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The role of artificial intelligence in enhancing project efficiency

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Abstract
In light of rapid changes, intense competition, and advanced technological development, traditional processes previously used have become ineffective in addressing complexity and maintaining efficiency. Therefore, it has become necessary to leverage artificial intelligence to facilitate the work of project managers, given its ability to simplify and schedule operations, thus contributing to improved decision-making. The research relied on gathering the opinions of a group of project management specialists in Babylon and analyzing this data using a statistical program to answer the question: What is the impact of artificial intelligence on the efficiency of implementing investment projects? The research findings included: AI has a significant impact on project efficiency.

Keywords: Artificial intelligence, project management, investment projects, efficiency, decision-making

Introduction

Currently, the world is witnessing an artificial intelligence revolution with various tools aimed at improving people's lives in various fields, including the success of investment projects of various types. Technological development helps solve complex issues that were previously difficult to address. Most industries typically use technological techniques to achieve project efficiency, whether existing projects or those planned for the future. The integration of human energies and expertise with artificial intelligence ensures continuous improvement. The impact of artificial intelligence on our societies is expected to increase in the near future. Artificial intelligence has demonstrated significant progress in the field of business and investment, but the extent of this impact is largely unknown (Fridgeirsson *et al*., 2023) [7]. It is well known that any organization needs to rely heavily on its capabilities to implement projects effectively and efficiently. However, the increasing complexity of the business environment, the intensity of competition, and the desire to survive, continue, and continuously improve require more advanced technologies than the traditional methods previously used, as these become incapable of dealing with delays, duplicate tasks, and the challenges represented by risks. Project budget overruns are also problematic. Additionally, companies strive to maintain their competitiveness by delivering projects faster and more efficiently, increasing pressure on project managers to meet deadlines, meet costs, and achieve the required quality. (Shoushtari *et al*., 2024) [19] Artificial intelligence (AI) assists and supports the decision-making process by assisting in activity estimation, planning, cost estimation, and other processes (Dacre & Kockum, 2022) [5]. AI applications encompass a wide range of technologies. These technologies help project managers enhance their ability to predict and assess risks, in addition to improving resource utilization. This helps organizations increase overall effectiveness, reduce costs, and increase success rates through AI (Vergara *et al*., 2025) [20]. It should be noted that organizations with an efficient approach are those that optimally utilize the means, tools, and technologies to achieve their assigned mission Where a company is more efficient than others if it can produce the same output as the other company with fewer inputs. This research is divided into four demands. The first demand was devoted to the scientific methodology, while the second demand was devoted to the theoretical intellectual framework. The third demand was devoted to the practical framework, and the fourth demand was for conclusions.

First requirement: Scientific

First: The research problem

The projects sector in Iraq in general, and in Babil Governorate in particular, suffers from weak project efficiency. This is due to weak planning, weak predictive budget estimates, and weak estimation of expected risks. This impacts the efficiency of implemented investments. This requires the adoption of a technology that contributes to increasing the accuracy of estimates. This technology is artificial intelligence, which facilitates dealing with challenges. Within the framework of problem, we can formulate the research problem as follows:

What is the impact of artificial intelligence on the efficiency of implementing investment projects?

Second: Research Objectives

- Measuring the impact relationship between artificial intelligence and project efficiency
- Clarifying the importance of adopting artificial intelligence for project management professionals
- Statement on project managers use artificial intelligence programs

Third: Research Hypothesis

Artificial intelligence has an impact on project efficiency (quality, time, cost) in the Babylon Projects Department, measured by:

- Artificial intelligence has an impact on project quality efficiency
- Artificial intelligence has an impact on project time efficiency
- Artificial intelligence has an impact on project cost efficiency

Fourth: Research Methodology

On the practical side, a special form was used to collect the opinions of project specialists. On the theoretical side, the research relied on contributions from authors and researchers through published journals and research.

Second Requirement: Theoretical Framework

First: The Concept of Artificial Intelligence

Artificial intelligence in project management helps enhance human capabilities by providing insights and automating repetitive tasks, as well as enhancing efficiency and accuracy. It allows project managers to focus more on strategy, leadership, and decision-making, while AI takes on the arduous tasks of data analysis and managing routine tasks (Ogunbukola, 2024) [15].

Many researchers have addressed the concept of artificial intelligence.Russell & Norvig (2022) [17] have known define ai "as the study of agents that receive percepts form the environment and perform actions" who defined artificial intelligence as "a field of computer science concerned with creating systems capable of performing tasks requiring human intelligence, such as learning, speech recognition, decision-making, and problem-solving". Knew artificial intelligence "autonomous, non-human entities capable of absorbing information from their environment and acting on it in a way that enables them to achieve their goals." It is also defined as "artificial intelligence as a foresight tool that enables people to reconsider how they analyze data and integrate information, and then use these insights to make better decisions". It is also defined as "the ability to plan, think, learn, sense, and construct a sense of knowledge" (Georgiev *et al*., 2024) [8]

Second: Benefits Artificial Intelligence for Projects Constantin *et al*., 2024[4], identified the benefits as follows:

- The ability to analyze complex data related to projects
- Increased ability to improve Project Management Processes
- Increased ability to predict potential risks that projects may face
- More accurate and sound decisions
- Increased effectiveness and efficiency in project management.

Third: Steps for Implementing Artificial Intelligence in Projects Reim (2020) identified four steps for implementing intelligence in project management:

- The need to understand artificial intelligence and identify the organizational capabilities necessary for successful digital transformation.
- The need to understand and understand current business management, identify the capabilities required to accomplish it, and define the role of the business ecosystem.
- Develop and improve the necessary capabilities of project specialists
- Need to motivate specialized personnel to achieve organizational acceptance and develop internal competencies.

Fourth: Challenges of implementing artificial intelligence in project Management Shamim (2024) [18] has identified a set of challenges, which are:

- Technical complexity, as implementing AI-powered project management systems requires knowledge of algorithms.
- Data quality issues, as data quality greatly contributes to ensuring the success of AI implementation.
- Ethical considerations related to data privacy and job loss.

Second: Project Efficiency

Definition of efficiency

(Grimshaw *et al*., 2004) [9] defined efficiency as "the use of the least possible amount of resources to achieve the desired result. This concept is usually measured in terms of funding, inputs, time, or customer satisfaction". It also refers to "improving project management with the goal of improving delivery on time and on budget" (Wysocki, 2011) [21].

Efficiency be defined as "an organization's ability to survive, adapt, and grow regardless of the goals it achieves" (Al-Jerba, 2011) [1]. It has also been defined as "doing things right, in the right way, by the right people, in the right place, and at the right time" (Burke, 2011) [3]. Efficiency is also defined as "achieving a goal in terms of cost and time." Therefore, NGOs are said to be efficient when they achieve project objectives at the lowest possible cost and on time (Ochuodho, 2015) [14]. It is also defined as "a measure of a producer's ability to produce maximum output of acceptable quality with the minimum amount of inputs". It is also defined as "the researcher defines organizational

effectiveness as the organization's ability to achieve its goals and adapt to its environment, ensuring its survival, continuity, and ability to grow, develop, and sustain itself".
Edwards Deming argued that costs are reduced as a result of reducing the number of reworks, errors, delays, and problems

Project Efficiency
Diao, 2024, has identified that project efficiency can be achieved using intelligence by adhering to the project budget, which is a cost measure, while meeting project deadlines is a time-bound measure. Delivering the project according to agreed specifications is a quality measure, as illustrated below.

Activity planning
Application of AI technologies has revolutionized project planning and scheduling, providing greater speed and accuracy compared to traditional project planning, which relied on the expertise of experts and the availability and accuracy of historical data. These data are easily affected by numerous factors and constraints, resulting in inaccurate project and activity planning. Artificial intelligence technology can achieve more accurate and faster project planning and scheduling by analyzing large amounts of data and simulation algorithms.

Cost Estimations
The application of artificial intelligence helps in estimating and predicting project costs with great accuracy and reliability. Traditional cost estimation relies on historical data and the opinions of experts and specialists. This makes these estimates easily affected by a range of factors and subjective errors, which impacts the accuracy of cost estimates. AI can achieve more accurate cost estimates.

Quality Management
Traditional quality management relied on sampling and manual inspection, which is vulnerable to the influence of many human factors and subjective assessment, leading to poor assessment of quality problems. Currently available artificial intelligence technology helps achieve real-time monitoring of project quality and predicting it through a set of quality management tools and algorithms.

Data Analysis
Research data collected from the responses of project management specialists was analyzed and interpreted. Based on the analysis, the role of AI was ranked in terms of quality, time, and cost.

First: AI Data Analysis: The artificial intelligence variable achieved a weighted arithmetic mean of (3.68), which falls within the "good" category, and a standard deviation of (0.93). This indicates the organization's support for the use of AI to achieve project efficiency, reinforced by the relative importance reaching (76%).

Second: Presenting, analyzing, and interpreting the responses of the research sample members regarding the project's efficiency. In this section, the data on the components of this variable will be analyzed.

Table 1: Mean, standard deviation, and relative importance of project efficiency dimensions (quality, time, and cost)

	Dim	M	SD	%
1	Quality	3.40	1.27	67
2	Time	3.65	1.19	75
3	Cost	3.43	1.13	68
Project efficiency		3.49	1.23	70

By analyzing the table data, it became clear that there is awareness among project management specialists to achieve efficiency by using artificial AI.

- **Quality:** The importance of quality from the perspective of management specialists was (67%), which indicates the interest of the sample surveyed in quality and meeting customer needs.
- **Time:** The importance of project completion time from the point of view of management specialists was (75%), which indicates the respondents' strong interest in implementing projects within the specified time frame, i.e. according to the plan.

The importance of project costs from the perspective of project management specialists (68%) indicates that project specialists are concerned with the cost of investment and not exceeding the allocated budget.

Table 2: Impact of artificial intelligence on overall project efficiency (regression and statistical test results)

	Project efficiency			
	Beta	**Chi-Square**	**T-Test**	**F-test**
AI	0.79	0.76	5.40	8.35

By analyzing the results, it became clear that AI explains (76%) of the changes in project efficiency, while the remaining percentage (24%) is due to other variables that are outside the current research model.

Table 3: Effect of artificial intelligence on project quality efficiency.

	Project quality			
	Beta	**Chi-Square**	**T-Test**	**F-test**
AI	0.75	0.50	3.81	9.30

By analyzing the table data, it became clear that quality is affected by (50%) the use of artificial intelligence by specialists in the field of project management, which is a high percentage, while the remaining percentage is due to other variables.

Table 4: Effect of artificial intelligence on project time efficiency.

	Project time			
	Beta	**Chi-Square**	**T-Test**	**F-test**
AI	0.84-	0.69	3.30	8.22

By analyzing the table data, it became clear that the project completion time is affected by (69%) by the use of artificial intelligence by project management specialists, which is a good percentage and means that there is a strong impact.

Table 5: Effect of artificial intelligence on project cost efficiency

	Project costs			
	Beta	**Chi-Square**	**T-Test**	**F-test**
AI	0.65-	0.51	4.52	6.33

By analyzing the table data, it became clear that the cost of completing the project is affected by (51%) by the use of artificial intelligence by specialists in the field of project management, while the remaining percentage is due to variables other than the aforementioned variable.

Requirement Four

Conclusions

- AI tools help project managers deliver projects on time.
- AI has a significant impact on project efficiency.
- Artificial intelligence has a significant impact on the final results of a project, reflecting on customer satisfaction due to the quality of the project.
- Artificial intelligence provides support to project managers in reducing pressure by providing accurate results.
- Artificial intelligence helps estimate cost ratios and reduce errors when preparing project budgets.
- Artificial intelligence facilitates project managers' efficient development of strategies and plans for various project activities.
- Artificial intelligence helps estimate the resources needed for each activity with the greatest possible efficiency, thus reducing the amount of resources used.

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