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How to exploit the benefits of Artificial Intelligence (AI) in the context of large complex industrial projects

The latest AI developments in recent years and its impressive results have created new expectations across various disciplines. In particular, a significant increase in productivity is expected in many areas of engineering and construction. In this paper we analyse the role AI plays in the fields of project management and control for large, complex industrial projects. It will be updated with the future development of the technology. A separate White Paper will deal specifically with project control aspect.

Direct and indirect application of AI tools

AI is a technology that is expected to improve productivity and performance in many areas of project and project-related disciplines. In particular, for project management and project control, direct and indirect applications can be identified.

The direct application of AI tools refers to the operational applications aiming to support actual live single project deliveries. An example would be an application that automates the update and forecast of the project schedule, interacting with a project control process aiming to support a live project delivery.

On the other hand, indirect application of AI tools refers to tools that do not directly interact in single project management or project control processes, but are rather utilised as a support to the project team members through applications such as chatbots or assistants, or utilised to automate administrative tasks, or are used to support management of portfolios of projects.

Nowadays the most significant impact of AI applications is achieved through indirect applications that aim to improve productivity and efficiency of the project team

AI in project management and project controls disciplines – current status

PVD's experience is that, at the current state of the technology, AI tools are most effective when applied indirectly to the project management and project controls disciplines.

The main reasons for this are that direct AI tools have not yet been widely tested and proven successful in real megaproject environments. One issue is the lack of very large databases for teaching algorithms. Additionally, direct AI tools on project management processes generate an inherent loss of understanding and control due to the complex inner workings of the AI algorithms. This feature can be a particularly sensitive topic for project managers, as a high level of understanding and traceability of the project processes is essential for decision making and the ability to demonstrate the basis for decisions, not least when something goes wrong.

In consequence, and as seen across multiple other industries, the most significant benefits from AI applications in the disciplines of project management and project controls are achieved through indirect applications and are mostly related to improving productivity and efficiency of the project team. These benefits can be significant within a project-driven environment, considering that project team focus is a proven success factor in megaprojects.

AI applications in project-related disciplines and support disciplines can have a significant impact in project performance

In addition to project management and project control disciplines, AI tools can be applied in other project-related disciplines such as engineering or construction, or in support disciplines such as human resources or finance. Benefits from these implementations can be significant both at a discipline and at a project level. It is, therefore, essential that project managers follow the evolution of these developments and that they push for their testing and implementation if judged beneficial. Some examples of actual operational developments to-date in project-related or support disciplines are listed below:

- In HSSE, AI tools can monitor fabrication sites and help prevent incidents by early identification of situations and/or behaviours that could compromise health, safety, security or environment,
- In HR (recruiting and onboarding), AI tools can optimise recruitment processes such as sourcing and filtering candidates. Additionally, AI applications can automate and personalise onboarding programs and therefore accelerate the onboarding phase,
- In engineering, AI tools can be used to automate calculations (e.g. MTO based on 3D model) and to optimize the 3D model design, plant layout, structural design, etc,
- Generating deliverables: AI tools can be used to improve productivity by providing customised templates and drafts for a large number of project deliverables from templates of past projects, which can then be reviewed and improved by project personnel. This includes minutes of meetings and associated update of action registers,
- In data analysis for claims, AI tools can help sieve through very large datasets to find relevant data to support claims
- In performance analysis at portfolio level and identification of performance issues, AI tools can help identify projects that need closer attention based on their macro-performance reports and numbers
- In Quality control in manufacturing, visual inspection applications based on AI (Computer Vision), have been proven to improve detection of quality non-conformances, leading to reduced quality risks from a project perspective.

- In predictive maintenance, machine learning (a type of AI) can be used to better predict maintenance needs of critical equipment, leading to reduced downtime and improved operating costs, positively influencing project profitability and attractiveness during development phases. Predictive maintenance based on machine learning exists for several years and has been implemented in different industries successfully.

AI developments directly applied to project management and project controls

Even though PVD currently recommends an indirect AI application, interesting developments are applied directly to project management and project control that are worth following or even testing. This helps prepare organisations for future implementations, which would only take place once the technology has achieved a greater level of maturity.

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In these cases, it is essential when assessing the implementation of an AI development to ensure that the benefits are estimated objectively, and that the main challenges are identified timely and managed properly. The main challenges can include, among others, the set-up of exploitable data, the integration with existing systems, the loss of understanding of inner workings of the algorithm, change management, etc.

The AI developments that PVD considers having the most potential are listed below.

- In document control, generative AI assistants can retrieve specific information or produce summaries from a large quantity of documents from a document control system,
- In estimation engineering, AI tools can estimate ratios, quantities, prices, etc. based on preliminary data with improved accuracy, which can be particularly useful for Capex calculation during early stages of project development,
- Automated physical progress measurement, through the interpretation of videos or photos of construction work,
- In scheduling, schedule software developers, have developed benchmark tools based on AI, which serve to estimate how realistic a planning is, or to obtain rates based large amounts of historical data for similar activities). Some also claim to be able to develop good quality schedules from large troves of historical datasets including subsequent schedule updates (that claim would still need to be reviewed),
- Weak signal identification in large projects through analysis of the flow of email and document communication.

Conclusion

As we have mentioned in the PVD handbooks, megaprojects are at the end of the day, human adventures, and the project management team is at the core of it. For this reason, and despite the level of sophistication, technology is and will remain a support for teams developing projects. In this sense, AI tools can certainly add value and improve project performance; the key, however, is to identify where these applications can generate the most benefits at a reasonable level of risk.

In PVD's experience, nowadays the most significant impact of AI applications is achieved through indirect applications that aim to improve productivity and efficiency of the project team, such as automation and chatbot-like applications. Also, AI applications in project-related disciplines as engineering or in support disciplines such as HR can have significant positive impact on project performance.

Direct AI applications in the fields of project management and project controls even though having interesting potential, are not the most effective implementations yet, and significant risks exist if not implemented carefully and with a comprehensive project vision. However, this is a field that needs to be watched because of the disruptive potential of such tools in the future.