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# Implementing Project Management Information Systems for Effective Mitigation of Project Risks in Developing Nations: A Focus on Nigeria

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## *Abstract*

Many projects in developing nations fail and get abandoned due to improper use of project resources, lack of standard practices, shortage of inadequate skilled project managers, and low adoption of technologies and information systems in project development lifecycle. This study examines implementing project management information systems (PMIS) for effective mitigation of project risks in developing nations, focusing on Nigeria. The Theory of Acceptance Model is adopted to explore project managers' planned behavior in the adoption of PMIS in their project development cycle. An online questionnaire was used to gather data from 130 respondents, who are key players and relevant stakeholders in Nigerian project management organizations. The respondents' perceptions were quantified based on their attributes of adopting project management information systems for the

mitigation of project risks. Statistical techniques of mean, correlation and regression were used for the data analysis. The results show occasional adoption of PMIS applications for managing various stages of projects, from planning to evaluation; PMIS exerting significant positive influence on expected project outcomes; a strong positive relationship (r = 0.827) between the use of PMIS application tools and project outcomes; and a mild positive relationship (r = 0.435) between the frequency of PMIS usage and the project outcome. The positive influence included improved work productivity, quality of decision and control of project activities and schedule, efficient resource allocation, and effective time management. The study concludes that the implementation of PMIS can lead to effective mitigation of project risks in developing nations. Developing nations' organizations should adopt PMIS.

**Keywords:** Project management information systems, Implementing, Project risks, Effective mitigation, Developing nations

# Introduction

In contemporary times, the procedures humans adopt to perform their activities have been altered by the advent of technology and information systems. Information systems and technology have brought about business globalization, and created avenues for organizations to plan, control and evaluate project operations across boundaries. The traditional process involving linear and hierarchical project development and execution across several skilled practitioners has now been replaced with robust applications. The typical transfer of information involving the use of paperwork and file keeping has now been replaced using electronic means resulting in faster and more precise decision-making. In the last decade, the architecture of Project Management Information Systems (PMIS) has experienced considerable changes, while being constantly developed into more complex, multifunctional, and distributive management systems to encompass the entire operations of the project cycle (van Besouw and Bond-Barnard, 2021). The use of information systems and technology has penetrated the

foundation of every organization increasing their capabilities for agility such that these businesses can hardly survive in this present-day environment. Technology has infiltrated the core operations of projects with increasing capacity to incorporate all the activities and stakeholders involved in a project across continental boundaries (Varajo and Amaral, 2021). There are specialized technologies for different fields of application such as the PMIS for project managers. Over the last years, PMIS technologies have been developed to a great extent in project management, designed with the capabilities to support the entire life cycle of complex projects across various organizations (Braglia and Frosolini, 2014). The purpose of a PMIS system is to improve the efficiency of project development cycles through proper and transparent flow of information across all users such that the project managers are empowered to track the progression of projects and specific tasks (Amami et al., 1993). Thus, the status of projects can easily be determined and communicated to relevant stakeholders. This timely and coherent flow of information between project managers, team members and other stakeholders transforms rigid organizations into agile systems, which significantly keep these people up to date. This communication channel allows for rapid responses to changes in project design, resource allocation, delivery dates, etc.

Developing nations like most African and some Asian countries continue to trail developed nations like American and European countries due to their low adoption of technology and automated systems. Despite the increasing number of projects being executed in these regions, there seems to be a disproportionate increase in supporting technologies. Most of these developing countries are generally poor, and thereby lack human and financial capacity to drive the development of the technologies that best fit their system. Incessant failure and project abandonment are characteristics of projects in this region. This situation further deepens the development gaps. Prevailing management challenges such as inadequately skilled project managers and lack of standard practices are responsible for numerous project failures or abandonment leading to loss of valuable resources. In addition, weak coordination of project activities, improper communication and collaboration between project managers and other team members, and the problems of proper resource management (money, facilities, time, and people) shrink the chances of the success of a project. These challenges can easily be addressed through the

adoption of information systems, such that projects are holistically managed within the project cost and time based on accurate information. Therefore, this study seeks to investigate the potential influence of PMIS adoption on project outcomes in developing nations with a focus on Nigeria.

**Aims and Objectives**

The aim of this research is to investigate the impact of project management information systems on project risk management, focusing on Nigeria for a case study. Its specific objectives are to:

i. Determine the frequency of adoption of PMIS among Nigerian organizations.
ii. Measure the adoption of various PMIS tools and functions in the execution of projects.
iii. Examine the influence of PMIS on project outcomes.
iv. Measure the relationship between the adoption of PMIS and project outcomes.

**Research Questions**

The following research questions are designed to guide the study:

i. What is the frequency of adoption of PMIS among Nigerian organizations?
ii. What is the extent of the adoption of various PMIS tools and functions in the execution of projects?
iii. What influence do PMIS exert on project outcomes?
iv. What is the relationship between the adoption of PMIS and project outcomes?

**Project Management Information Systems (PMIS)**

The concept of PMIS describes a computer-based information technology and software system, structured to organize and manage project data. These systems have the capability to create, analyze, store, and retrieve project information for efficient and effective performance. PMIS technologies are developed comprising several different software applications to perform dedicated functions such as project information management, resource management and allocation,

stakeholders and team collaborations, data repositories and cost management systems. PMIS systems are developed with software packages that can present information in graphical and tabular representations to aid project managers or management in timely and accurate planning, controlling, and monitoring of projects. For speedy project execution, these systems have the capability of automating the processes involved in project management through knowledge sharing and connecting various members of numerous project teams across international boundaries around the world (Awofadeju, 2023).

Ilyas et al. (2013) have described PMIS as a systematic process that involves locating, collecting, organizing, modifying, sharing, and using information systems and technology. These Information Systems are suitable tools and techniques for gathering relevant information about a project, and then utilizing these tools for managing the project processes and complexities. They have become indispensable for developing proper support structures necessary for the integration and distribution of information that aids project managers in planning, organizing, and controlling the activities and resources of any project (Micale et al., 2021). The dimensions of a PMIS are solely structured around communication and documentation for project-related information purposes. These systems are designed to handle basic information about the project such as the project goals, location, stakeholders' information, teams involved, current calendar, project status etc (Berisha-Shaqiri, 2014). This implies that technology is both a product and a procedure for achieving identified activities and supporting the capabilities of humans.

Zambare and Dhawale (2017) described PMIS as important building blocks for modern project management. Over the last decade, the architecture of PMIS systems has experienced considerable changes and is constantly being developed into more complex, multifunctional, and distributed, management systems to encompass the entire operations of the project cycle (van Besouw and Bond-Barnard, 2021). These systems are designed with the capability of automating project management processes by connecting various project teams across several locations around the world. As many organizations are gradually expanding transforming from focusing on individual projects to multiple complex and global projects across international boundaries, they tend to handle various projects that

are vastly multifaceted. The complexity of these projects is compelling management to harmonize their administration of these projects concurrently with the desired level of detail-specific accuracy and unparalleled precision competitively to ensure that they remain relevant in business as well as dominate in their respective fields. This empowers project managers to effortlessly aggregate all planning, stakeholders' collaboration, activity scheduling, organization, control, and monitoring of the project tasks.

**Importance of PMIS**

PIMS are designed to adapt to the project management needs of present-day managers under specific project initiation, implementation, and administration (Berisha-Shaqiri, 2014). Even though the complexities of global corporations are increasing, PMIS is being designed to be a more reliable support tool that can assist in managing the difficulties of these complex projects increasing the confidence of managers. For instance, advancement in the information technology and software development industries has provided some of the most dependable application solutions suitable for handling the complexities of projects (Obeidat and Aldulaimi, 2016). The use of information systems in project management is gradually replacing the exclusive reliance on human potential for storing and retrieving large information, project planning and execution. The globalized integration of sophisticated systems and software solutions with remote location capability in modern business overcomes the barriers to the execution of projects in various locations at a time.

Project Information Management Systems have the capability for project risk management. Due to their nature, organizations continue to encounter increasing project complexity imposed by the uncertainty, volatility, and ambiguity of the business environment (Varajão and Amaral, 2021). Information system has become the core assets of businesses and has become critical in every aspect of the organization and the handling of projects. They are essential for achieving competitive advantages, operational cost reduction and productivity improvement (Varajão et al., 2021). There are various project management software developers competing to dominate the market by offering sophisticated software to their various clients. The fierce competition among the largest manufacturers: Oracle,

Microsoft, Autodesk, Meridian, and Huddle among others will continue to drive innovations in the continuous development of PMIS (Micale et al., 2021).

Presently, information systems for project management are of various sizes and structures, most of which are either of standard operation or customized to suit the business operations of the clients (Braglia and Frosolini, 2014). For instance, there is the implementation of modules for Customer Relationship Management systems (CRM), Enterprise Resource Planning (ERP), Business Intelligence (BI), and Supply Chain Management (SCM) systems (van Biene-Hershey and Strous, 2017). These IS modules are usually customized for businesses (large or small) with the capability for business and process improvement through information technology (Brodin, 2018).

**Features of PMIS**

There are several features of PMIS for different business operations. Micale et al. (2021) suggest that the key features of PMIS should include project initiation, planning and scheduling, resource management, project control, documentation, and risk management. Table 1 shows a summary of the various features and types of PMIS packages.

**Table 1: Features of PMIS**

| Feature | Tool | Software |
|---|---|---|
| **Activity planning** | | Asana |
| | Critical Path Method | MS Project |
| | WBS | Podio |
| | Gantt chart | Liquid planner |
| | Milestones | |
| **Resource planning** | | Trello |
| | Allocation of resources | MS Project |
| | Balancing of resources | Podio |
| | Critical Chain Project | Asana |
| | Cost Management | Wrike |
| | Calendar | Liquid planner |
| | Resource Chart | |

| Feature | Tool | Software |
|---|---|---|
| | Resource Breakdown Structure (RBS) | |
| | Stakeholders Directory | |
| **Control** | Performance Tracking | Trello |
| | Budget Control Comparing | MS Project |
| | Time Control | Podio |
| | Modifying Tasks | Asana |
| | Travel Cost | Wrike |
| | Reassigning resources | |
| | Quality Management and Validation | |
| **Risk Analysis** | PERT | MS Project |
| | Simulation | |
| | Risk Management | |
| | Issue Management | |
| | Claim Management | |
| **Reporting** | Document Management | Asana |
| | Report | MS Project |
| | Version Tracking | Huddle |
| | Archiving project information | Wrike |
| **Communication Management** | E-mail | Basecamp |
| | Chat | Huddle |
| | Communication Group | Asana |
| | Forum | MS Project |
| | Messages Outside the System | Podio |
| | Video & Audio | Trello |
| | RSS feed | |
| | Automatic check-in | |
| | Activity comments | |
| | Guests and Followers | |
| | Calendars and emails synchronizing | |
| **Utility** | To-do list | MS Project |
| | Filters | Liquid planner |
| | Customized fields | Trello |

| Feature | Tool | Software |
|---|---|---|
| | Contacts list | Asana |
| | Procurement management | Podio |
| | External tools integrations | |
| | Guide and technical support | |
| | Mathematical calculations | |
| | Reminder | |
| | Multi-language support | |
| **Customer information Interdependencies Management** | User interface, Access permits | MS Project Liquid planner Trello Asana |

**Source: Authors, 2023**

**Adoption of PMIS in Developing Countries**

Developing countries are generally regarded as being poor lacking financial capacity to support sustainable projects in their countries. These countries rely upon the available limited resources or financial aid from the developed nations. For instance, most countries in Africa are relatively poor and in dire need of mega projects to match the needs of their populace. The African continent is torn up by decades of war, civil unrest, communal clashes, insecurity, and insurgency compounded by corrupt and unprofessional practices. The continent continues to trail its counterparts in the developed world. In recent times, Africa can be regarded as a developing site owing to the increased number of developmental projects in most parts of the continent.

However, most of these mega projects are usually funded and executed with support from external donors and or in conjunction with the government in the form of foreign aid. However, due to a lack of standard practices and other project management challenges, there is a rise in project failure or a very high likelihood of project abandonment (Adams, 2017). Successful projects are the building blocks for development in any society. Most projects in developing nations suffer from resource constraints and management issues such as economic, human capacity and time restraints which are essential for project completion (Borstnar, Kobal and

Ilijaš, 2013). These challenges are direct results of the government's inability or willingness to commit funds and resources for the execution of such projects. The lack of standard information-sharing infrastructures, communication transparency and collaboration amongst the various stakeholders including government and private institutions organizations impedes the flow of vital information required during the project development cycle.

Project management practices continue to experience low levels of professionalism and deficiency in standard practice as well as technical incompetency (Ogunsanya, Aigbavboa and Thwala, 2016). For instance, inadequate project appraisal, insufficient preparatory analyses, and faulty procurement procedures by government and private bodies are responsible for the failure, breakdown, or abandonment of most projects (Adams, 2017). Incessant failure and abandonment of projects result in an enormous waste of insufficient and vital resources which further deepens the developmental gaps in these regions. Additionally, the adoption of project management information systems continues to encounter challenges and factors such as lack of support structures, incompetence of project management experts, high cost, unwillingness to adopt new systems, and government resistance (Zuofa and Ochieng, 2012). Most project managers of various organizations have to develop their systems or depend on ineffective practices, which frequently lead to little success, negative outcomes, or complete project failure (Odimabo and Oduoza, 2018).

**Impacts and Limitations of PMIS**

The use of technology and automated systems with multiple users is typical in most projects requiring inputs from various teams to remotely view and update project information. These capabilities and features enable big corporations to execute projects in numerous locations by providing a suitable platform for planning, controlling, and coordinating the activities of these projects concurrently. Such organizations rely on applications that integrate various project data across locations (Braglia and Frosolini, 2014). According to Berisha-Shaqiri and Berisha-Namani (2015), the use of information technology infrastructure in project management is economical. This investment mostly leads to increased efficiency and cost-effectiveness of business operations significantly contributing to

organizational growth and development through productivity improvement and increased production (Vuksanović, Ugarak and Korčok, 2016).

It positively stimulates innovation and drives creativity which is vital for project success. The impacts of PMIS are investigated under risk management and project quality. The impacts of Project Management Information Systems on projects can be dimensioned in terms of the project outcome: project success and project deliverables (Nguyen, Nguyen and Nguyen, 2016). The outcome of successful project management is a function of the management procedure that affects the actualization of the project scope, cost, and schedule (George, 2020). These quantities signify how efficiently and effectively the project has been executed. Successful project deliverables are tangible evidence primarily measured by the project's resulting products after production. Information quality affects the value of the project output. Due to the complex nature of most projects and the level of risk, Odimabo and Oduoza (2018) examined that the management of risk in projects necessitates the application of advanced approaches such as the adoption of PMIS to achieve the required project specification and stakeholder's expectation of performance, high-quality and reduced negative outcomes.

Precisely, information systems have become highly significant in project-driven organizations in the designing and execution of high-quality or complex projects with shorter product development cycles and reduced costs (Obeidat and Aldulaimi, 2016). The quality of information determines the value of project decision-making. The findings of Ali, Anbari and Money (2008) revealed that project managers' need for quality information quality was the main deciding factor for the adoption of project management systems. For instance, Obeidat and Aldulaimi (2016) reported that project managers of extremely vigorous industries such as construction projects are likely to adopt PMIS. Risk is inherent in every project and a function of the managers' decisions. How well the projects are managed the quality of information available and other critical factors significantly impact the level of the project's outcome and project success (Cadle and Yeates, 2008).

The limitations of the use of PMIS are operational difficulties, high expectations and overreliance (Vuksanović, Ugarak and Korčok, 2016). The design of these systems places an excessive emphasis on monitoring and reporting activities of the

project with the tendency for the management teams to over-rely on the technology for these activities rather than on the quality of information (Reed and Angolia, 2018). This reliance causes management to have high expectations for the project outcome. Furthermore, the implementation of IT systems requires substantial capital investment and set-up. A defective business process usually leads to the development of several systems adding to the overall project costs. Additionally, the operation of these devices requires the services of qualified professionals and the training of employees. Also, the ineffective application of these systems aggravates quality issues relating to defects in project designs and the number of reworks in the project. Therefore, PMIS if wrongly developed or applied may result in low system performance or failures, which are very costly for the organization.

**Methodology**

The data collection procedure is based on the subjective view of the respondents to measure the degree of PMIS adoption in developing nations in the management of projects, and its impacts in influencing project outcomes through a survey of project managers. This survey utilizes a structured questionnaire to easily standardize the data collection process from a large number of respondents with fixed options. This technique adopts a common framework for all the respondents and allows for easy comparison of responses from which general observations or deductions can be inferred (Agresti and Franklin, 2009). Hence, this strategy permits the use of statistical data analysis procedures.

A non-probability sampling design approach of purposive sampling is adopted for designing the sample frame of the respondents for data collection. This sampling technique is most appropriate to select suitable respondents with appropriate knowledge and vastness on the subject matter. A sample of 150–200 respondents is adopted. The questionnaire is designed for the collection of primary data based on the perception of the respondents regarding the use of PMIS in Nigeria. The questionnaire items are designed predominantly with closed-ended questions using the Likert scale. The Likert Scale is suitable for the quantification of responses from the questions with fixed options that can be easily analyzed statistically (Dawson, 2002). The questionnaire for the survey is administered electronically

through the designed form on Qualtrics. The data on the Likert scale is interpreted as shown in Table 2, as suggested by Terano (2015).

**Table 2: Interpretation of the Likert scale**

| Scale | Interval | Interpretation |
|---|---|---|
| **1** | 1.00 - 1.49 | Strongly disagree /Never |
| **2** | 1.50 - 2.49 | Disagree/Rarely |
| **3** | 2.50 - 3.49 | Neutral/Occasional |
| **4** | 3.50 - 4.49 | Agree/ Often |
| **5** | 4.50 - 5.00 | Strongly agree/Very often |

**Source: Authors, 2024**

The design of the questionnaire is in four sections. Section A contains items about the background information or demography of the respondents. This comprises gender, level of education, duration in current position, type of organization and project, and nature of the project. Section B contains questions relating to the degree of PMIS adoption in the organization and the project development cycle. Section C is concerned with the application of PMIS in the execution of the project such as activity planning, resource planning, project control, utility, risk analysis, communication management, and job reporting. To distribute the questionnaires effectively to the target population, the link to the form is sent through various channels primarily e-mails and social media handles of the respondents.

The quantitative technique is employed to analyze the data collected. This includes the use of descriptive statistics (frequency, mean score, and standard deviation) and inferential statistics (correlation analysis). Frequency, percentage, and mean score are used to summarize the key features of the level of PMIS adoption, application, and impact on project outcomes. The frequency distribution is the summary of the data counts for each class variable in the study (Teddlie and Tashakkori, 2009). This is expressed in percentage as:

$$fk\% = \left(\frac{fk}{N}\right) \times 100 \qquad 3.1$$

Where $fk$ = class frequency of category k, N = total sum of the class variables,

The mean score is the overall average of the response distribution of a category of variable in the study which indicates the most appropriate to the overall population

responses. Standard deviation is a measure of the class variability. The measures of association are utilized to predict the relationship between the level of implementation of PMIS in project management and the project outcome. The regression is applied to predict the level of interactions between the dependent variable and the independent variables. Herein, the independent variables considered are the Frequency of PMIS adoption (X1) and Use of PMIS Application Tools (X2). The dependent variable is the Project Outcome. The regression model developed is:

$$Y=\beta 0+\beta 1X1+\beta 2X2 \qquad 3.2$$

Where: $Y=¿$ the dependent variable,

$\beta 0=¿$ the constant term or Y-intercept

$\beta 1,2=¿$ the respective coefficients of the dependent variables (X)

$X1,2=¿$ the independent variables.

To perform these data analyses, the Statistical Package for Social Science (SPSS) and Excel tools are used.

The research process takes due recognition of ethical issues as applied during the data collection procedure. At the commencement of the data collection procedures, the consent of the respondent is required to agree or disagree in taking part in the survey. They are well-informed ahead of the details of the study as well as their right as regards their level of participation and freedom to withdraw from the process at will. The respondents are instructed not to supply any sensitive data of the respondents such as name, address, location, etc to ensure the respondents' anonymity and confidentiality. The respondents are assured of the intention of the data collection and the full responsibility of the researcher for the data protection during collection, analyses, storage, and disposal throughout the research process.

The data were collected online through a questionnaire designed on Qualtrics. The respondents filled out and submitted their responses to the questionnaire through the link sent to them via email and social media channels. No printed copy of the questionnaire was distributed or received from the respondents. A total of 205 contacts of potential respondents were identified through links to various project management organizations and institutes in Nigeria such as the Project Management Institute (PMI), and Chartered Institute of Project Managers (CIPM).

Out of the potential respondents, a total of 130 responses were recorded. Therefore, the response rate is:

$$Response\ rate = + \frac{Total\ number\ of\ response\ received}{Total\ number\ of\ potential\ respondents} \times 100$$

Response rate $= \frac{130}{205} \times 100 = 63.41\%$

**Project Management Applications**

Table 3 is a summary of the adoption of PMIS application tools at the different phases of managing a project. With a mean of 3.30 and a standard deviation of 0.85, 104 respondents indicated that they occasionally use PMIS for the project planning stage in project management. The result in Table 3 shows outcomes for the other stages of project management in the organization.

**Table 3: Stages of PMIS adoption and use**

| Field | Min | Max | Mean | Standard | Responses |
|---|---|---|---|---|---|
| **Project learning phase** | 1.00 | 5.00 | 2.98 | 0.93 | 109 |
| **Information Access** | 1.00 | 5.00 | 3.08 | 0.88 | 100 |
| **Project planning** | 1.00 | 5.00 | 3.30 | 0.85 | 104 |
| **Project Customization** | 1.00 | 5.00 | 3.09 | 0.78 | 101 |
| **Information retrieval and response** | 1.00 | 5.00 | 3.17 | 0.93 | 99 |
| **Managing multiple projects** | 1.00 | 5.00 | 3.17 | 0.95 | 99 |
| **Scheduling Projects** | 1.00 | 5.00 | 3.20 | 0.85 | 100 |
| **Project and System Integration** | 1.00 | 5.00 | 3.10 | 0.92 | 99 |
| **Project evaluation** | 1.00 | 5.00 | 3.23 | 0.94 | 100 |

**Source: Authors, 2024**

Several factors were reported to be responsible for the occasional adoption of PMIS in project management especially in developing nations. Table 4 is a summary of these factors.

**Table 4: Factors Limiting the Adoption of PMIS in Project Management**

| Factor | Frequency | Percentage |
|---|---|---|
| **Fear/Failure adapting to a new system** | 14 | 13% |
| **Difficulty in adjusting to new routines** | 14 | 13% |
| **Lack of confidence in information systems** | 12 | 11% |
| **Bad past experiences** | 4 | 4% |
| **Employee resistance** | 8 | 7% |
| **High cost** | 25 | 23% |
| **Lack of technical know-how** | 31 | 28% |
| **Others** | 1 | 1% |
| **Total** | **109** | **100%** |

**Source: Authors, 2024**

The result in Table 4, 28% of the respondents reported that the lack of technical know-how is the major limiting factor for the adoption of PMIS in project management in their organization while 25% indicated high cost. Others opined that the fear of failure trying to adapt to a new system (14%), the difficulty in adjusting to a new routine (14%), or lack of confidence in information systems were their major limiting factors.

**Application of PMIS**

PMIS is adopted in various degrees in these organizations. The result measured the degree to which the project managers adopted various tools and functions of PMIS at the different stages of the project lifecycle. These PMIS tools were categorized into four groups: project activity planning, controlling function, monitoring function, and evaluating function tools. The tools in the planning of activities are represented in Table 5.

**Table 5: Adoption of PMIS Tools in Activity Planning**

| Tool | Min | Max |
|---|---|---|
| **Work Breakdown Structure (WBS)** | 1.00 | 5.00 |
| **Critical Path Method** | 1.00 | 5.00 |
| **Gantt chart** | 1.00 | 5.00 |
| **Spreadsheets** | 1.00 | 5.00 |
| **Milestones** | 1.00 | 5.00 |

**Source: Authors, 2024**

The result from Table 5 shows that there is occasional adoption of the Critical Path Method, Work Breakdown Structure, Gantt chart, Milestones and Spreadsheet applications in planning activities of project management. Most PMIS applications are built with the above-named tools which may be responsible for the similar results obtained. The application of these tools in resource allocation and planning is shown in Table 6.

**Table 6: Use of PMIS in Resource Planning**

| Field | Min | Max | Mean | Standard Deviation |
|---|---|---|---|---|
| **Allocation of resources** | 1.00 | 4.00 | 2.00 | 0.82 |
| **Balancing of resources** | 1.00 | 4.00 | 2.14 | 0.71 |
| **Managing cost** | 1.00 | 4.00 | 2.38 | 0.97 |

**Source: Authors, 2024**

The result shows that with means less than 2.49, PMIS applications are rarely used in the allocation of resources, balancing of resources, or managing project costs. However, these tools were adopted in the control of project activities as shown in Table 7.

**Table 7: Use of PMIS in Project Control**

| Field | Min | Max | Mean | Standard Deviation |
|---|---|---|---|---|
| **Performance Tracking** | 1.00 | 5.00 | 3.39 | 1.06 |
| **Budget Control** | 1.00 | 5.00 | 3.46 | 1.07 |
| **Time Control** | 1.00 | 5.00 | 3.59 | 1.05 |

| Field | Min | Max | Mean | Standard Deviation |
|---|---|---|---|---|
| **Travel Costing** | 1.00 | 5.00 | 3.32 | 1.06 |
| **Quality Management and Validation** | 1.00 | 5.00 | 3.51 | 1.07 |

**Source: Authors, 2024**

The result obtained in Table 7 shows that PMIS application tools were often used in time control, and quality management with means of 3.59 and 3.51 respectively. While with means of 3.46, 3.39, and 3.32, these tools were occasionally used in project performance tracking, budget controlling and travel costing respectively.
PMIS applications are composed of several utility tools. The respondents were asked to specify their level of adopting these utility tools. The summary of their responses is shown in Table 8. With means ranging from 3.20 to 3.43, there is occasional use of the to-do list, customized fields, contact list, and procurement management utility tools in PMIS.

**Table 8: PMIS Utility Tools**

| Field | Min | Max | Mean | Standard Deviation |
|---|---|---|---|---|
| **Customized fields** | 1.00 | 5.00 | 3.02 | 1.24 |
| **To-do list** | 1.00 | 5.00 | 3.40 | 0.93 |
| **Procurement management** | 1.00 | 5.00 | 3.43 | 1.07 |
| **Contacts list** | 1.00 | 5.00 | 3.40 | 1.04 |

**Source: Authors, 2024**

In comparison to communication management tools, Table 8 shows that with means ranging from 3.59 to 3.92, the respondents signified they often utilized E-mail, Chat, Communication Group, Forum, Video & Audio, and Activity Comments and media for communication. While with means of 3.32 and 3.13, there is occasional use of other media for messaging outside the system and RSS Feed respectively. Table 9 shows tools used in PMIS communication.

**Table 9: Use of PMIS Communication Tools**

| Field | Min | Max | Mean | Standard Deviation |
|---|---|---|---|---|
| **Chat** | 1.00 | 5.00 | 3.78 | 1.06 |
| **Communication Group** | 1.00 | 5.00 | 3.77 | 1.07 |
| **Video & Audio** | 1.00 | 5.00 | 3.59 | 1.10 |
| **E-mail** | 1.00 | 5.00 | 3.92 | 1.05 |
| **Forum** | 1.00 | 5.00 | 3.64 | 1.08 |
| **Activity comments** | 1.00 | 5.00 | 3.61 | 1.07 |
| **Messages Outside the System** | 1.00 | 5.00 | 3.32 | 1.01 |
| **RSS feed** | 1.00 | 5.00 | 3.13 | 1.19 |

**Source: Authors, 2024**

Similarly, in terms of the reporting capabilities of PMIS, Table 10 shows that with means between 3.59 and 3.70, PMIS tools are often used in document management, reporting and archiving project information while with a mean of 3.31, there is the occasional use of PMIS in version tracking.

**Table 10: Use of Reporting Tools**

| Field | Min | Max | Mean | Standard Deviation |
|---|---|---|---|---|
| **Managing document** | 1.00 | 5.00 | 3.70 | 0.99 |
| **Project reporting** | 1.00 | 5.00 | 3.82 | 0.93 |
| **Tracking project version** | 1.00 | 5.00 | 3.31 | 1.17 |
| **Archiving project information** | 1.00 | 5.00 | 3.59 | 1.08 |

**Source: Authors, 2024**

PMIS is adopted in the management of project risks. Table 11 shows the results of the responses of the respondents to their adoption of PMIS in the management of risks in their projects. Similar to the utility tools, with mean responses between 3.11 and 3.31, there is the occasional use of PMIS in the management of risk.

**Table 11: Use of PMIS in Risk Analysis**

| Field | Min | Max | Mean | Standard Deviation |
|---|---|---|---|---|
| **PERT** | 1.00 | 5.00 | 3.14 | 1.11 |
| **Simulation** | 1.00 | 5.00 | 3.22 | 1.14 |
| **Risk Management** | 1.00 | 5.00 | 3.29 | 1.13 |
| **Issue Management** | 1.00 | 5.00 | 3.31 | 1.10 |
| **Claim Management** | 1.00 | 5.00 | 3.11 | 1.02 |

**Source: Authors, 2024**

With the adoption of the various PMIS tools in the management of the different stages of a project, the impact of PMIS on the outcomes of projects in organizations is shown in Table 12.

**Table 12: Influence of PMIS on Project Outcome**

| Field | Min | Max | Mean | Standard Deviation |
|---|---|---|---|---|
| **Productivity Improvement** | 1.00 | 5.00 | 4.17 | 0.84 |
| **Quality of decision improvement** | 1.00 | 5.00 | 4.21 | 0.68 |
| **Reduced decision-making time** | 1.00 | 5.00 | 3.84 | 0.89 |
| **Task completion time reduction** | 1.00 | 5.00 | 3.84 | 0.92 |
| **Activity-control improvement** | 1.00 | 5.00 | 4.07 | 0.73 |
| **Activity-planning improvement** | 1.00 | 5.00 | 4.18 | 0.74 |
| **Project monitoring** | 1.00 | 5.00 | 4.19 | 0.78 |
| **Resource allocation efficiency** | 1.00 | 5.00 | 4.04 | 0.76 |
| **Project cost allocation** | 1.00 | 5.00 | 3.99 | 0.81 |
| **Project scheduling** | 2.00 | 5.00 | 3.99 | 0.66 |
| **Resource usage** | 1.00 | 5.00 | 3.97 | 0.78 |

**Source: Authors, 2024**

From the result shown, with means ranging from 3.84 to 4.21, the respondents agree to the influence of PMIS in improving the productivity of work, quality of decisions, control of project activities and schedule, efficient allocation of resources and time management. This implies that PMIS is perceived to have a significant influence on expected project outcomes. These results reflect the proven

relationship between PMIS and project outcome, which is a very strong one. There is a very positive relationship (r = 0.827) between the use of PMIS application tools and project outcomes. Besides, there is a mild positive relationship (r = 0.435) between the frequency of PMIS usage and the project outcome. The correlation is significant at the 0.01 level (2-tailed). Further, the use of PMIS tools has a positive coefficient (1.288) which signifies the expected improvement in project outcome for a unit use of PMIS tools. In the case of the frequency of use, the negative coefficient (-0.281) indicates a decrease in project outcome for a unit increase in the frequency of PMIS usage.

**Conclusion**

This study investigated the implementation of project management information systems (PMIS) in developing economies focusing on project-oriented organizations in Nigeria. The scope of PMIS implementation in developing economies and its impact on project outcomes were investigated through a questionnaire survey focusing on project managers and business owners in Nigeria. Most projects are complex and dimensioned by the number of projects/locations and employees. Sustainable projects suffer from resource constraints and management issues. Economic, human capacity and time are essential resources for project completion. To achieve the required project outcomes of high-quality and reduced negative occurrences, advanced approaches for efficient planning, resource control and project monitoring have to be applied.

Typically, the concerned organizations are mostly construction, production, financial management, logistics and express delivery services, information technology and telecommunication industries, hospitality, and healthcare industries. Several factors are responsible for this low adoption of PMIS. The major factors are the lack of technical know-how and the high cost of these systems. Other significant factors are the fear of failure trying to adapt to new systems, the difficulty in adjusting to new routines or lack of confidence in information systems. Developing countries are generally regarded as being poor and lacking the financial capacity to support. The relative ease of technology adoption is influenced by the age, education and experience of the user. The degree of technology acceptance in the operations of project management is observed to be higher in younger people

than adults with the former possessing a higher propensity for technology and information systems.

With the advancement in technology and globalization of the world economy, organizations must take advantage of information systems. The use of PMIS tools is positively related to the project outcomes. This suggests an expected improvement in project outcome with the continuous use of PMIS tools. Project outcomes arises from improvement in productivity of work, quality of decision, control of project activities and schedule, efficient allocation of resources and time management. These quality issues are primarily responsible for increased costs and time overflows in the project execution. Organizations are thereby able to predict quality failure patterns and costs, and thereby adequately strategize prevention plans. Nevertheless, they face challenges like incompetency, operational difficulties, high expectations and overreliance. Yet, organizations must properly manage their projects to ensure execution within a specific duration and budget.

**Recommendation**

The following recommendations are made:

i. Addressing the low-level adoption of information systems among organizations in developing nations requires that they continuously strive to invest in the purchase of PMIS technologies and the training of their employees to possess the required skills and knowledge across the various stages of project management, so as to stay updated with emerging technologies for efficient business operations.
ii. The adoption and use of information systems must be incorporated to drive the core activities of project management and to mitigate the continuous failure or delay of projects in this region.
iii. The culture of these organizations must consistently evolve from the traditional operation and project development to the use of technology that suits the specific organizational needs.
iv. The technology acceptance must be balanced across a combination of adaptable to the individual's choice of learning needs.
v. Organizations must develop customized systems based on the specific requirements of their projects or client needs.

## References


Adams, B. A. (2017) Project Management for Developing Countries: Back to Basics. *Dama International Journal of Researchers (DIJR)* [online], 2(4), 5–9. Available from: www.damaacademia.com.

Agresti, A. and Franklin, C.A. (2009) *Statistics: The Art and Science of Learning from Data.* 2nd edition. New Jersey, Pearson Prentice Hall.

Ali, A.S.B., Anbari, F.T. and Money, W.H. (2008) Impact of Organizational and Project Factors on Acceptance and Usage of Project Management Software and Perceived Project Success. *Project Management Journal* [online]. pp. 6–33.

Amami, M., Beghini, G. and Manna, L. (1993) Use of project-management information system for planning information-systems development projects. *International Journal of Project Management, 11*(1), pp. 21–28.

Awofadeju, M. O. (2023, Sept.) Implementing project management information system and project risk management in developing economies: a case study of Nigeria. Independent project report submitted for the degree of Master of Science in Project Management, University of the West of England.

Berisha-Shaqiri, A. (2014) Management Information System and Decision-Making. *Academic Journal of Interdisciplinary Studies* [online], 3(2), pp. 19–24.

Berisha-Shaqiri, A. and Berisha-Namani, M. (2015) Information Technology and the Digital Economy. *Mediterranean Journal of Social Sciences* [online], 6 (6), pp. 78–83.

Borstnar, K.M., Kobal, V., and Ilijaš, T. (2013) *Impacts of implementation of project management information system in a small R&D company-case study*. In: *32. mednarodna konferenca o razvoju organizacijskih znanosti* [online]. Available from: https://www.researchgate.net/publication/236656392.

Braglia, M. and Frosolini, M. (2014) An integrated approach to implement Project Management Information Systems within the Extended Enterprise. *International Journal of Project Management* [online]. 32 (1), pp. 18–29.

Brodin, M. (2018) *Security strategies for managing mobile devices in SMEs: A theoretical evaluation*. In: *2017 8th International Conference on Information, Intelligence, Systems and Applications, IISA 2017* [online]. 2018-January, Institute of Electrical and Electronics Engineers Inc., pp. 1–6.

Cadle, James. and Yeates, Donald. (2008) *Project management for information systems* 5th edition. Harlow, England, Pearson Prentice Hall.

Dawson, C. (2002) *Practical Research Methods: A user-friendly guide to mastering research techniques and projects.* 1st edition. [online]. Oxford, United Kingdom., How to Books Ltd. Available from: http://www.howtobooks.co.uk.

George, C. (2020) The Use of Project Management Information Systems in the Monitoring of Projects. *International Journal of Scientific Research and Engineering Development* [online]. 3 (1), pp. 692–700. Available from: www.ijsred.com.

Ilyas, M.A.B., Hassan, M.K. and Ilyas, M.U. (2013) *PMIS: boon or bane?* Istanbul, Turkey, PA: Project Management Institute.

Lai, P. (2017) The literature review of technology adoption models and theories for the novelty technology. *Journal of Information Systems and Technology Management* [online]. 14(1), pp. 21–38. Available from: https://www.tecsi.org/jistem/index.php/jistem/article/view/10.4301%25S1807-17752017000100002/643.

Micale, R., La Fata, C.M., Lombardo, A. and La Scalia, G. (2021) Project management information systems (Pmiss): A statistical-based analysis for the evaluation of software packages features. *Applied Sciences (Switzerland)* [online]. 11 (23).

Nguyen, T.D., Nguyen, D.T. and Nguyen, T.M. (2016) *Information systems success: The project management information system for ERP projects*. In: *Lecture Notes of the Institute for Computer Sciences, Social-Informatics and Telecommunications Engineering, LNICST* [online]. 165, Springer Verlag, pp. 198–211.

Obeidat, A.Q.M. and Aldulaimi, S.H. (2016) The Role of Project Management Information Systems Towards the Project Performance the Case of Construction Projects in United Arab Emirates. *International Review of Management and Marketing* [online]. 6 (3), pp. 559–568. Available from: https://www.youtube.com/http:www.econjournals.com.

Odimabo, O. and Oduoza, C.F. (2018) *Guidelines to Aid Project Managers in Conceptualising and Implementing Risk Management in Building Projects*. In: *Procedia Manufacturing* [online]. 17, Elsevier B.V., pp. 515–522.

Ogunsanya, O.A., Aigbavboa, C.O. and Thwala, D.W. (2016) *Public-Private Partnership Infrastructure Projects in Developing Nations: Lessons for The Nigerian Construction Industry*. In: *International Conference on Infrastructure Development in Africa* [online]. South Africa, pp. 477–486. Available from: https://www.researchgate.net/publication/337636366.

Reed, A.H. and Angolia, M. (2018) Risk management usage and impact on information systems project success. *International Journal of Information Technology Project Management* [online]. 9 (2), pp. 1–19.

Teddlie, C. and Tashakkori, A. (2009) *Foundations of Mixed Methods Research: Integrating Quantitative and Qualitative Approaches in the Social and Behavioral Sciences* 1st edition. California, USA, SAGE Publications, Inc.

Terano, H.J. (2015) Development and acceptability of the simplified text with workbook in differential equations as instructional material for engineering. Asia Pacific Journal of Multidisciplinary Research [online]. 3 (4), pp. 89–94. Available from: https://www.researchgate.net/publication/309187764.

Van Besouw, J. and Bond-Barnard, T. (2021) Smart project management information systems (SPMIS) for engineering projects– project performance monitoring & reporting. *International Journal of Information Systems and Project Management* [online], *9*(1), pp. 78–97.

Van Biene-Hershey, M.E. and Strous, L. (2017) Erratum to: Integrity and Internal Control in Information Systems. In: [online]. pp. E1–E1.

Varajão, J. and Amaral, A. (2021) Risk management in information system projects. *Journal of Project Management and Productivity Assessment* [online]. 9 (1), pp. 58–67.

Varajão, J., Pereira, J.L., Trigo, A. and Moura, I. (2021) Information systems project management success. *International Journal of Information Systems and Project Management* [online]. 9 (4), pp. 62–74.

Vuksanović, D., Ugarak, J. and Korčok, D. (2016) *Industry 4.0: the Future Concepts and New Visions of Factory of the Future Development*. In: *International Scientific Conference on ICT And E-Business Related Research* [online]. Belgrade, Serbia, Singidunum University, pp. 293–298.

Zambare, P. and Dhawale, A. (2017) Project Management Information System in Construction Industry: A Review. *International Journal of Engineering Sciences & Research Technology* [online]. 6 (7), pp. 54–60. Available from: http://www.ijesrt.com.

Zuofa, T. and Ochieng, E.G. (2012) *Towards the advancement of project management practice in developing countries: the case of Nigeria*. In: *PMI® Research and Education Conference*. Munster, Ireland, PA: Project Management Institute.