Using Artificial Intelligence in Project Management

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Abstract

The development of project management is going in a fast pace in accordance with the development of artificial intelligence, and researchers are racing to study the optimal ways to use it in project management in a more effective and sustainable manner. This research aims to study the use of artificial intelligence in project management and its constraints. The researcher found that artificial intelligence can be used for management of every project stage. The researcher concluded that feeding artificial intelligence with promising predictions professionally through previous projects will contribute in data collection with higher intelligence and faster than the employee who relies on intuition and emotional intelligence, and thus enables it to make the right decision and exploit the self-learning of the machine and its ability to make decisions, monitor the behavior of the project, predict its future trends and challenges. At the project level, we find that the role of artificial intelligence is highlighted in repetitive, multi-functional, and complex projects. At the project stage level, artificial intelligence is used more widely in the project planning stage, especially planning to manage project costs, schedule, productivity, risks, and safety. This research serves as a starting point for inputs represented by more focused research to study how to analyze, improve and organize the use of artificial intelligence and its challenges in each step of the project for converting it into outputs through a tangible process that may be represented by talking robots or applications on a mobile phone or something else.

Keywords

Artificial intelligence, project management, machine, automation, sustainability, constraints, prediction.

1. Introduction

This research is considered suitable for all categories interested in advanced project management, and it aims to study all uses of artificial intelligence in project management, the constrains of use, and to conclude the main role of artificial intelligence in project management. The research discusses this purpose in a simplified narrative manner, for most of what has been done on this subject, then study and compile the most important results in preparation for their future exploitation as inputs to a more advanced process.

Artificial intelligence will exceed human capabilities within 45 years" by 50% possibility [1], Recently, the spread of artificial intelligence applications has increased in many industries, and it has become famous in the field of project management due to the it's multiple benefits. Applications of artificial intelligence such as support, accuracy, insight, strategy used, creativity, eliminating information bias, and eliminating the use of emotional intelligence [2].

Artificial intelligence in project management can be summarized and classified into the following four types that depend on context and process. integration and automation; chatbot help; the project shall be based on machine learning; autonomous project management. Among the above, machine learning-based project management has been suggested to be most beneficial [2].

There are several representative contemporary cases of the dynamic application of artificial intelligence in project management, for example the use of Monte Carlo simulations with decision trees, packaging, random forests, boosting and support machines to predict project duration [3] through feedback from previous projects similar to the project or in other ways.

The aspects in which data science and big data influence project management can be analyzed and identified in two ways: the first is the context in the "broader ecosystem" in which the project is located and the second is the essential events of the project. The availability of this large volume of project data will enable big data analytics to shape the future of project management in many ways, including planning, delivery, project team, quality, risk and knowledge management as well as resource management [4] [5].

1.1. Research Problem:

As we mentioned previously in the introduction, artificial intelligence is in rapid, dynamic development, and has prominent importance in project management due to its many advantages. The research problem poses the following questions related to the use of artificial intelligence in project management.

- How is artificial intelligence used in the project management stages?
- What are the limitations of using artificial intelligence in project management?
- Can we conclude the key role of artificial intelligence in project management?
- Is it possible to infer which stage of the project most uses artificial intelligence?
- What are the most common types of projects that use artificial intelligence?

1.2 Research Importance and Objectives:

Research Importance appears in presenting the use of artificial intelligence at every stage of project management and clarifying the limitations of its use.

The research objectives can be summarized as follows:

- A presentation of the use of artificial intelligence in the project management stages
- Explanation of the limitations of using artificial intelligence in project management
- Conclusion of the key role of artificial intelligence in project management

- Conclusion of the stage of the project that is most used for artificial intelligence
- Conclusion of the most common types of projects that use artificial intelligence

1.3 Previous Studies:

Kuster [6] has identified emerging trends for the use of artificial intelligence in project management including increased automation, the strength of data in cost estimation models, intelligent project control systems based on earned value management, and optimization of input factors to reduce workload.

Bento et al., [7] highlighted the growing interest of the scientific community in using artificial intelligence in project management through his review of the methodologies of previous studies into the possibilities and limitations of artificial intelligence in project management.

Auth et al. [8] presented a framework that "defines the basic concepts and requirements for applying artificial intelligence to project management and also" the project management requirements for this application.

Auth et al. [9] also provided an overview of artificial intelligence tools and approaches that can be used during the automation of project management tasks.

Through the study of Holzmann et al., [10] the most important functions that will be supported by artificial intelligence that were identified are creating a project schedule, and analyzing the implications of deadlines that have not been.

Darko and others [11] presented a scientific study on the latest research on artificial intelligence in the architectural and construction industry, and cost, productivity, safety, and risk management were the main issues of that research.

In the next ten years, project cost management, project schedule management, and project risk management are likely to be most affected by artificial intelligence, especially in the cost and risk planning and schedule estimation stage. Conversely, the areas of knowledge and processes that require human skills will be least affected by artificial intelligence, with the development and management of teams and management of stakeholder highlighted [12] and highlighting the development of project manager skills in tasks that artificial intelligence can't achieve [13].

Zhu et al. [14] found that the most effective applications of intelligent technologies are data collection for real-time progress tracking, monitoring, and timeline estimation.

Makaula et al. [15] developed a framework for artificial intelligence in construction management in which a theoretical framework was developed based on research results that explains the application of artificial intelligence across the project life cycle and the results of each application.

Endo [16] conducted interviews with service project managers from information technology, aerospace and construction, and concluded that almost all project managers

have a positive attitude towards adopting artificial intelligence in their current or near future projects.

Ianire and others [17] believe that the application of artificial intelligence in real project management scenarios is still at an early stage. There is no intelligent environment for the proposals of a project manager supported by artificial intelligence, despite the existence of studies that discuss artificial intelligence in intelligent project management; it still requires a deeper investigation. There is also no evidence of project managers adopting artificial intelligence despite the fact that project management supports artificial intelligence seems encouraging, but its design, standardization and implementation in project-based companies remains a challenge. Hence, the adoption of artificial intelligence in project management has not yet been observed.

Niederman [18] highlights that complex information technology management may particularly benefit from artificial intelligence, which may provide task completion estimation, efficient task assignment, and advanced visualization techniques to track/trace project processes.

2. Using artificial intelligence in project management:

Artificial intelligence can be applied in managing each stage of the project as per the following:

2.1 The stage of project idea and preparation:

Artificial intelligence can analyze large amounts of available data, which helps in making better decisions regarding the project idea. Artificial intelligence can also be used to predict project performance for project selection, which links critical success factors to project success by classifying the level of project risk through the experiences of project managers [19], as well as determining project characteristics through neurolinguistic programming [18].

2.2 Feasibility study stage:

Assessment and analysis of the proposed project using artificial intelligence, careful analysis and research to support decision-making, where the assessment is through determining the optimal capital structure for the project, for example BOT projects [20]and analysis using economic criteria to select projects as net present value, internal rate of return, benefit cost ratio, and bayback period.

2.3 Design:

Using artificial intelligence to create the initial design for the project, then obtaining the owner’s approval for it, then developing the initial design into a detailed design, as well as using it to create a worksheet that specifies the proposed implementation method until fully implemented, the main components of the project, and choosing the most appropriate equipment and materials for implementation. It is used in making architectural, structural, electrical and mechanical designs, predicting the general and

special specifications of the required resources, recording them, and making inventory lists of quantities, where artificial intelligence is used to estimate the quantities of materials required to implement each item, the time required to complete it, and the cost of implementing each item, and then the total cost of the project, and the communication of the project team, Hsu et al. [21] developed a practical and efficient ML-based system integrated in Building Information Modeling (BIM) to resolve construction project design dispute, and proposed a cost-effective AI-powered chatbot framework for project management [22] and voice chatbots integrated with BIM.

Also, artificial intelligence-based simulation models and digital twins are used to design and process activities, plans, and functions for the new generation of buildings, as these models use data about the building's use, composition, functions, and environment to simulate different design options and predict their effects on the efficiency of home functions, comfort, and safety [23].

2.4 Tenders, bids and contracts' stage:

With regard to the tenders and bids stage, in project bidding, by analyzing the uncertainty in the bidding document and extracting the influencing factors from it, the risks of those bids are predicted [19] [24]. Artificial intelligence can be used to predict bid award amounts for projects [25], and at the stage of submitting competing bids, an accurate tool has been developed for decision-making regarding pre-qualification of contractors to bid [26] [27] and make reliable prediction about contractor's deviation from the client's goals [28]. Artificial intelligence constitutes a system that supports making the right decision to choose the contractor [29]. Its role is not limited to that only, but artificial intelligence also provides a procedure for making the decision regarding bidding/not bidding. [30] and determining whether to participate in the project tender and choosing the most satisfactory tender performance [31]. Decision support in order to facilitate the scenario selection process for renegotiating PPP contracts [32].

2.5 Planning Stage:

Artificial intelligence can create a knowledge base that includes information about previous projects to predict project planning outcomes [33]. It is useful for future projects by collecting knowledge from that information through automated data management, and British companies have implemented a type of AI-based knowledge management in shared and common data environments for project team members which makes it easier to obtain and track documents efficiently ([34], so artificial intelligence works with lessons learned from previous projects [35] and also " From the project history, it can also propose new project schedules and adapt them [36] [37] to the real time according to resource performance and project progress. In construction projects, delay levels can be predicted using data from previous projects [38] [39].

Project scope management, site planning and management, where artificial intelligence provides a decision support tool that relies on an expert system for flexible management of the construction site to develop optimal implementation scenarios that could be

achieved using a “dynamic” model of the construction process that focuses on resource synchronization and workflow continuity, which is critical in scheduling and recurring projects management [40]. Establish a work breakdown structure and tasks, creating the project budget [41] and predicting the project cost [42] [18], such as predicting the construction cost in construction projects [43], and predicting and estimating the project duration [44] [45] and assigning key scheduled activities for planning tasks [46] and project scheduling [47]and developing an “automated” framework for planning the project schedule [38] [18] The machine can be used to collect descriptive data in an unremarkable manner, such as predicting risks [48] [39], inferring risks using knowledge related to the risks of previous projects [49], and defining risks using various techniques such as brainstorming or nominal techniques. group, Delphi, or other techniques, for example,” and tracking and analyzing project risks and mitigating them (Akinosho, 2020) and managing them [50] [51] [52] [18], such as predicting risks related to contractors and supporting decision-making at every stage of the project [53], and using the matrix method to develop artificial intelligence use cases in the field of project management, where the knowledge areas of project management were placed in the columns of the matrix and artificial intelligence functions such as prediction and decision making opposite to them in the rows [54]. Artificial intelligence is also used to reduce uncertainty regarding the project development duration, achieve the best fit between the project workforce and the quality of the project, reduce re-implementation of work, and have a positive impact on project's total costs [55], artificial intelligence serves processes where historical data is available and can be used to estimate and improve the planning process and repetitive tasks. Artificial intelligence can also predict the state of the project when it is affected by changes caused by the environment (Morozov, 2019), and it can also control the project [1] [56], verify its profitability performance [57] and manage production [58]and project cost prediction [59] [60] [61]. For example, in construction projects, the highway construction cost index was accurately predicted in the short, medium and long term [62], artificial intelligence can also predict prices [63], pricing [64] and carry forward resources on project activities [65] [66] and resource management [18], and solve resource management problems [67] [68], and resource allocation [69], and resource leveling [70] [71] and solve resource leveling problems for multi-unit projects [72], which leads to reducing project implementation time and accurately predicting project cash flows [43] in an intelligent manner through drawing cash flow maps taking into account the degree of Project complexity [73] [74] [75], which leads to saving project cost and time [35], it can also make the process of constructing the project network faster and more productive with the help of artificial intelligence [76] through accurate prediction of construction productivity [77], monitoring security, achieving project safety indicators [78] and ensuring them [79], ensuring construction site safety and monitoring construction health and predicting it [43] and monitoring health and safety on site via video surveillance or even robots ([43], and it can also be used in supply chain management [80] and even in the purchasing process, as it makes Purchasing tasks are more strategic and less operational, enhances the purchasing function, and enhances the cross-functional role of purchasing [81], billing, warehouses,

and maintenance [82]. Processing, calibration, defect repair, value engineering, change management, formulating a method to estimate the possibility of making changes in production cost and warranty in the early stage of a new product design project [83], and compressing the project schedule and reducing its duration [84], reducing cost and reducing waste of materials used [85], as well as predicting scheduling issues in engineering project management [86] [87]and finding intelligent solutions to project problems, for example, scheduling projects based on limited resources, as well as identifying, understanding, analyzing, prioritizing, engaging and monitoring stakeholders [17], and predicting disputes in construction projects [88], for example accurate prediction of the results of dispute resolution between the public and private sectors [89] and in public-private partnership construction projects, a method was proposed to predict the tendency of dispute in those projects [90] and support the process Arbitration, as well as anticipating fluctuations in project construction costs and prices in the long term using long-term memory [91] [62] and artificial intelligence can actually benefit the company's innovation [92], and developing project management knowledge areas [12] and creating flexible project management capable of adapting and restructuring the project to keep pace with any new reality [93]. Other areas can also be taken into account, such as evaluating and measuring different information technologies [94], develop and implement strategic roadmaps with support from project management [95].

2.6 Stage of implementation, follow-up, and project resource management:

Artificial intelligence improves cooperation and coordination as machines can create algorithms that can determine who will complete project tasks such as financing, contracting, and training in a way that can be optimal for the project, which in turn leads to improved coordination between the various parties of the project, and affects the efficiency of project implementation, removing bias in decision-making using artificial intelligence resulting from the absence of empathy and human interactions.

Artificial intelligence can schedule meetings and appointments, such as the appointments and dates found on the Primavera program, as well as the program's calendar, and program them into audio, when necessary, which helps in staying on track during project completion. Artificial intelligence also provides additional time for humans, allowing them to be gradually integrated into high-level or complex tasks related to areas of knowledge and processes that require human leadership skills, such as developing and managing teams and managing stakeholders [76], where technology carries out simpler and mundane tasks. Also, human skills such as empathy, emotional intelligence, negotiation, decision-making, and human resource management will be valuable in the near future, perhaps more than ever before [96] [97].

Assessing and classifying job candidates and determining their emotional intelligence using data from social networks elsewhere [98]. Assigning labor tasks to save project time [37], measuring and identifying the specific strengths of employees and evaluating the suitability of these strengths to serve, improve, and contribute to project management

[99], this is done through effective classification algorithms used to predict employee performance [100].

Support decision-making in determining the type of construction machinery most suitable for use in the activity taking into account economic and technical criteria [101] and analyzing construction equipment activity using audio signals and supporting machinery [102], activity classification and machine learning regarding complex activities for construction workers [103], using automated methods to identify workers' activity, for example using smartphones [104], and recognizing vision-based actions of construction workers using machine learning [105] and construction equipment activity [106] such as assessing labor intensity for construction workers based on a wearable smartphone system [107] and automated work recognition using an activity-tracking wristband device [108] as well as chat robots [18]. The designed chatbot prototype was implemented using the conversational platform "Dialog Flow", an NLP agent, and in the following tool environments: Jira for planning/tracking/managing projects, messaging platform Slack for communication, Google Drive for storing project data, and Google Calendar for scheduling meetings and Skype to communicate with users. The proposed solution has the ability to save routine maintenance time and reduce project failures [41].

2.7 Quality control and monitoring:

Quality control [109], for example, provides a tool based on machine learning to link different documents from the project and update their traceability [110], as well as to retrieve traceable knowledge to obtain information from workers' emails based on machine learning techniques [111]. Adjusting expectations, maintaining baselines, and preparing reports, which facilitate updating the quality control plan. Update project progress and schedule, identify scope creep and deviations, produce a dynamic risk map, extract outcomes, prioritize tasks, allocate team members [41] and assess workforce activity [43]. Artificial intelligence can also automatically monitor remotely to manage project construction, for example, managing the construction of power substation projects [55]. In construction projects, project monitoring by analyzing job site data using computer vision to predict the best continuity of construction activities in each scenario using robots and drones with sensors to survey job sites and assess production. In construction projects available computer vision-based sensor technology is used to track temporary resources at infrastructure construction sites [112], for example tracking building, equipment and workers [113].

2.8 External Factors (Force Majeure):

Limiting the spread of epidemics and thus achieving greater sustainability for humans. In the event of force majeure such as epidemics and pandemics such as Covid 19 and others, the use of artificial intelligence will be more effective and sustainable than the help of humans while taking precautionary measures such as sterilization and others. It is expected that all of these artificial intelligence technologies will be more sustainable and

focused enabling factors to the humans and more flexible in the field of project management and industry in general [114].

2.9 Delivery Stage:

The role of artificial Intelligence in the delivery stage is automated verification of AI-powered compliance/conformity in projects [115] [116] [117]and verify that all work has been completed in accordance with the specifications and terms of the contract before the contractor evacuates the site of all materials, temporary construction purposes and equipment in preparation for the initial delivery.

3. Limitations of using artificial intelligence in project management:

In previous studies, the limitations imposed on the application of artificial intelligence in project management were not clearly and explicitly identified, but some of them can be referred to as the clear lack of research in all areas of project management or the need to focus on a specific field such as the field of construction, for example, or even limitations in data entry for artificial intelligence.

Although many human resources fear that machines will replace them and projects will no longer need their current jobs, such as training institutions, for example. There is no doubt that artificial intelligence will reduce the number of jobs that were previously performed by humans in various projects. But according to the conclusions, artificial intelligence will not perform project management tasks that require human understanding, empathy, and interpersonal interactions (Thordur Vikingur Fridgeirsson, 2021) (Bento, 2022) as the impact of artificial intelligence is reduced in areas of knowledge and processes that require human leadership skills such as human resource management and decision making. (Bento, 2022) Thus, the indirect role played by artificial intelligence appears in freeing up employees for the most important tasks that require greater analysis than other tasks, such as developing and managing teams and managing project stakeholders. Also, artificial intelligence does not work without human input, as it is only an auxiliary and supportive technology in project management, but it will not manage the project and therefore will not replace the project manager. Poor leadership and cognitive skills of artificial intelligence make project managers significantly more skeptical about taking advice from intelligent systems than from more senior employees (Kolbjørnsrud, Amico, & Thomas, 2021). But research shows that managers are more willing to use artificial intelligence system will put their trust in it if they understand how it works and how it can provide advice, and also if the system provides convincing explanations and has a proven track record (Kolbjørnsrud, Amico, and Thomas, 2021).There is a disruptive potential for artificial intelligence, along with its benefits in data analytics. In project management, for example, as we mentioned previously, an AI-assisted project manager is likely to reduce repetitive project management tasks (such as risk assessment), automate them, and track communications between stakeholders. On the other hand, big information project that using artificial intelligence algorithms to help project management is considered a major concern as

companies will be affected if data security, privacy and credibility are not protected (Afzal, 2021) (Ianire Taboada, 2023). The high costs of using artificial intelligence may constitute restrictions on its use in some countries, especially developing countries, such as the costs of construction, operation, maintenance, processing, calibration, development, and repair of damage, errors, and defects, whether in the machine or the data that is fed to it. So far, there is not a single robot that is capable of being applied to management programs. Projects such as BIM or project management programs such as Primavera as an alternative to humans. Also, so far there is no specific study or research on the use of artificial intelligence for project development and the project life cycle (Ianire Taboada, 2023).

There is a gap between scientific research on artificial intelligence in the engineering field in general and engineering project management in particular and its application in the practical reality in which we live (Bento, 2022). We also find that they are all separate efforts that need to be assembled into a robot, for example." we find that in these efforts, despite their differences, they may meet at points and may coincide in some directions, but their goal is the same, which is to apply artificial intelligence in project management. Some evidence also showed a lack of knowledge of artificial intelligence in the field of project management (Bento, 2022), as the specialty of artificial intelligence is separate from the specialty of project management, and most researchers and specialists in the field of project management are almost ignorant of most of the techniques used in artificial intelligence, especially in developing countries. Therefore, the combination of the two specializations requires the work of a consortium or commission of the two specializations, or the work of a branch of project management science, so that project management using artificial intelligence is to serve, expand and develop this field. Likewise, the science of project management, its teaching, books, programs, training courses, and certificates "Internationally approved, in general, it will need to be developed in the future" to match the rapid pace of progress in the use of artificial intelligence in project management science. Current methodologies are largely insufficient to use artificial intelligence to establish complete and clear control over the project in terms of cost, time and quality, as it can also be concluded that artificial intelligence passes into more specific areas of project management such as human resources management or information management, but perhaps not in all areas of project management, or there was no data that could support this assertion (Bento, 2022), so the application of artificial intelligence does not actually and accurately cover the processes of planning, monitoring, monitoring and controlling all stages of the project throughout its life cycle. There is a gap in sustainable AI-based project management as there is a lack of sustainability-aware AI-powered project management in line with the 2030 United Nations Sustainable Development Agenda which highlighted the inclusion of sustainability in emerging technology-driven industries (Ianire Taboada, 2023). It is still unclear to what extent the requirements for business development analytics align with the promising features of advanced artificial intelligence such as distance learning. (Ianire Taboada, 2023). We still lack scientific research, for example, regarding artificial intelligence determining the most appropriate types of tenders and the most appropriate

types of contracts to implement the project. The search for comprehensive solutions for managing smart projects powered by artificial intelligence remains a subordinate and subsequent task to basic tasks (Ianire Taboada, 2023).

4. Discussion:

The most prominent uses of artificial intelligence in the project stages can be summarized, beginning with the project stage as an idea and preparation for it, where artificial intelligence is used to predict the project performance to choose the project, and determine the project characteristics through neuro-linguistic programming, by analyzing large amounts of available data that helps in making better decisions, in the design stage, Building Information Modeling (BIM) is used to resolve construction project design conflicts, AI-powered and cost-effective chatbots for project management and voice chatbots integrated with BIM. In the planning stage, we find the term forecasting repeated in most activities. Artificial intelligence can predict project planning outcomes and delay levels using data from previous projects, and predict and estimate the project duration, predict risks and infer risks using knowledge related to the risks of previous projects, also predict the state of the project when it is affected by changes caused by the environment, predict the cost of the project in the short, medium and long term, and predict prices, and accurately predict project cash flows in an intelligent way by drawing cash flow maps, taking into account the degree of project complexity, and accurately predict construction productivity and predict construction validity, and also predict scheduling issues in engineering project management, finding intelligent solutions to project problems, and predict disputes in construction projects, for example, accurately predict the results of resolving disputes between the public and private sectors, in projects for building partnerships between the public and private sectors and predict the tendencies of dispute in those projects, and also anticipate fluctuations in project construction costs and prices in the long term using long-term memory, artificial intelligence is a tool to support decision-making and develop an “automated” framework for planning the project schedule, it can be used for estimation and improvement of the planning process and repetitive tasks. It solves resource leveling problems for multi-unit projects, which leads to reduced project implementation time, security monitoring, construction health monitoring, on-site health and safety monitoring via videos or even robots, and also enhances the multi-functional role of purchasing, billing, warehouses and stakeholder monitoring. In the implementation and project resource management stage, the role of artificial intelligence is to create algorithms that can determine who will complete project tasks such as financing, contracting, and training, schedule meetings and appointments, program them with audio when necessary, and use data from social networks elsewhere to evaluate and classify job candidates and determine the extent of their emotional intelligence, and predicting employee performance, assigning labor tasks, and supporting decision-making in determining the most appropriate type of construction machinery to use in the activity, analyzing construction equipment activity using audio signals and supporting machines, activity classification and machine learning regarding complex activities for construction workers, and using automated methods to identify

workers' activity and automated work recognition. In the quality control stage, providing a tool based on machine learning to link various documents from the project and update the ability to trace them, as well as to retrieve knowledge tracking to obtain information from workers' emails based on machine learning techniques, adjust expectations, maintain baselines, and prepare reports, which facilitate updating the quality control plan, update project progress and schedule, identify scope creep and deviations, produce a dynamic risk map, extract outcomes, prioritize tasks, allocate team members and evaluate workforce activity, with regard to control and monitoring, artificial intelligence can automatically monitor remotely to manage project construction, for example in construction projects, monitor the project by analyzing work site data using computer vision to predict the best continuity of construction activities in each scenario using robots and drones equipped with sensors to survey work sites and assess production. Also, in construction projects, sensor technology based on computer vision is used to track temporary resources at infrastructure construction sites. With regard to external factors (force majeure), artificial intelligence has a role in reducing the spread of epidemics and thus achieving greater sustainability for humans, in the event of force majeure, such as epidemics and pandemics such as Covid-19 and others, the use of artificial intelligence will be more effective and sustainable than the help of humans, while taking precautionary measures such as sterilization and others. Finally, in the delivery stage, the term automated verification appears in the automated verification of compliance/conformity supported by artificial intelligence in projects and automated verification that all work has been completed and finished in accordance with the specifications and terms of the contract.

As for the limitations of using artificial intelligence in project management, the most important limitations are that the impact of artificial intelligence is reduced in areas of knowledge and processes that require human leadership skills, such as human resources management and decision-making, and artificial intelligence will not perform project management tasks that require human understanding, empathy, and personal interactions. Artificial intelligence does not work without human input and is only an assistive and supportive technology, but it will not manage the project and therefore will not replace the project manager. Likewise, leadership and cognitive skills of artificial intelligence are weak, as project managers are significantly more skeptical of taking advice from intelligent systems than from higher-ranking employees. There is a destructive ability of artificial intelligence, along with its benefits in data analytics, and in project management, for example, the Big Information Project, which uses artificial intelligence algorithms to assist project management, is a major concern, as companies will be affected if data security, privacy, and credibility are not protected. Some evidence has also shown that there is a lack of knowledge of artificial intelligence in the field of project management, there is also a gap between scientific research on artificial intelligence in the engineering field in general and engineering project management in particular and its application in the practical reality in which we live. There is also a gap in the management of sustainable projects based on artificial intelligence, as there is a lack of project management supported by artificial intelligence that is aware of

sustainability. There is also a lack of clarity to what extent the requirements for business and project development analyzes are compatible with the promising features of advanced artificial intelligence, such as distance learning. Finally, the search for comprehensive solutions for managing smart projects that operate with artificial intelligence remains a subsidiary task and subsequent to basic tasks.

5. Conclusion:

We note through the research that the main role of artificial intelligence in project management is forecasting, using analysis of previous projects and project history to support decision-making, as well as performing cross-functional roles, scheduling and monitoring, we also note that the project planning stage is the most likely to use and exploit artificial intelligence, especially the planning stage for the schedule, project cost, productivity, risk and safety management. Repetitive, multi-functional, multi-unit, and complex projects are the projects most commonly used for artificial intelligence, artificial intelligence can also be used in project management in various disciplines during the project life cycle, starting from the idea stage and presenting the proposed projects for implementation, passing through the feasibility study, then tendering, contracting, contract drafting, and planning, including, risk management, cost and time estimation, resource management, performance indicators, implementation, quality control and monitoring, construction drawings, initial and final delivery, and even arbitration, dispute resolution, change management, and value engineering. However, until now, the use of artificial intelligence in project management remains a primary use, but it is expected that they will be integrated in an accelerated and increasing manner in the future. This research will contribute to the interest in the use of artificial intelligence in project management by highlighting the research and clarifying the uses of artificial intelligence in project management in order to enhance the use while taking into account the constraints in order to manage them and develop an improvement plan for the use of artificial intelligence in the future on a broader and more developed scale. Concrete image and encourage further research on this topic, in order to gain sound knowledge for the future, the researcher calls for more depth and strengthening of research in the field of using artificial intelligence in a more focused manner on managing each stage of the project separately so that knowledge of using these technologies is obtained at a higher level of certainty, and do not doubt the understanding, comprehension, application and benefit, and research in this growing field will greatly assist in its development.

6. Recommendations:

The researcher recommends that one of the international companies interested in developing this field adopt the idea of holding a global tender calling for the entry of a consortium or commission from various countries of the world, bringing together artificial intelligence specialists and project management specialists to develop intelligent robots to serve this multidisciplinary field and teach it to students and researchers.

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