



Impact of IoT and Digital Technologies on Project Management Efficiency: A Survey Study

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Abstract: *The Internet of Things (IoT) and digital technologies have made a significant impact on project management, enhancing efficiency, communication, monitoring, and decision-making. Some of the traditional methods of project management can sometimes have problems with poor communication, understated estimation, quality of resources usage, and lack of risk management. Advanced digital solutions, including AI, Cloud computing, Big data analytics, Blockchain technology and IoT devices, hold the promise of delivering innovative solutions to these challenges through automation, real-time monitoring, predictive analysis, and intelligent decision-making. The study is a survey research that explores the effect of Digital Technologies and IoT on the efficiency of the project management, specifically on the efficiency of the following project management tasks: planning, monitoring, communicating, managing risk, and optimizing resources. This research also evaluates the added value of digital tools to increase productivity, reduce operating costs, enable collaboration and support data-driven project management. Additionally, it outlines the critical implementation issues, such as cybersecurity concerns and deployment expenses, technical skill gaps, and integration complexities. The study highlights growing importance of digital transformation in project management and provides recommendations for future studies to recognize impact of implementing digital transformation to increase project efficiency in various industries through a comprehensive literature review.*

Keywords: *Internet of Things (IoT), Digital Technologies, Project Management, Artificial Intelligence (AI), Big Data Analytics.*

1. Introduction

Project management is now an essential area for companies that wish to achieve success in strategic initiatives through effective management of resources in the areas of planning, coordination, monitoring and control. In today's business settings, projects are more complex, technologically advanced, with multiple and dynamic stakeholder needs and highly competitive projects [1]. Challenges that conventional project management practices may face are ineffective communication, slow decision-making, inaccurate forecasting, ineffective resource utilization, and poor risk management practices. As a result, organizations are increasingly relying on digital technologies to enhance project performance, improvement productivity and ensure the success of their projects [2]. Digital transformation has completely restructured project planning, monitoring and control processes and enabled organizations to evolve towards intelligent, automated and data-driven project management systems (PMS).

One of the technologies that has the potential to change the way PMS is done is the IoT. IoT is an interwoven network of Smart Devices, sensors, machines, and systems that can collect, share, and process data with the Internet with minimal or no human intervention [3][4]. IoT permits real-time monitoring and collection of data, which gives project managers insights into equipment performance, resource availability, conservational factors, and progress. Present visibility helps make better decisions, mitigate risk, enhance

operational efficiency, and minimise project delays and failures [5][6].

From an AI perspective, predictive analytics, intelligent scheduling, and risk assessment can be enhanced, while cloud computing allows for remote collaboration, centralized data storage, and seamless communication among project stakeholders. Cloud computing can facilitate seamless collaboration, central data storage, and smooth communication among project stakeholders, while AI can enhance predictive analytics, intelligent scheduling, and risk assessment. Large amounts of structured and unstructured data pertaining to projects can be analyzed using big data to increase forecasting accuracy and also to identify trends [7][8]. The documentation related to the project and transactions is also made more transparent, secure and accountable through the use of blockchain technology. But the adoption of digital technologies in organizations is not without its issues, such as cost of implementing digital technologies, cybersecurity problems, integration issues and organizational change concerns. Therefore, the relevance of the project management efficiencies impact of IoT and Digital technology is increasing. The objective of this survey research is to study impact of the IoT and other digital technologies on project management, the major advantages and disadvantages, as well as the future of digital transformation and its potential to enhance project efficiency.

1.1. Structure of the paper

The sections of this paper are as follows: Section II discusses the evolution of digital technologies, including IoT, AI, Cloud Computing, Big Data, blockchain, and 5G. Section III explains their role in project management. Section IV addresses implementation challenges and project management tools. Section V reviews existing literature, while Section VI concludes study and suggests future research directions.

2. Evolution of Digital Technologies in Project Management

Digital technologies transform PMS by enhancing communication, automation, data analysis, monitoring, and decision-making. Skills such as AI, IoT, Cloud Computing, Big Data, blockchain, and 5G improve efficiency, collaboration, productivity, and project outcomes.

2.1. Overview of Digital Technologies in PMS

Digital technology has potential to transform the production of products and services, bring forth innovations, and engage with other businesses, workers, and customers. They provide several advantages to business operations and, in the long run, enormous potential to boost business efficiency. Digital technologies support project management by improving communication, resource planning, workflow automation, real-time monitoring, and decision-making processes. An organization's productivity, operating expenses, and project performance may all be improved with the use of these technologies.

2.1.1. 5G Networks

In comparison to the current standard, 4G networks, the upcoming 5G networks promise connections that are up to 200 times faster, and they are sure to spark a flurry of innovation in hardware and software across all industries. The 5G wireless networks will link tens of billions of objects, machines, and communication devices to the Internet, increasing bandwidth for quicker, more reliable machine-to-machine communication.

2.1.2. Internet of Things (IoT)

This refers to interconnected devices whose operational states can be monitored or modified through internet connectivity, with or without active human intervention. IoT includes smart objects and sensors capable of collecting, transmitting, and exchanging data between systems and individuals. Applications range from monitoring equipment performance to advanced technologies such as autonomous vehicles and smart infrastructure. In the situation of PMS, IoT can help to improve monitoring, predictive maintenance, and operational visibility.

2.1.3. Big Data Analytics

The application of sophisticated methods and tools to process and interpret massive amount of data produced by growing digitalization, Internet use, and IoT systems, is called analytics. This technology allows patterns, relationships and dependencies to be identified, and outcomes and behavioral trends can be predicted. Retailers often use big data to provide a more tailored experience for their customers by studying

their online activity and shopping habits. In project management, analytics is used for making informed decisions, predicting risks, and optimizing PMS.

2.1.4. Cloud Computing

Cloud computing refers to internet-based services that provide flexible access to computing resources, including storage, databases, software, and processing capabilities [9]. This technology enables organizations to scale computing resources according to short-term or long-term business needs [10][11]. Cloud computing minimizes recurrent maintenance, IT support, and certification costs while eradicating substantial initial investments in hardware and software, thereby reducing technology upgrade expenses. Cloud systems help in sharing resources, accessing data, and collaboration remotely in project management.

2.1.5. Artificial Intelligence (AI)

It is the ability of machines or systems to learn, apply and demonstrate intelligent behavior. It involves completing a range of cognitive tasks such as perception, comprehension of verbal information, inference, learning, decision making and engaging in the ability to move and manipulate objects appropriately [12]. ML, in which computers make decisions using probability functions learnt from experience, is the engine that propels advancements in AI applications and paves the way for the development of novel software and robotics.

2.1.6. Blockchain Technology

A distributed ledger technology, blockchain stores and updates its database over a system of linked computers [13]. This ledger is updated in real time on every node in the network, providing everyone with a transparent and consistent view of what's happening in the system. On blockchain, records can be seen and verified by authorized participants, which reduces the need for intermediaries to cope with the authentication and verification processes. blockchain therefore creates trust through decentralization and provides avenues to cut down on transaction costs, as well as secure value transfer and legally required agreements. Blockchain has potential to enhance transparency, traceability, and accountability in project transactions and documentation within project management [14].

2.2. Impact of IoT on PMS Efficiency

The IoT has revolutionized PMS, providing real-time monitoring, data collection, and intelligent decisions. The Internet of Things (IoT) can enable data-driven project execution, enhance operational efficiency and optimize resource utilization. Key applications for the IoT in relation to PMS are constant monitoring of objects. Through IoT sensors, data is collected in real-time on various parameters including location of resources, conditions of the environment and equipment status. Examples include sensors attached to construction machinery that monitor vibrations, energy consumption, and equipment wear, enabling timely interventions to prevent equipment downtime and reduce maintenance costs.

The capacity of the IoT to produce data in real-time greatly enhances the quality of decisions. Project managers can use IoT data in conjunction with AI and ML techniques to better and earlier inform their decisions [15][16]. For example, during infrastructure construction, information from IoT sensors monitoring conditions such as weather and ground vibrations can be critical for safety on site, resource management, and activity planning [17]. In addition, the IoT capacity to spot outliers and potentially dangerous situations makes it an indispensable tool for project risk management. In order to minimize risks, sensors can be placed within systems that are vital to society. These sensors can measure abnormalities such as unexpected operation or vibration, which could signal structural wear [18].

3. Role of IoT and Digital Technologies in PMS

IoT and Digital Technologies have revolutionized project management in today's world by enhancing communication, monitoring, planning, and decision-making. The Internet of Things sensors, Cloud Computing, AI, and Big Data Analytics can help project managers monitor project activities in real time, boost team collaboration, lower risks, and increase overall efficiency. These digital solutions help to optimize resources, make quicker decisions and automate processes, which leads to better project performance and successful project completion.

3.1. IoT Applications in Project Planning and Monitoring

The use of IoT can greatly improve project planning and monitoring by providing up-to-date data on activities throughout the project lifecycle. Sensors, smart devices and global positioning system (GPS) technologies are a part of the IoT technology that allow the ongoing monitoring of project activities and operational processes [19]. Predictive analytics and automation of data collection are key capabilities of IoT in project planning, allowing managers to better forecast resources, optimize task schedules, and reduce project delays. Moreover, cloud-based IoT systems can offer immediate access to project-related information which can improve communication, coordination and decision-making among project teams [20].

IoT applications enable real-time intensive care of machinery, materials, labor productivity, and site settings in terms of project monitoring. The intelligent monitoring techniques and wireless sensor network can detect the equipment failure, safety issues and operational problems in real time at an early stage [21]. Consequently, workplaces are made safer, quality control is enhanced, productivity is boosted, and downtime and operating expenses are minimized [22]. In addition, there can be many IT-based monitoring systems used in construction and infrastructure projects for structural health monitoring and risk management. The systems help to enhance performance of project, increase performance, and create effective decisions at different stages of the project.

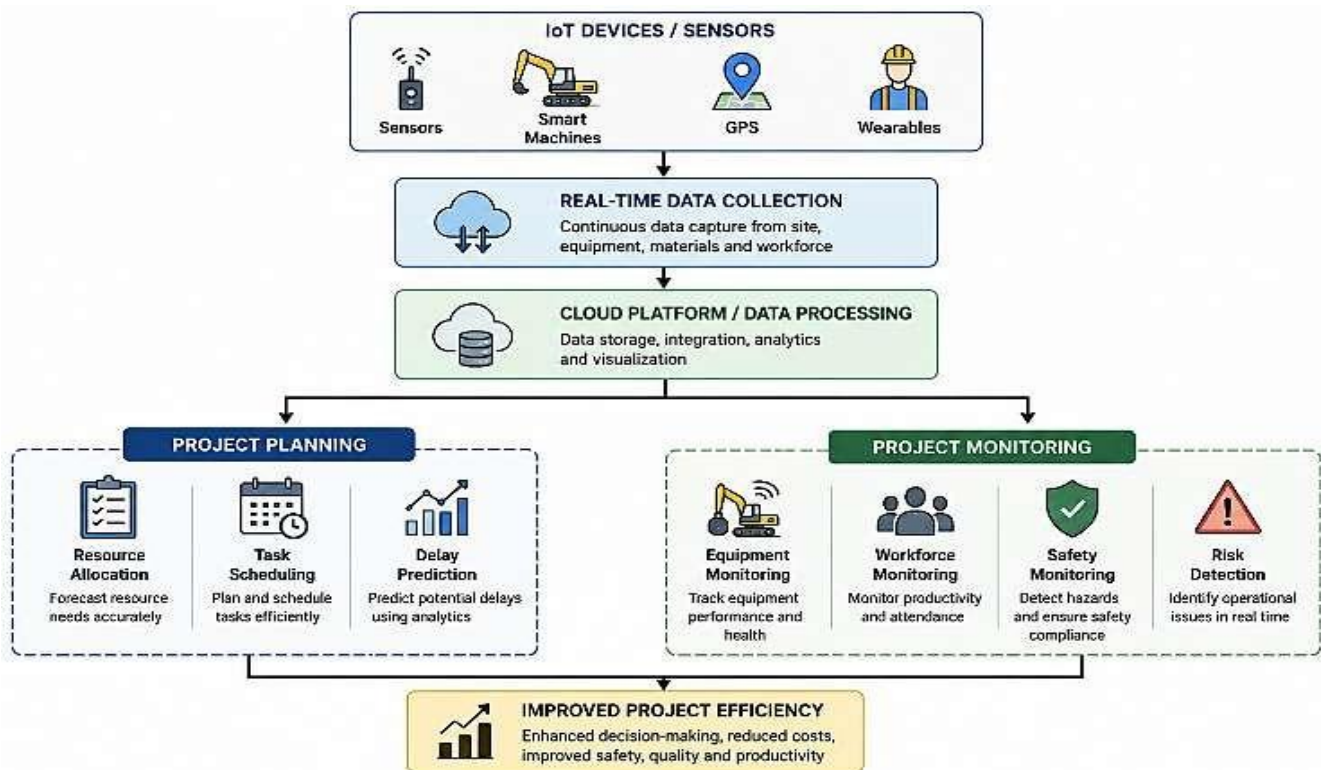


Fig 1: IoT Applications in Project Planning and Monitoring

Fig. 1 shows an example of how IoT technologies are used in the project planning and monitoring phase. The integration of IoT devices and sensors allows for real-time Data Collection and cloud-based processing, which helps optimize resource planning, task scheduling, equipment monitoring, risk detection, and project efficiency.

3.2. Impact of Automation and Data Analytics on Project Efficiency

The integration of automation and DA has had a profound impact on project management by boosting efficiency, precision, and decision-making abilities. These technologies help project managers streamline operations, manage resources efficiently, and boost the effectiveness of their projects. The key impacts of automation and data analytics on project efficiency are as follows:

- **Reduction in Manual Work:** Automation solutions make repetitive procedures easier, like scheduling, reporting, data entry, and progress tracking, without adding more manual work to the administration.
- **Improved Accuracy and Reduced Human Error:** Automated systems minimize the likelihood of human errors in project documentation, scheduling, and data processing, resulting in improved accuracy and consistency.
- **Enhanced Time Efficiency:** By automating routine activities, project teams can save time and focus on strategic planning, problem-solving, and critical decision-making activities.
- **Data-Driven Decision-Making:** Project managers can use DA to learn more about stakeholder involvement, market trends, and project performance, which helps them make better, more evidence-based decisions [23].
- **Cost Reduction and Quality Maintenance:** Automation and analytics technologies help organizations reduce project costs while maintaining quality standards throughout project execution.

3.3. AI-Driven Decision-Making in PMS

AI is revolutionizing PM decision-making by offering cutting-edge solutions to maximize project results. In domains like risk assessment, resource allocation, and performance monitoring, AI applications increase efficacy and efficiency [24]. This section discusses three major areas where AI enhances project management:

3.3.1. Risk Assessment and Mitigation

Risk management constitutes a crucial component of project management since it allows one to recognize possible hazards and create plans to mitigate or eliminate such. Methods that have been around for a while rely on potentially subjective sources like expert opinion and historical data. AI can go one step further and use predictive analytics to analyze project history and detect patterns and potential risks. AI-based risk management solutions can detect risks, monitor project operations, and warn users of potential risks. These systems integrate data from project reports, environmental considerations, and past data, allowing for proactive risk

management and improved decision-making for project managers.

3.3.2. Resource Allocation Optimization

Resources have to be allocated appropriately to ensure timely & cost-effective completion of the project. AI improves resource planning by forecasting resource requirements using ML algorithms, which is based on past research and project-specific variables. AI systems can use data to optimize resource allocation strategies, such as identifying the best way to allocate resources across different projects or tasks. This means that it is supporting key tasks and doesn't waste time or resources and increases the productivity.

3.3.3. Project Forecasting and Performance Monitoring

AI makes real-time tracking and data analysis easier, which greatly improves predicting and monitoring project performance. Project managers may make well-informed choices at every stage of a project's lifespan thanks to AI-driven technologies that continually evaluate performance. With AI-powered monitoring systems, KPIs including performance against schedules and budgets, resource usage, etc., are all measured. This allows identification of deviations early, helps to implement corrective actions and enhances overall project success.

4. Challenges and Digital Tools in Project Management

The adoption of IoT and digital technologies in project management offers improved efficiency, communication, and monitoring. However, organizations face implementation challenges while relying on advanced project management tools to enhance collaboration, planning, and performance.

4.1. Challenges in Implementing IoT and Digital Technologies

The implementation of IoT and digital technologies has improved project management through better communication, monitoring, and decision-making. However, organizations face several challenges during adoption, including technical, financial, and organizational issues.

- **High Implementation Cost:** IoT devices, cloud systems, and digital platforms require significant investment in infrastructure, software, and maintenance, making adoption difficult for small and medium organizations.
- **Cybersecurity and Data Privacy Issues:** Continuous data exchange in IoT systems increases risks of cyberattacks and unauthorized access, creating concerns about data protection and secure communication.
- **Lack of Technical Skills and Training:** A shortage of skilled professionals in IoT, data analytics, and digital systems, along with inadequate training, can reduce implementation effectiveness.
- **Resistance to Change:** Employees may resist adopting new technologies due to fear of change and preference for existing work processes.
- **Integration and Compatibility Problems:**

Integrating new technologies with legacy systems can cause inefficiencies due to incompatible devices, software, and communication protocols.

- Data Security Concerns: Protecting sensitive project information requires strong security measures and privacy safeguards.
- Connectivity and Infrastructure Limitations: IoT systems rely on stable internet and digital infrastructure, which may be limited in remote or underdeveloped regions.

4.2. Project Management Tools

Digital technologies have become an essential component of how teams handle projects nowadays. They assist to keep things organized, making it simpler to manage projects, stay on schedule, and collaborate more successfully. There are numerous tools available, but here are some of the more popular ones:

4.2.1. Microsoft Project

This has been around for a while and is applied extensively by large corporations. Planning, scheduling, and monitoring every aspect of a project are all excellent uses for it. Budgeting, resource management, and Gantt charts are some of the tools' capabilities. It is a good match for organizations who currently use Microsoft technologies since it connects with Microsoft 365. It is most effective for big, organized tasks that need careful preparation [25]. Details project planning, structured task administration, and large enterprises. Workload balancing, budgeting tools, Gantt charts, and task obligations. Constraints: Expensive, less adaptable for agile teams, steep learning curve, and more costly than other tools.

4.2.2. Monday.com

Monday.com is a popular cloud platform because to its user-friendliness and adaptability. Teams may adapt it to their process, whether they're working on a basic to-do list

or a massive undertaking. Automation, real-time updates, and seamless integration with popular apps like Slack, Google Drive, and Zoom are all part of its capabilities. It's particularly well-liked among agile teams and startups because of its contemporary style and flexibility. Startups, agile teams, and companies looking for adaptable processes. Reporting tools, real-time collaboration, automation, and customizable dashboards.

4.2.3. JIRA

JIRA is a potent tool created primarily for software development teams by Atlassian. It helps manage everything from sprints to bugs and backlogs and supports agile methodologies like Scrum and Kanban. JIRA is an excellent option for engineering teams as it integrates nicely with other development platforms like Bitbucket and Confluence. Teams that produce software and manage agile projects. Sprint planning, problem monitoring, agile boards, and thorough reporting. It might be intimidating for non-software teams and needs training for new users due to its complicated configuration.

4.2.4. Trello

Trello is easy to use, graphic, and straightforward. Its foundation is a drag-and-drop board system that allows users to arrange tasks into lists and cards. It's ideal for independent contractors, small groups, or anybody looking for a simple, hassle-free method of job management. Additionally, Dropbox, Slack, and Google Drive work well with Trello. Freelancers, small companies, and visual job management. Task automation, drag-and-drop functionality, and third-party tool connectors. is unsuitable for complicated projects and lacks sophisticated project tracking tools.

Table I analyzes four PMS software based on their benefits, drawbacks, cost effectiveness, and references to research sources.

Table 1: Advantages and Disadvantages of different Project Management Tools

Tool	Advantages	Disadvantages	Cost Efficiency
Microsoft Project	Resource management, innovative scheduling, and Gantt charts	Costly and challenging learning curve	Costly for small companies yet economical for large corporations
Monday.com	Adaptable, automated, and instantaneous reporting	Might get expensive as the size of the team grows.	Flexible plans and reasonable prices
JIRA	Outstanding issuetracking and perfect for agile teams.	complicated structure that calls for training	Economical for software teams
Trello	Easy-to-use, straightforward, visual Kanban board	Limited sophisticated tracking makes it unsuitable for big projects.	There are inexpensive premium options and a free plan.

5. Literature Review

The reviewed studies examine IoT, BIM, automation, and digital technologies in project management, emphasizing productivity, communication, resilience, safety, and sustainability while revealing limited survey-based evidence on efficiency outcomes.

Z. Liu and N. Wang (2026) analyzes how they affect the

robustness of construction projects and delves into the mediating function of relational governance via the lens of Organizational Information Processing Theory (OIPT). In terms of anticipating, coping, and adaptability, new digital technologies have a favorable effect on construction project resilience, according to an empirical study based on a poll of 198 contractors [26].

S. Qadir et al. (2026) investigate the extent to which digital technologies improve construction project administration in England, while also addressing the scarcity of empirical evidence regarding their practical implementation. Although automation, the IoT, and Building Information Modeling

IM) are frequently discussed, their quantifiable influence on project performance remains ambiguous. This study presents a context-specific adaption of the TOE framework that uses the DOI theory and the English construction industry to identify and prioritize adoption factors [27].

F. O. Adejola and E. N. Nwobodo-Anyadiegwu (2025) focus on the advantages and difficulties of employing digital technology to improve these three aspects of building project management via a methodical study of the literature. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) criteria are followed in this work. The Scopus and Web of Science databases yielded a total of eighteen publications. The results show that BIM is the most significant digital breakthrough promoting increased productivity, higher safety standards, and the development of sustainable practices [28].

G. O. Daramola et al. (2024) investigate how digital technology and agile approaches could enhance the efficiency of communication in project management in the energy sector. It makes the argument that incorporating technology, such as agile approaches, real-time data sharing platforms, and project management software, may significantly enhance

communication and provide more adaptable and responsive project management. The study creates a theoretical framework that illustrates how various technologies relate to project management methods, including strategies for execution and anticipated effects on project achievement [29].

M. El Khatib et al. (2023) propose to learn about the strengths and weaknesses of IoT applications in project management and how to effectively manage and deploy IoT systems. The study was carried out using questionnaires and semi-structured interviews. The study's authors list cost savings, increased productivity, and improved communication and coordination among others as some of the many potential benefits the IoT could offer to project management [30].

A. E. Oke, V. A. Arowoija, and O. T. Akomolafe (2022) involved in research and development related to the impact of the IoT on building efficiency and effectiveness. Researchers employed quantitative method and participants were asked to rate their opinions on a five-point Likert scale. The most important takeaways of the IoT are privacy and security, being able to recover past data, ease of use, and efficiency. Six types of IoT effects were found through factor analysis [31].

Table II summarizes authors, methodologies, contributions, advantages, limitations, and recommendations, highlighting research gaps in evaluating IoT and digital technologies' comprehensive impact on PMS efficiency through survey studies.

Table 2: Literature Analysis of IoT and Digital Technologies in Project Efficiency

Authors	Methods	Contributions	Advantages	Limitations	Recommendations
Z. Liu and N. Wang (2026)	Empirical study based on a survey of 198 contractors using Organizational Information Processing Theory (OIPT)	Examined how new digital technologies affect the resilience of building projects and the function of relational governance as a mediator.	Demonstrated positive effects of digital technologies on anticipation, coping, and adaptation capabilities in projects	Limited to the construction sector and resilience perspective; lacks focus on broader project efficiency indicators	Conduct broader survey studies examining IoT and digital technologies' impact on overall project management efficiency across industries
S. Qadir et al. (2026)	Empirical study using TOE framework and DOI theory in England's construction sector	Identified key adoption drivers of digital technologies in construction and proposed a context-specific TOE adaptation model	Improved understanding of BIM, automation, and IoT adoption for better project resilience and performance	Limited to England's construction industry; lacks broader industrial applicability and measurable efficiency analysis	Conduct survey-based studies across multiple sectors to evaluate the direct influence of IoT and digital technologies on project management efficiency
F. O. Adejola & E. N. Nwobodo-Anyadiegwu (2025)	Systematic Literature Review (SLR) using PRISMA guidelines with 18 selected studies	Synthesized findings on digital technologies improving productivity, safety, and sustainability in	Provided an integrated perspective for policymakers and practitioners on digital capacity building and	Based only on secondary studies; limited empirical evidence and overemphasis on BIM	Future studies should empirically investigate IoT and digital technologies through surveys to assess impacts on efficiency indicators

		construction management	regulatory priorities		
G. O. Daramola et al. (2024)	Conceptual analysis using IT, agile methodologies, and project management theories	Developed a conceptual framework linking digital tools and agile practices to communication efficiency	Highlighted the potential for improved responsiveness, adaptability, and communication in energy projects	No empirical validation; restricted focus on communication rather than full project management efficiency	Validate the framework through empirical survey studies measuring the role of digital technologies in project performance
M. El Khatib et al. (2023)	Semi-structured interviews and questionnaires on IoT in project management	Explored the benefits, shortcomings, and best practices for IoT implementation in project management	Demonstrated IoT's role in reducing costs, increasing efficiency, and enhancing communication and coordination	Small-scale and qualitative in nature; lacks cross-sector generalization	Extend the study using large-scale surveys to quantify IoT's impact on project efficiency metrics
A. E. Oke, V. A. Arowoia & O. T. Akomolafe (2022)	Quantitative method using five-point Likert scale questionnaires and factor analysis	Examined the effects of IoT on construction project performance and categorized impacts into six factors	Identified improvements in safety, efficiency, data collection, and operational performance	Focused only on construction projects; insufficient emphasis on broader project management efficiency	Investigate IoT adoption across industries and assess its effects on scheduling, resource optimization, and decision-making efficiency

6. Conclusion and Future Work

The integration of IoT and Digital Technologies has significantly improved PMS efficiency by enhancing communication, monitoring, automation, and decision-making processes. Technologies such as AI, Cloud Computing, Big Data Analytics, blockchain, and IoT-enabled systems have transformed traditional project management approaches into intelligent and data-driven frameworks. Enhancements to stakeholder cooperation, risk assessment, real-time monitoring, and predictive maintenance are all made possible by these technological advancements. In addition, with the help of digital technologies, project managers may enhance project performance, cut down on operational delays, optimize expenses, and make better-informed choices. These advantages aren't enough to guarantee a smooth rollout, however; worries about cybersecurity, high deployment costs, a lack of technical skills, incompatibilities, and organizational aversion to change are all obstacles. The practical influence of the IoT and digital technologies on efficiency of project management should be better understood via large-scale survey-based and empirical investigations across many sectors in future study. Furthermore, future research should examine integration of emergent technologies, including digital twins, peripheral computing, and explainable AI, in project environments. Research should also emphasize developing cost-effective implementation frameworks, enhanced cybersecurity mechanisms, and standardized integration strategies to maximize benefits of digital transformation in PMS.

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