

EFFECTIVENESS OF ARTIFICIAL INTELLIGENCE AS A TOOL FOR PROJECT MANAGEMENT IN NIGERIA

Emmanuel C. Irondi
Innocent I. Eneh
Christopher N. Mbah

Post Graduate school, Faculty of Engineering, Enugu State University of Science and Technology,
Enugu, Nigeria

ABSTRACT

Project management as a function is going through a revolutionary phase of change brought on by the digital era. This, among other factors, has prompted project managers to look towards finding new and creative ways to work better and more efficiently through the use of technology. Artificial intelligence for project management is a specific area of focus that has so far not been looked into and remains largely unexplored, especially in light of the upcoming digital era. This study is an innovator in this regard and is an exploratory investigation into how artificial intelligence systems can be used to support project managers with becoming more efficient in their daily work. In order to achieve a preliminary understanding, an online survey first was conducted amongst project managers. The results of the survey were used to supplement the second step in the research process which consisted of semi structure interviews with project managers to gain an in-depth understanding of the topic as well as to discover areas of opportunities which can be used for future research and developments. The study yielded results in terms of understanding and establishing the needs of the project managers who were involved directly in this investigation as key stakeholders. This study has also been successful in establishing a foundation for AI scientists to use for the purpose of developing tailored solutions for project managers

Keywords:

Artificial Intelligence (AI), Artificial General Intelligence (AGI), Machine learning (ML), Artificial Neural Network (ANN), Deep Learning (DL), Natural language Processing (NLP), Representative learning (RL), Deep reinforcement learning (DRL), Stratejos, Meno, Fireflies, PMBOK (Project Management Book of Knowledge).

INTRODUCTION**Evolution of Artificial Intelligence**

AI initially started as being a pure sub-branch of computer science that aims at making computers and machines intelligent; where intelligence is restricted in the short term to mean reasoning, knowledge representation, planning, learning, natural language processing, vision and perception. In the long-term view, the ambition is to achieve AGI (Artificial General Intelligence), the idea of intelligence involves a much more complex problem of an amalgamating various scientific disciplines such as mathematics, psychology, engineering etc.

Alan Turing, considered by many as the father of modern Computer Science, published in 1950 his popular Turing test that consisted of a machine that can make conversation that is indistinguishable from a conversation with a human being. If the machine passed the test, it would be labelled as “Intelligent”, as per Turing. He dreamt of the day when humanity would make its Last and Final Invention. Since then, advancements in Computer Science coupled with the revolution in technology pertaining to higher processing power has made it somewhat possible for these purely theoretical reflections to take some tangible shape and form.

AI has made incredible progress in the past few years. The AI of today can-do specific tasks such as driving a car, booking meetings or even talking on your behalf on an audio call. The underlisted enhancements were brought forth by AI’s subsets and techniques.

Artificial Intelligence: AI can be defined as a machine that inputs data from the real world, processes it and makes specific decisions as a result in order to achieve a goal. Today’s applications of AI include driving cars, chatbot, image/voice recognition, etc.

Machine learning: ML is a subset of AI which focuses on developing software, mostly algorithms that can learn to accomplish tasks by themselves without a developer explicitly telling it how to. For ML to properly work it needs clean and relevant data.

Representation Learning: RL is a branch of ML which goes deeper than Traditional ML which needs more human intervention. RL models take in huge amounts of data and learn representations also called features by themselves.

Artificial Neural Network (ANN): Artificial neural networks are the most popular RL technique. It was inspired by the human brain. It is a collection of artificial neurons that are arranged in such a way that they can send and receive information among them in order to produce the desired output.

Deep learning: Deep learning is also a representation learning technique. It is made of five or more layers of artificial neurons. A single input layer takes the data, three or few hidden layers that processes the data and learn new features and a single output layer to show results.

Machine vision: It is a branch of deep learning that focuses on object recognition. It is used for self-driving cars algorithms, image recognition and any AI that needs to at some point to recognize objects.

Natural Language Processing (NLP): Natural language processing is a machine learning technique that is used to teach the machine to recognize characters and language. Deep learning for NLP is a much efficient technique that allows AI to interact via natural languages (spoken or typed). The NLP is a mix or interaction of natural language fields, artificial intelligence and computer system, as illustrated below.

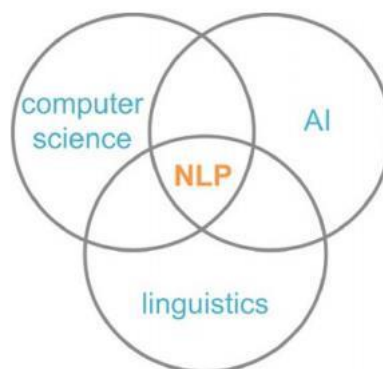


Fig 1- Venn diagram showing Natural Language Processing

Deep reinforcement learning: DRL is a reinforcement learning method that involves artificial neural networks. Reinforcement learning is good at taking the suitable decision among other options. DRL is better when it comes to processing a huge variety of data coming from an external environment.

MEHODOLOGY

The survey employed qualitative research in analyzing how AI systems can support Project Managers to become more efficient in their daily work

The methodology utilized for this survey was a questionnaire designed with 5-Linkert model response distributed online to project managers using google apps. In this survey, the questions on the questionnaire were divided into four categories:

Section one deals with what AI in Project Management entails. The second is a general observation on how AI is beneficial to project managers; the third section analyzes different artificial intelligence tools that could help project managers perform their work and section four analyzes how AI enhances project manager productivity and efficiency. Cronbach alpha formular was used to test internal consistency and validity of the responses of the project managers on the returned questionnaires. The strength as determined with Cronbach alpha formular was found within an excellent range of **0.92**. From data collected via responses with PM on their familiarity with the use of AI software on their projects (table below) about 10% of project managers had good knowledge of AI software, 68% of the PM have little or no knowledge about AI software and 14% acceded to the use of the software in managing certain aspects of their work

Alternatives	Frequency	Percentage
Have never heard of it	30	25
Little use of it	17	14
Neutral	9	8
Heard a little about it	51	43
Have good knowledge	13	10
Total	120	100

ARTIFICIAL INTELLIGENCE AND PROJECT MANAGEMENT

Artificial Intelligence has entered several industries over span of time probably a decade. With the initiative adoption of machine learning and deep learning algorithms, many existing sectors have witnessed prevalent disruption by this new technology. About three years ago, data collection and data storage has become the standard; and sectors which have conventionally maintained well-established data banks, such as healthcare, finance, and logistics, will stand at vantage position of benefit from an AI solution.

From the societal acceptance perspective, the general public will have to arrive at a compromise in the near future about how to quantify and regulate these advances. For instance, at what point do we say that we are allowing Artificial Intelligence take over the diagnostics of a patient, or allowing Artificial Intelligence drive whereas we sleep comfortably behind the wheel? From a purely logical standpoint, one expects that in case the frequency, rate and fatality of errors when AI is in charge is lower than what we measure when humans are in charge, then society should have no doubts in handing the reins over to AI. However, from social epistemology, an emerging precept is that generally, the overall public is going to be far less forgiving in case of an error if the decision making is not controlled by humans. Let us therefore to take a brief look at some industries currently advancing towards AI integration into their working space.

HEALTHCARE SECTOR UTILIZATION OF ARTIFICIAL INTELLIGENCE

The healthcare sector at its entirety has been gathering accurate and relevant data about her patients, therefore, this makes Artificial Intelligence a good fit for a critical sector and data-rich world of healthcare services in the following ways:

- Artificial Intelligence (AI) can enable easier analysis of scan results through image recognition. This has notably been used to help doctors diagnose symptoms at a much higher rate, as AI can go through multiple scans much faster than humans. Artificial Intelligence has higher diagnostic accuracy, and can be monitored by doctors to avoid false diagnosis.
- AI can find a variety of use-cases in the healthcare sector. Predictive analytics is expected to save 25% of healthcare cost by 2026. Using the power of predictive analytics especially machine learning algorithms, AI can help doctors make proactive moves towards ensuring their patients' health. This is a much better approach to healthcare than the reactive approach taken today.
- By looking at the patient's financial history, in the past three years, AI can accurately predict the likelihood of an individual defaulting on a loan. This may lead to AI deciding who has access to treatment based on their insurance scheme.

ARTIFICIAL INTELLIGENCE IN TRANSPORTATION SECTOR OF A COUNTRY'S ECONOMY

Transportation sector of some countries has evolved where vehicles can navigate and move without any human assistance. AI in transportation helps the sector increase passenger safety, reduce traffic congestion and accidents, lessen carbon emissions which has become much of a climatic problem for many countries, and also minimize the overall financial expenses. Companies like Tesla or even Uber can deploy autonomous vehicles in the real world. Computer vision technology that uses AI can be used to facilitate the delivery of goods. An example is Tesla's semi automobile truck that has safety features made possible by AI algorithms. In the near future, this technology will be so advanced that humans will have to take the position of a supervisor who will only be required to monitor the AI. Major challenges in the transportation industry like capacity problems, safety, reliability, environmental pollution, and wasted energy are providing an opportunity for AI innovation.

IMPACT OF ARTIFICIAL INTELLIGENCE ON PROJECT MANAGEMENT

Artificial Intelligence is a complex field consisting of numerous distinctions, but at the same time when used correctly, the technology can definitely increase productivity and reduce errors drastically. One of the most significant advantages of using such technology to minimize errors especially in software development projects, where you can find a variety of defects detected at any stage is an essential measure of the project quality.

Business Insights

AI enables project management to provide more insights into possible outcomes, which will enhance the quality of decision-making. By finding relationships and trends in data, the system will remove superfluous information, thus allowing management to focus on the most important information.

The journey for most companies, which started with the internet, has taken them through key stages of digitalization, such as core systems modernization and mobile tech integration, metamorphosed into intelligent automation stage. Many companies have before now started implementation of intelligent solutions such as advanced analytics, process automation, robot advisors, expert systems, and self-learning programs. But a lot more is yet to come as technologies evolve, democratize, and are put to innovative uses.

To effectively exploit the advantages offered by AI, companies may need to fundamentally reconsider how humans and machines interact within their organizations as well as externally with their value chain partners and customers. Rather than taking a siloed approach and having to reinvent the wheel with each new initiative, financial services executives can consider deploying AI tools systematically across their organizations, encompassing every business process and function.

Project planning could be made more robust by enabling auto-scheduling by means artificial intelligence such as *reclaim.ai, or clockwise*

The rise of virtual assistants will help project managers to stay up to date on trends in their industries and help them to deploy experts to bring even more value to projects. Recommendations are a very important and useful aspect of AI. Machine learning algorithms are capable of giving recommendations on prioritizing projects based on data from previous projects.

In Risk Management:

AI may not replace human judgment in the foreseeable future, but it is highly required to support humans. For example, in healthcare industries, the execution phase of projects is quite unique. There are more layers of stakeholders who need to sign off on every step of the process. Project management in the healthcare industry involves a lot of people who could be taking care of one particular patient which makes clear that human to human communication is requisite.

So, if a doctor relieving his duty should communicate the exact condition of a patient to the incoming doctor which if not done properly might lead to a potentially negative outcome. This is an area where AI cannot clearly come in and replace the humans involved.

In healthcare, machine-learning-based project management is a relatively new technology that can be used to make project plans adapt and baselined in near-real-time based on historical team performance and project progress. Also, AI can be used as a project management tool to predict more precisely future issues based on previous data thereby reducing risks related to people, vendors, entities etc. on the project.

Resource Allocation:

In Human resource Management AI can enhance Human Capital Optimization by calculating the best allocation of resources, Identifying the right skill for the right job, pinpointing training needed for a specific employee, predicting resources excess or shortage, providing feedback about the project manager's behavior and competency, and can become a solution to numerous project failure whose causal factor in time past are identified as teams incapability of fully grasping and/or executing a project's main goals and objectives. This in principle can also be extended to operational allocation as well, not just restricted to projects, provided that organizations maintain a detailed RACI (Responsible, Accountable, Consulted and Informed) for their employees.

AI is penetrating the project management field slowly and step by step. Project managers can utilize Stratejos which is a smart assistant for software teams using Jira and Hipchat which can focus on assisting project manager's with project estimates, budgets, and sprint management, allowing other AI like Meno focusing in assisting project managers with management of team knowledge. These project management AI tools can give

project managers a foretaste of the future where AI will automate tasks, provide insights and communicate with project team members.

The only challenge is that these AI tools rely on people to input data correctly, update tools in a timely manner and make corrections where necessary.

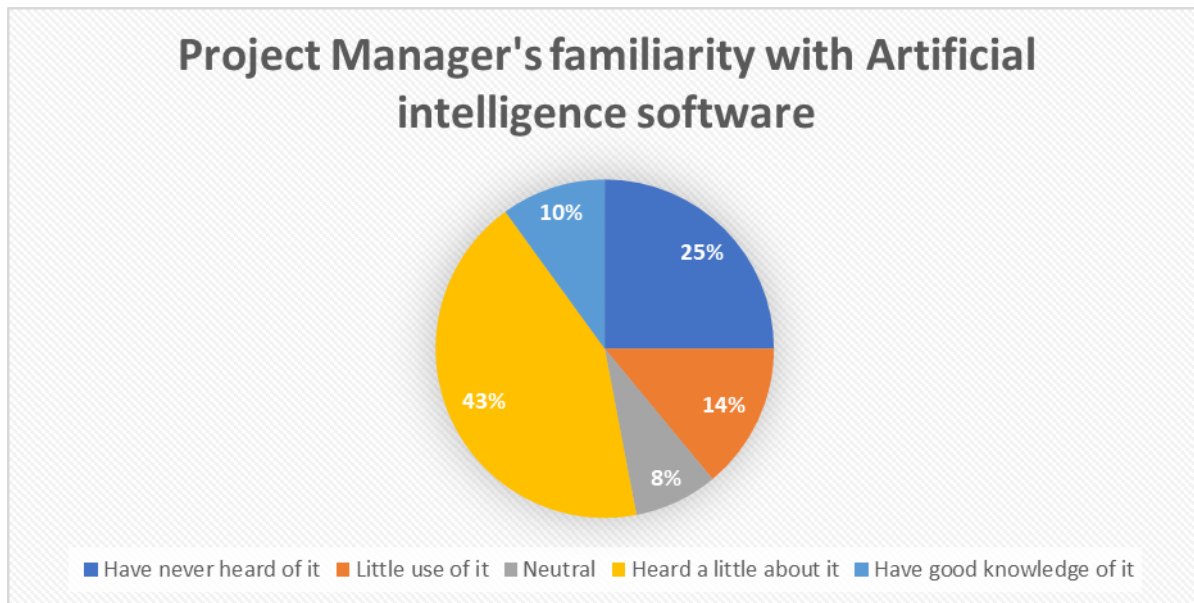


Figure 2: Project manager's familiarity rate with AI software

From sampled opinion of Project managers in the Nigeria using South South, and South East as case study on familiarity rate on project managers with AI software's, it was found that about 50% of respondents have not said they have not heard about or used artificial intelligence (AI) in their projects within last 5 years. Only about 25% of the respondents acknowledged its utilization in their project execution efforts. However, AI isn't to be feared rather It may even be the best team member, especially for project managers. AI for project management is on the rise, and the way things are going, it's going to help project team members make smarter decisions and move faster

There are three key areas reflected in this work where Artificial intelligence has made huge impact on the individual processes/phases/subprocesses of the Project Management Book of Knowledge (PMBOK), they are and not limited to:

1. Project Integration Management (PMBOK v6, Chapter 4 subprocess 4.2) which deals with "Development of Project Management Plan" which unifies data input from all other planning processes to output a comprehensive plan, this area has already begun to see the valuable impacts of AI through integration and automation technologies which has enabled interaction between MS Project Online and Wunderlist for task creation and scheduling, which makes it a good indicator of how AI will infiltrate all of the integration sub-processes and AI chatbots. These AI applications are already being adopted by and creating immense value for many organizations, and we expect that they would be commonplace in the next coming years.
2. Project Quality Management (PMBOK v6, Chapter 8): A project management Quality Compliance Methodology consists of many checkpoints covering specific quality compliance areas developed and utilized to monitor and manage over 60 client projects, it captures and stores resultant data for over 2 years. This methodology was subsequently automated using AI in the form of a virtual assistant robot, to check the compliance levels of a sample set of projects and the results were that the robot was successfully and accurately able to analyze the project data, evaluate each project's compliance levels, provide recommendations on improving quality, and redefine the scope for subsequent compliance checks. All insights were presented in a comprehensive executive style dashboard report fully created

by the robot, which also autonomously shared these reports to the appropriate stakeholders immediately via email.

3. Project Communications Management (PMBOK v6, Chapter 10) which states how chatbots can take over menial tasks such as organizing meetings, plan vs progress checks, reminding project team members of scheduled activities” and go a step further by “listening to meetings to assign tasks to people with target dates, send out actions and follow-up” .

They describe a few current real-life use cases which are summarized in table below.

While the communication management transformation is in full progress with integration and automation technologies and chatbots being implemented by many organizations, the impacts on quality management, with these arising from the adoption of machine learning, are expected to fully materialize within the next 5-10 years.

AI Integration and Automation	AI Chatbots
Using online templates and workflows, e.g. in Slack or MS SharePoint, to reduce time and enhance the quality of data	Fireflies.ai is an AI bot for Slack that processes conversations within Slack and recognizes tasks and assignments on this basis
Sending alerts when potential budgeting or scheduling issues are identified for the project	Stratejos.ai sends team members reminders, tracks their performance, and enables the project manager to recognize top contributors based on measurables

ARTIFICIAL INTELLIGENCE AND PROJECT MANAGERS

With artificial intelligence project manager’s will be able to devote more time to strategic and tactical thinking and judgment since repetitive tasks and routines can be automated. Which implies that project managers will focus more on value-added activities around the projects they are handling, thus they will become more effective and efficient, They will rely on the decisions of the machines that:

- Will advise future trends,
- Automate time scheduling,
- Respond to requests coming from superiors and staff.

Project manager’s ability to integrate common collaboration tools such as Slack, with project management software such as JIRA will make him become more effective when it comes to problem solving since it is known that project managers spend more than half of their time on administrative tasks such as dealing with check-ins and managing updates.

AI can be of value add to the role of a Project Manager because AI frees up time for project managers to focus on strategic-level goals and planning, may also appear to be a threat to job security, but it may instead increase the value that project management professionals can bring to the table, and can help project organizations or companies achieve long-term objectives successfully by further solidifying the significance of roles by adding value to them. For instance, AI bots are capable of stepping up and handling fewer intensive tasks for the project manager with current systems cutting time spent on busy work in half.

CONCLUSION

The key findings from assessment revealed that there are several areas of opportunities within project management where AI systems could be developed and utilized to support project managers. The need for this was confirmed by all of the project managers who were interviewed as a part of this survey. An existing project management AI solution for risk analysis and risk management exist which can ultimately be used to strengthen the business case in support for the development and use of AI in other project management elements. Several key insights about the views and knowledge of project managers regarding AI systems were also established during the course of the survey. One significant finding is that the project managers have a positive inclination towards using AI systems in their daily work which enhances high of AI tools or software. Also, it was it is a known fact that there is lack of awareness concerning AI systems within the project management community which could significantly inhibit the systematic AI utilization for this specific function in the future. It is crucial for organizations to tackle this by educating project managers about AI as well as by employing AI scientists who can drive the organization’s technological strategies to ensure positive growth in the upcoming digital era for project management.

IJETRM

International Journal of Engineering Technology Research & Management

www.ijetrm.com

REFERENCES

- Arup; UCL; APM. (2018). Arup. [Online]. Available at: <https://www.arup.com/publications/research/section/future-of-project-management>. [Accessed 15 January, 2018].
- Atlassian. (2017). [Blog]. 3 ways Artificial Intelligence will change Project Management for the better. Atlassian Blog.
- Bhaskar S. Digite, Inc (2022) “5 ways Artificial Intelligence (AI) will aid project management”
- Olivia Montgomery. Software Advice Inc (March 17, 2020) “5 Benefits of Artificial Intelligence in Project Management”
- Nilsson, N. (2010). The quest of artificial intelligence: a history of ideas and achievements. Cambridge University Press.
- Pan, Y. (2016). Heading toward Artificial Intelligence 2.0. *Engineering*, 2(4), pp. 409-413.
- PMI. (2013). A Guide to the Project Management Body of Knowledge (PMBOK® Guide) (5th Edition), Project Management Institute, Inc. (PMI)
- PMI. (2018). What is Project Management? [Online]. Available at: <https://www.pmi.org/about/learn-about-pmi/what-is-project-management>. [Accessed 17 April, 2018].
- Russel, S. and Norvig, P. (1995). Artificial Intelligence – A Modern Approach. PrenticeHall, Inc., pp.5. https://en.wikipedia.org/wiki/History_of_artificial_intelligence
- <https://www2.deloitte.com/us/en/insights/industry/financial-services/artificialintelligence-ai-financial-services-frontrunners.html>
- <https://www.pwc.ch/en/publications/2019/ai-will-transform-project-managementen2019-web.pdf>
- <https://cmte.ieee.org/futuredirections/2018/05/18/the-future-of-health-care-is-tied-to-big-data/>
- <https://www.forbes.com/sites/cognitiveworld/2019/07/26/how-ai-can-transform-thetransportation-industry/#6e7ec0124964>
- <https://pomodoneapp.com/blog.html/2019/08/31/impact-of-artificial-intelligence-inprojectmanagement/#:~:text=AI%20can%20even%20automate%20simple,and%20improvements%20to%20the%20project>.
- Project Management Institute publication available at <https://www.pmi.org/resources/articles/5-implications-of-artificial-intelligence-for-project-management> | PMI (Accessed: 7th October 2022)