THE NEXT FRONTIER: EXPLORING THE POTENTIAL OF AI IN ENHANCING PROJECT MANAGEMENT PRACTICE

Costanza Mariani

Politecnico di Milano, Italy

We are in a period of the highest interest in artificial intelligence, with a lot of investments in this topic. Over its history, AI has had many ups and downs. Generative AI started to gain interest in 2014, and from that time on, a great change in the world of artificial intelligence has started. From 1915, when for the first time the term was conceived, there were many gray or black periods during which nobody cared about AI or was interested in the topic anymore. Somehow, there has been a disillusion regarding AI, which was due mainly to the fact that people were seeking to develop general AI. It is important to understand that general AI is the concept where a machine could perform a task like simulating the behavior of a human in a wide array of tasks. So this caused quite a disillusion, while it was very clear that the development of artificial intelligence is with a narrow purpose because the machine could concentrate just on one specific task and could carry on just one task at a time.

It is possible to identify some of the main domains of artificial intelligence. The first one is a cognitive domain, where there are predictive analytics and forecasting models. In these categories, we can encompass machine learning algorithms that allow us to develop a cognitive augmentation of what we know. Moreover, there is a user vision, predictive and prescriptive models, advanced calculation and data analytics, and natural language processes, and everything is generated from language. In the last couple of years, the retention of generative AI has changed to augment the tasks that artificial intelligence is able to perform.

According to the Microsoft CEO, more than 10% of all the data in a couple of years might be fully AI generated. This is causing a huge shift on the market of labor. Many professions are likely to be strongly impacted by AI, specifically the banking and all the administrative tasks. Moreover, the industries that are quite close to project management, such as architectural engineering, general management, construction industries, are likely to be impacted by the artificial intelligence.

The insights from studies and surveys that were published in the last 10 years are gained and divided into the three main project management phases: the pre-project phase, the planning phase and the monitoring and controlling phase. The question is where an application of artificial intelligence in project management is possible.

In the pre-project phase, the AI could be very useful in the big-no-big phase, to decide whether to do it or not for a specific project, or in refining the estimates times. Basically, AI could be used to identify what would be the cost related to an investments. Another area of interest is related to selecting optimal projects to be included in a portfolio, or to optimize an already existent portfolio of projects.

In the planning phase, there are some useful techniques that are mainly related to supervised machine learning, specifically project design. AI can be used mainly for predicting the project duration or for some project tasks, as well as for cash flow prediction, cost management, and project budgeting. For the risk assessment, artificial intelligence is used to better understand the relationship between different risks and the possible impact of interrelated risks on the project. The second usage is to identify the percentage of impact and the probability of risk.

There are also applications during the monitoring and controlling phase where it can be focused on the calculation of indicators, like the estimated complexion.

The aim of the research was to confirm that a specific AI algorithm can work during the project and that a specific algorithm can be applied to a specific project setting. Practically, the aim was to demonstrate the adoption of AI in project management and to understand the implications of doing so. For the purpose of the research, some specific application domains were selected. The first data related to project portfolio management was collected from an engineering company in Italy. The second and third project data were collected by one Italian company for supernumerary decommissioning, while the fourth project was based at a large IT company in Italy.

During the research, for each of these four cases, it was important to understand what the needs of the company were. According to it, a specific AI technique was selected to be applied in these contexts to consider if the AI technique could improve the process of being used in a specific project. For each of the cases, a demonstration of both how AI works and how it usually works in a company was provided. There were two components. The first consisted of identifying an optimal selection of projects to be included in an existing portfolio. Therefore, data regarding 35 projects was collected, and some classifiers were applied to identify the expected level of success of the projects. This level of success was based on a return on investment measure. It was concluded that AI was able to very well classify all the projects with the level of success expected.

Further, a study on risk management was considered in the research. The first part consisted of tracing in a more precise way the probability and impact of risk associated with the project and understanding the connection between the implication of correlated risk and the overall risk core of the project. For providing these results, a Bayesian network was designed, and it was concluded that AI was able to better predict the schedule contingency of the project with respect to what had been planned in the company. Then, the next parts were about selecting optimal mitigation actions and stakeholder management.

In the research, one of the companies needed a new system for recognizing and identifying stakeholders. It was suggested to apply supervised machine learning instead of a classical and traditional stakeholder power matrix to cluster their interests and their focus. It was found that unsupervised machine learning was able to provide a better identification of the stakeholders involved in the project. Moreover, three levels of implications of employing AI in project management could be concluded from the analysis: implications on the project management process, implications on the organizational level, and implications on competencies. Related to the project management process, it was concluded that artificial intelligence, when implemented in a specific domain, was able to provide better efficiency and effectiveness in the

project. Also, when classifying stakeholders with unsupervised machine learning, the company was able to perform a very tailored communication strategy for its stakeholders, and it was very well performed. Overall, the process was much more uniform.

All these results lead to necessary changes in the organizational structure. Companies should be introduced to competencies that are not currently present in the absent project management working environment. That is why upskilling and reskilling are needed. Also, there are cultural and ethical considerations. The fact is that artificial intelligence can be very much used in the practice dimension, while currently people are mostly looking to automate repetitive tasks. This means that artificial intelligence can be more used for strategic insights and tasks, like portfolio and stakeholder management, than just for shortening the task duration.

At the end, it is important to conclude about the strategic usage of AI and the value a project can generate. Artificial intelligence can be used to co-create value with stakeholders. First, we should work to find a collective intelligence system that gathers preferences from the project owner and stakeholders. Also, we should work on the application of a text mining algorithm that can extract from this collective intelligence system a list of preferences that can then be balanced to the needs of the project. This is supposed to have a huge impact on the way artificial intelligence is used. Many projects are yet to be project-level research because we don't have it in practice, and that is why it would be a tool for co-creation. In conclusion, for value co-creation, we should be able to engage stakeholders when defining project preferences, which will set our future research direction.