

Effects of Artificial Intelligence on Decision Making in Project Management

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Abstract

The objective of this paper is to examine the effect of AI on decision making in project management. More specifically, the paper looks into the quality, integrity and volume of the data collected by AI systems which is then displayed for the project manager to carry out project decisions. After conducting secondary research in which numerous academic articles were read and information was collected from multiple regions and primary research in which 13 IT managers and Project managers were interviewed, the drawn conclusion was that AI application improves data quality and integrity leading to improved speed and effectiveness of decision making in both single and multiple project environments.

Keywords

Project Management Information System, PMIS, Artificial Intelligence, AI, Decision Making, Data Quality, Data Integrity

1. Introduction

All organizations rely on different decisions to drive their operations, and their performance is dependent on the effectiveness of their choices. It is for this reason that large firms implement PMIS (Project Management Information System) to facilitate effective decision making and efficient management of information (Radovic-Markovic & Vucekovic, 2015). Managers of these companies believe that these technologies can help them improve their decision-making, as well as foster proper planning and monitoring of the company operations to improve the attainment of the set goals and objectives. Bakens (2010) adds that management information systems create a convenient working environment for project managers, thus allowing them to handle several activities concurrently.

AI is associated with both benefits and risks, implying that the technologies linked to it expose the users to these factors. It is for this reason that it affects the implementation of PMIS in many ways. In some cases, the organizations that use AI fail to reap its rewards, because their managers have little or no understanding of AI and how it can affect the operations of a company.

Kolbjørnsrud, Amico & Thomas (2016) mentioned that AI is primarily designed to empower people and improve their productivity. It holds that AI learns, reasons, adapts and similarly executes tasks to that of a human mind. The evidence for this verdict is that several technology companies and startups have already developed systems that help them use AI in solving some of the problems facing the society. At the organizational level, the use of AI has an impact on several technologies like the PMIS. While past studies have demonstrated that the use of AI could lead to poor decision-making, this research holds that project managers can harness the benefits of AI if they use it correctly.

Part of the study is on how AI influences PMIS provides information that is helpful to managers in understanding how they can use AI to improve their decision-making when running various projects. Discussing the benefits and drawbacks of AI in management presents managers with a range of insights that they use in determining how they can reap the rewards of AI (Maleszak & Zaskórski, 2015). The hypothesis of this research holds that the deployment of Artificial Intelligence in Data Collection Processes will improve the data integrity in the management information system. This in turn leads to the argument that the implementation of Artificial Intelligence in Data Management Processes will enhance the decision-making processes due to having higher quality data.

Several studies have shown that the massive investments in Management Information Systems also come with several problems in data collection, compilation, and collation. It is for this reason that the companies that use them still come up with wrong decisions. This research will review some of the factors that are likely to steer such outcomes. Several studies have also demonstrated that Artificial Intelligence has a significant impact on the information systems used by business to drive various operations. For that reason, this research strives to test the above hypothesis to establish the effect of AI in the study and implementation of PMIS to help project managers make a better decision for the implementation and management of various operations.

2. Literature Review

Modern firms are investing in new technologies and information systems to achieve their organizational objectives and implement the strategic changes within a controlled environment. According to Bakens (2010) "Project management is not easy regarding the complexity, uncertainties and a large number of activities involved, even in a single project environment." For this reason, many organizations established project management offices (PMOs) to ensure a steady flow of work within the organizations and have better coordination and control of projects. Project management offices have an impact on the strategic, tactical,

and operational levels. For instance, PMOs are responsible for strategic policies and processes as well as other perspectives such as the efficiency of knowledge management and the effectiveness of project management within a certain organization. The roles of project management offices are used for sharing knowledge among the undertaken projects and keep the quality of product and services consistent over time.

Let alone AI, the initial core of data collection and processing has its own drawbacks that can affect the use of AI in PMIS. The use of PMIS in project management may face multiple difficulties and problems that can be avoided through proper understanding and finding solutions to better the practice of PMIS.

Organizations spend millions of dollars to perfect the design of PMIS yet systems continue to fail. These designs are attributed to the way PMIS designers view organizations, their employees and the function of PMIS within the organization. This may be due to lack of systems or the improper understanding of what the organization needs before the system design. Underestimating the complexity in the business systems and not recognizing it in the PMIS design leads to problems in the successful implementation, which can also be a result of lack of consistency or existing manual systems. The successful adoption of technologies in companies is much depending on technology characteristics, project and organizational characteristics, user and social characteristics, and task characteristics. However, these factors are much neglected by organizations especially among small companies (McLean, Stacie, & DeLone, 2014). After the design of the PMIS, other leading causes of failure would be improper training on the system and unsuitable implementation of it. The PMIS does not meet certain key factors of its users such as the inability to get the processing done in a particular manner or lack of user-friendly system. The organization may have a weak human resource management that cannot acquire specialized personals or specialized equipment or resources to implement to the new PMIS.

The acceptance and approval of the technology of PMIS into a company depends on the organizational culture. Without a correlation between the culture of an organization and the cultural expectations embedded within the PMIS, a costly implementation failure is likely to happen. A study was done comparing the implementation of PMIS in different Arab countries- Northern Africa and the Gulf Countries. The study revealed that age, gender and education levels are factors that contribute to the success of PMIS in the two regions. It showed differences in organizational cultures that impact upon PMIS adoption in both regions. The Arabian Gulf region was dominated by an adhocracy culture that values the adoption of PMIS, whereas the North Africa region was dominated by the hierarchy culture type that favors a centralized management style, which impacts negatively on PMIS adoption. The Arabian Gulf region did not show any significant effect of technology acceptance variables. However, in the North Africa region, technology acceptance played a vital role in PMIS adoption (Twati, 2007).

PM offices are essential for decision-making processes, because it keeps the decision-makers informed about the best practices, available information, and recent position or status of their projects. Adding to that, project management information systems are correlated with decision-making processes as it used to provide managers and stakeholders with specific information to manifest better planning, monitoring and controlling of businesses. PMIS is considered to be beneficial to project managers managing single and complex projects because it contributes to timelier decision making and project success (Raymond & Bergeron, 2008). It is stated that there is a positive impact with higher information availability on people's ability to process and the use of such information in short and long-term planning and in decision making tasks (Handzic, 2001). It is clear that the better the availability of information, the better the impact on both efficiency and accuracy of business decisions. In addition, PMIS is indispensable in the area of decision-making as it can monitor by itself the instability in a system, verify a course of action and take action to keep the system in control. As Kolbjørnsrud, Amico and Thomas (2016) mentioned in Harvard Business Review, "Human judgment is unlikely to be automated, intelligent machines can add enormously to this type of work, assisting in decision support and data-driven simulations as well as search and discovery activities".

Another research carried out by Tarafdar et al. (2019) and published in the MIT Sloan management review examines the effect of Enterprise Cognitive Computing (ECC) which is based on embedding algorithms into applications aimed at improving business operations. An example of this would be the operation of an ECC call center which enables the business to have an operating call center 24 hours a day around the year. It also allows 90% of customer complaints or inquiries to be addressed on the first phone call while transferring complex situations to employees with less than half of the customers realizing that they are interacting with a machine. The same study has also reached the conclusion that the enhanced business operation makes more accurate information available for decisions to be made, improving the decision making all in all.

When taking the previous reasons for failed application of PMIS into account, these pitfalls could be avoided and the actual benefits of AI application to PMIS could be taken advantage of. Through Integrating AI into Project management, the data collection process could highly improve both the quality and the quantity of the data provided to the project manager once he is faced with a decision. The previous statement holds in multiple sectors such as cost analysis and budgeting, assigning tasks, analyzing and mitigating risk and scheduling. A research recently carried out by EL Khatib on the topic of Lessons Learned has covered the extreme importance of archiving all details regarding previous projects mainly what went right and what went wrong in addition to having an effective system to which these archives could be accessed and retrieved. By doing so, major PMIS takes could be avoided and successful solutions and processes could be repeated to achieve the same success (El Khatib et al., 2021). When an AI system is applied to the knowledge management system, the process by which rele-

vant information is accessed and displayed could be automated making it much more efficient and therefore leading the project manager to have a lot of information regarding who performed well on which task, what were the main drainers of the budget and what were the success factors giving him/her the ability to make the best out of the recorded experiences and make the most effective decision contributing to higher project success.

To solidify the correlation between improved data availability and quality and improved timely decision making, we go over the findings of study conducted by the *Harvard Business Review* (n.d) in which 646 executives, managers, and professionals across all industries that are concerned with adapting Data driven decision making (DDDM). DDDM is a process through which data is collected and measured against KPI's, goals or trends to eventually be presented as a tool that could be utilized to strategize or make decisions based on actual proof and justification rather than completely relying on managerial experience and judgement. The study after surveying the 646 participants has concluded that this adaption has led to the enhancement of their skills in terms of the ability to utilize analytical tools to uncover strategic insights, balance data with instincts, developing best practices and finally carrying out more effective decisions in a timely manner with less pressure.

Apart from an automated recording and retrieving system from lessons learned, AI application in project management could also enable better decision making when facing multiple projects that share a pool of limited resources. While sharing resources through multiple projects, despite the advantage of decreased idle time, it still runs the risk of clashing schedules and conflict. With the help of AI it becomes more possible to predict possible outcomes of resource allocation, alert project managers to upcoming issues, aid in prioritizing projects and providing project managers with the necessary information to carry out decisions that best fit the projects' overall progress (Caniels & Bakens, 2011). In most project activities and areas, there is an availability of data that helps in using resources for decision making which can be seen in adopting the Internet of Things in smart cities development projects. The availability of connectivity led to the mass creation of data around the world and data became the most important source of a leading economy and innovation. A report published by Smart Dubai stated that the amount of data created will be around 180 zettabytes by the year 2025 which is equal to a billion terabytes (Andrikopoulos, et al., 2019). The huge amount of data available will need to be interpreted and analyzed in order to help in making the decisions; therefore, artificial intelligence can be utilized as a tool for such role. An example of using big data can be seen in the city of Calgary in Canada where they developed a PI System to gather updated information about the city water system to be able to monitor it and take preventive actions against flood (OSIsoft, 2015). According to Allam & Dhunny (2018), as cities are being digitized using technologies and AI to analyze data allowed planners and decision makers to collect data and formulate suitable policies to

help solve different kind of issues.

3. Research Methods

3.1. Secondary Data

The secondary data is obtained from several online journals and articles that are published in different academic websites and e-books. In this research paper, the secondary data is used to determine the relationship between project management information system (PMIS), and project management office (PMO), and how it's related to decision-making processes. The secondary data helped us to determine the effect of artificial intelligence (AI) on project management information systems and how it can be used to reduce the negative consequences of some external factors that are linked with these systems.

3.2. Primary Data

The data is collected by conducting a formal interview with 13 IT & Project managers from different companies. The selected questions are related to the central concepts of our research questions and hypotheses about how the application of AI could improve data integrity and quality, in turn, improving the decision-making process. The primary data is used to examine the real situation in the chosen organization.

3.3. Research Methodology

Several methodologies have been used in project management such as the Waterfall, Agile, Adaptive, Scrum, Lean, and Kanban methodologies. The Waterfall methodology, which is a sequential development process where progress is steadily made till the endpoint of the project imitating the movement of a waterfall is selected for this research project because it provides a better understanding of project stages and it is simple and easy to make and measure.

4. Analysis

Following the interviews with the managers in and by studying secondary resources, the following results were concluded.

1) Service-related companies especially the financial sector find it easy to implement the AI in PM:

The financial sector in UAE is using AI to implement their projects and achieve their objectives. A recent study was done at Mashreq Bank which had used AI to increase productivity by automating transactions and reducing the time per transactions. They had observed more than 150,000 error-free transactions in a single day. Using AI to automate this process has allowed Mashreq bank to have a higher number of transactions while eliminating data bias and providing a pool of data with higher integrity that could be accessed, analyzed and have conclusions drawn upon it in order to carry out future decisions more effectively.

One of the Managers stated that the tools used by most companies in AI is Chabot which acts as a replacement to customer service executives and also serves as a data collection point. The interaction with these Chatbots is wholly automated and thus reduces the chances of the human error and human mood distraction. The quality of data is improved as it is collected and filed by the entirely automated process. The chances of failure are one in ten million as compared to human error which is 1 in 10,000. This multifold accuracy did not only reduce time but saved the organization from any financial cost as a result of PMIS information processed by a human.

2) Pre-planning and collaboration across the board improve the quality of data:

Another Manager discussed some of the cases in companies where AI was used to collect and manage data. In most of the companies, it faced many problems to implement AI and run it smoothly. The primary reason is lack of collaboration and pre-planning. The team responsible for the implementation of AI needs to interact with the stakeholders on a regular basis. In one case, it took them more than four months to implement a simple task because the employees were not ready and briefed about the changes.

In addition, we found that the UAE government had implemented 26 mechanisms for implementation of AI in organizations (Emirates New agency, 2018). Several projects in public domains use AI systems.

3) The possibility of risk identification with the help of AI helps in making quality decisions.

The risks and amount of data in an organization both increase with the size of the operation. The management of data collection and organization through AI can help reduce the risk. The Project managers clarified that in banks where the loan defaulters are high in number, it is essential to identify the types of customers who are in such category. The AI can help identify and notify the decision makers in advance for any such users.

Machine learning enables predictive analytics and can provide advice to the project manager. For example, how to set up and steer the project given specific parameters, and/or how to react to specific issues and risks to reach the best possible outcome based on what worked in past projects (Lahmann, 2018).

4) Companies which implement AI in data collection improved higher accuracy of data and improved decision-making quality by revealing trends.

Higher accuracy is achieved as a result of AI in data collection. Boone says. "AI could identify slowly ramping trends in that stream of data that are significant but hard to see—or easy for humans to ignore even if they see them." (Branscombe, 2018).

5. Discussion

AI is playing a vital role in the data management and in the decision-making. The AI had played a key role in the UAE market especially in project manage-

ment to manage and collect data. The high accuracy of data management under AI is one of the most significant advantages to using AI. There is a positive impact on making a quality decision through AI. For instance, AI had proven to manage a more significant amount of data than any other source used in the past by organizations.

Among the Middle Eastern countries, the UAE will have the highest contribution in GDP for AI, an amount to almost 14% by the year 2030 (Pricewater Coopers [PwC], 2018). Some organization tends to ignore the use of AI and consider it very complicated. The primary reason why organizations had failed to utilize or implement AI for decision-making or data management is due to lack of leadership and interpersonal skills. Several organizations overcame this barrier and shifted the paradigm of their organization growth.

6. Research Limitations

There were certain limitations in this research project. For example, the lack of previous studies, sample size, and the ability to get access to additional information. There weren't a sufficient number of research papers in the region about the impact of artificial intelligence on project management information systems as it was mentioned earlier in the introduction. In addition, the number of managers was less than the predetermined amount. It was expected to get a total of twenty-five managers from different companies, but the primary data collected half that amount.

7. Conclusion

The research was based on two hypotheses:

- 1) Deployment of Artificial Intelligence in Data Collection Processes will improve the data integrity in management information system.
- 2) Deployment of Artificial Intelligence in Data Management Processes will improve the decision-making processes.

Both the secondary and primary sources research validates that both hypotheses are true. Organizations are developing their capabilities to embrace AI in data collection, data management and utilize the data for better decision-making. UAE is highly dynamic in welcoming AI for a better purpose. The barriers that hold organizations in adapting AI for data collection and management can overcome through collaboration and proper planning. DERQ as an organization is a perfect example of how AI technology is thriving in the UAE market for using AI for data management and decision-making.

In the future, AI will not be a choice but will be an integral part of their strategy for survival.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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