearson Correlation	.533**	.521**	.139*	.513**	1	
DOA	Pearson Correlation	.781**	.548**	.077	.730**	.743**	1

The research investigates the correlation between various factors and the decision to adopt AI (DOA) in project management at Ethiopian Airlines. The findings reveal that Compatibility (CP) has a strong positive correlation with DOA ($r = .781$, $p < .001$), supporting the hypothesis that CP significantly influences AI adoption. Similarly, Management Support (MS) also shows a strong positive correlation with DOA ($r = .548$, $p < .001$), confirming its critical role in facilitating AI adoption. In contrast, Complexity (CL) does not exhibit a statistically significant correlation with DOA ($r = .038$, $p > .077$), indicating that it does not impact the decision to adopt AI within this context. Additionally, both Relative Advantage (RA) ($r = .730$, $p < .001$) and Perceived Usefulness (PU) ($r = .743$, $p < .001$) demonstrate high positive correlations with DOA, further validating their importance in the adoption process.

These results indicate that while CP, MS, RA, and PU are significant predictors of AI adoption, CL does not hold the same relevance. The strong correlations suggest that enhancing compatibility and perceived usefulness of AI technologies, along with robust management support, could facilitate higher adoption rates within Ethiopian Airlines' project management framework. The study underscores the importance of addressing these factors to improve the implementation of AI technologies in organizational settings.

4.3 Regression analysis

Multiple regression analysis explores the connection between a single outcome measure and numerous predictors or independent variables (Jaccard et al., 2006). The proper application of multiple regression models necessitates the fulfillment of several critical assumptions to ensure model validity (Poole & O'Farrell, 1971). Valid inferences and generalizations about the theory can only be drawn if the assumptions underlying the analysis have been assessed and satisfied.

As detailed in the preceding section, all prerequisites for conducting multiple regression analysis were met. Linearity and homoscedasticity were evaluated through residual analysis and partial regression scatter plots, while multicollinearity assumption was scrutinized using variance inflation factor and tolerance. Normality was assessed via normal probability plots (P-P plots) of the standardized residuals. Consequently, multiple regression analysis is deemed appropriate for examining the variables.

Table 3: Model summary table.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.931	.866	.861	.28741	2.014

a. Predictors: (Constant), PU, CL, RA, CP, MS

b. Dependent Variable: DOA

The model summary table serves as a tool to assess the suitability of the employed regression model. It reveals that the independent variables, including, compatibility, Management support, complexity, Relative advantage and perceived usefulness, collectively accounted for 86.1% of the variance in Decision of Adoption, as indicated by the adjusted R-square value. The remaining 24.6% of the variance is attributed to other variables not included in this study. This suggests a substantial and statistically significant relationship between the independent and dependent variables

Model Fitness

Table 4: Analysis of variance table.

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	72.681	5	14.536	175.968	.000
	Residual	11.235	136	.083		
	Total	83.915	141			

a. Dependent Variable: DOA

b. Predictors: (Constant), PU, CL, RA, CP, MS

Table 5: Standardized and unstandardized coefficient.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	-.659	.177		-3.730	.000	-1.009	-.310
	CP	.480	.043	.445	11.170	.000	.395	.565
	MS	.098	.035	.104	2.765	.006	.028	.168
	CL	-.065	.032	-.067	-2.045	.043	-.128	-.002
	RA	.370	.042	.343	8.865	.000	.287	.452
	PU	.252	.038	.285	6.654	.000	.177	.326

The Beta (B) values were used as coefficients to complete the previously formulated regression model. The mathematical formula for the multiple regressions is depicted below:

$$DOA = \beta_0 + \beta_1 CP + \beta_2 MS + \beta_3 CL + \beta_4 RA + \beta_5 PU + \varepsilon$$

Where, ε = the residual amount.

The established regression equation for Decision of Adoption (DOA):

Y = -0.659 + 0.480(CP) + 0.098 (MS) – 0.065(CL) + 0.370(RA) + 0.252(PU) + ε

5. Conclusion and Implication

AI is prominent technology that not only in the aviation sector, but it is one of the most promising technologies for many large organizations and governments. This quantitative research study was conducted to understand the correlation between the constructs such as CP, MS, CL, RA, and PU, and the decision to adopt, AI technology in the Project management activities of Ethiopian Airlines. The theoretical model for this study was based on three theories: DOI, and TAM. The DOI theory helped to set the individual perspective about AI adoption. Whereas TAM theory helped in understanding the perspective of AI technology users from the usability perspective. The earlier research in AI focused on AI technological research, finding the technical solution to the business problem using AI technology, and an impact of AI technology use on employment generation or similar social concerns. This research focused on the constructs considered enablers or prohibiting factors for the new technology adoption in an organizational setting.

The data collection for this correlational cross-sectional quantitative research involved using a survey questionnaire derived from three different revalidated survey instruments ('Organizational Adoption of Virtual Worlds Survey', 'Cloud Adoption by IT Manager', and 'User Acceptance of Information Technology'). The researcher distributed the survey prepared with Google form for the employees of Ethiopian Airlines under different section. The participation for this anonymous survey was solicited using the Microsoft platform called Outlook. From a total of 156 distributed surveys, 142 were deemed usable, resulting in a strong response rate of 91.03%.

The findings revealed a significant interest in AI adoption. A strong majority (80.3%) of respondents

believe Ethiopian Airlines will integrate AI into project management within the next two years. This suggests a positive outlook on the potential of AI to improve project outcomes. Interestingly, the survey also indicated that the most common stages for current AI use are planning (26.1%) and execution (28.4%). This highlights the potential of AI in supporting strategic decision-making during the early stages of projects and influencing project delivery throughout the process.

Further analysis revealed that Compatibility and Perceived Usefulness emerged as the strongest drivers for AI adoption. Compatibility factors, particularly the industry's ability to integrate AI (mean score: 4.29), and the perceived usefulness of AI in improving project outcomes (mean score: 4.04) were the most highly rated determinants. This suggests that employees recognize the feasibility of integrating AI into existing project management practices and believe that AI can lead to positive improvements.

To gain a deeper understanding of the decision-making process, the study also examined the correlation between the various factors and the overall decision to adopt AI (DOA). The results showed statistically significant positive correlations between Compatibility (CP), Management Support (MS), Relative Advantage (RA), and Perceived Usefulness (PU) with DOA ($p < 0.001$). This indicates that when employees perceive a high degree of compatibility, strong management support, significant advantages of AI, and overall usefulness for project management, they are more likely to be in favor of adopting AI technologies. Interestingly, Complexity (CL) did not show a statistically significant correlation with DOA ($p > 0.001$). This suggests that perceived complexity may not be a major deterrent for AI adoption in this context.

In General, the findings of this study reveal a strong impetus towards AI adoption in project management within Ethiopian Airlines. The positive correlations between key factors like compatibility, management support, perceived usefulness, and relative advantage with the decision to adopt AI highlight the importance of focusing on these areas. By addressing concerns around complexity and actively promoting the benefits of AI for project management, Ethiopian Airlines can further encourage widespread adoption of AI technologies and potentially improve project outcomes.

Conflict of Interests

The authors declare that there's no conflict of interest concerning to the publication of this article.

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