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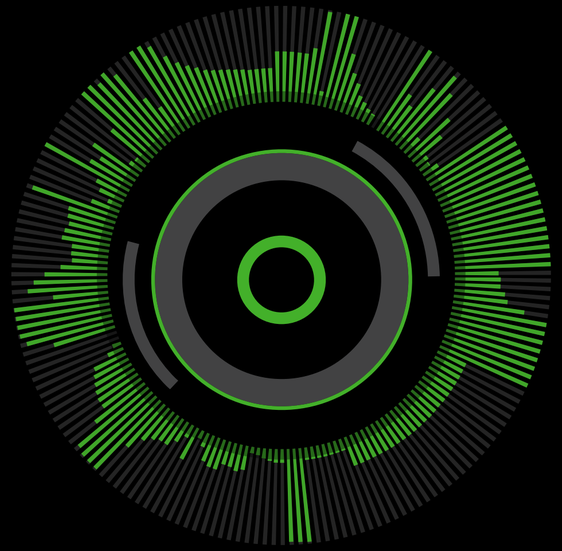
Standardization and process automation: Key aspects for cost efficiency in construction

In recent years, the construction industry has embarked on a journey of slow transformation towards the digitization of its key processes, which the Covid-19 crisis is undoubtedly accelerating. The need to continue executing projects under conditions of social distancing and limited capacity necessarily constrains the work and productivity of workers at construction sites. Hence, the trend towards process automation and the use of remote and industrialized production solutions is increasing.



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A major obstacle for the industry to overcome has been the difficulty in standardizing designs and construction methods so that they can be adapted to the specific conditions of each project. Furthermore, not having a market standard at the technology platform and management systems level has been an additional impediment. However, the implementation of methodologies and tools such as Building Information Modeling (BIM), digital field surveys through Laser Imaging Detection and Ranging (LIDAR) and Georradar and a rapidly growing increase in connectivity are becoming increasingly important in ever more companies across the sector, with further developments and reusable standardizations available in the various projects.

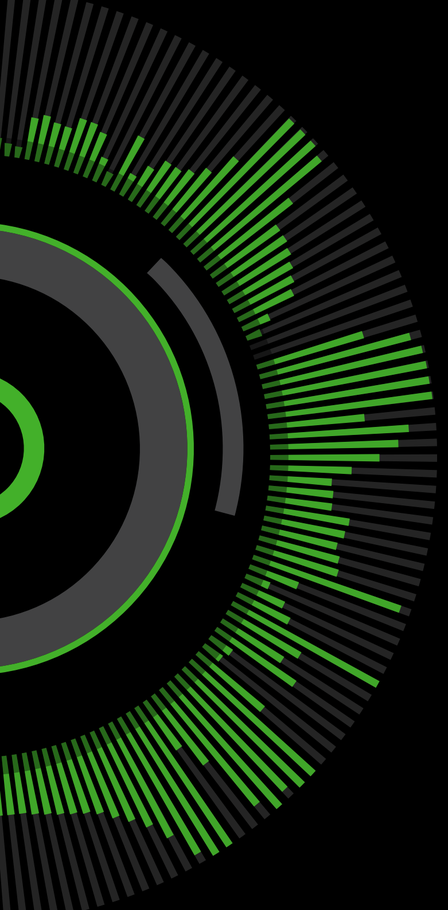
In this regard, it has been found that the digital design of the entire project and the standardized assembly of its parts (which could be factory-built and assembled on-site) drastically reduce the number of changes and simplify the costs of production and assembly, increasing the quality of the final product and minimizing reprocessing. Design management and approval of engineering changes, contract management, communications and notifications are processes that can be quickly done digitally and partially remotely. In addition, through more industrialized production, part of the certification and quality control of work can be carried out before on-site assembly, and the safety of all operations can be improved, for example:

- Creating a virtual model (Digital Twin) in the early stages of design Front-End Engineering Design (FEED) or earlier: Cost accuracy in the conceptual stage can be up to +/- 50%, while in FEED (Ready for Tender) accuracy improves to +/-20% or +/-30%. The use of a virtual model could improve such accuracy even more significantly.

- Digital Asset Lifecycle Management: The inclusion of the Enterprise Asset Management (EAM) tool in the BIM model allows the Digital Twin to be created during design phase (accessible in the Cloud). This facilitates early detection of integration and interference problems and other risks. It also allows data integration with Project Control tools, Quantitative Risk, etc.

- Making better design decisions that limit the impact on Operations and Maintenance (O&M) costs: Digital control of the asset and all of its components allows O&M costs to be planned more accurately, thus anticipating and avoiding cost overruns at this stage.

Increased construction connectivity, sensor systems and Internet of Things (IoT) devices will significantly increase the quality and quantity of data as well as its traceability, allowing each work resource (personal, machinery) to be controlled and its productivity to be measured so that improvements can be made on ongoing basis. In turn, the use of these devices will enable event evidence to be generated that can impact planning, control actual physical progress and furnish a better legal foundation so as to reduce disputes between the parties during the project. The mitigation of contractual disputes is one of the most advanced aspects in the field of project management brought in by BIM methodology combining with IoT devices, since their use allows early warnings to be generated



or future interferences and impacts on the work plan to be visualized. Therefore, the parties can adopt the appropriate measures before the impacts occur, thus reducing the final costs of the project.

Moreover, Geographic Information System (GIS) allow the available data of the physical elements of the project to be structured and tie them to their geographical location, thus reducing the need for comprehensive recognition campaigns, the uncertainties of the design phase, and, consequently, the costs of adapting future projects.

Therefore, the transformation of project management to an integrated BIM-GIS system, with the capability of integrating data from other systems currently used by the company (Customer Relationship Management, Enterprise Resource Planning, planning tools, etc.) offers significant improvements in the various phases of the life cycle of the assets and the organizations that manage them during those phases:

- In the design and construction phases, the associated costs are reduced (15-20% in design and about 10% during construction). The integration of unified information is materialized by reducing investment risk, attracting investment and operators, standardizing processes, and improving productivity and stability of time and costs. There are also other factors that contribute to cost reduction, such as the integration of models and suppliers, the digital implementation of each phase, the simulation of the construction process and virtual monitoring of design and construction.

- In the operation and maintenance phases, operating expense (OPEX) can be optimized at around 10-12% through procurement/supply chain monitoring, improved marketing and management solutions and increased competitiveness. Reducing personnel costs and optimizing processes also contribute to cost improvement.

This gradual standardization and digitization of processes in the project life cycle will give rise to key trends for the transformation of the industry, such as remote work. The possibility that qualified personnel can carry out their duties from any location with enough information about the status and progress of the project will allow productivity and efficiency to be increased without sacrificing control and quality. Even the use of industrialized processes and robots to perform the job will gradually reduce the need for people to perform high-risk work.

In summary, the standardization and automation of processes through digitization and the use of sensors will allow solutions to be resilient and flexible in times of crisis such as the current one, in which, due to the impact of Covid-19, we have validated hypotheses in a context of stress and confirmed the basic cornerstones of digitization in construction:

- Ability to create value in times of uncertainty: standardization and automation as an element of flexibility to create fast and efficient solutions.

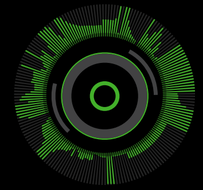
- Maintenance of operations in stressful situations: ability to always operate (24/7) and adapt to changes in workload and relocation of the human factor.

- Ability to drive and incorporate elements of ecosystem innovation by building specific use cases. Applicability with a creative and critical spirit.

- Real-time data collection and analysis for decision-making with "legacy" connection capability.

Conclusion

Nevertheless, it is vital to consider the importance of advancing standardization, automation and digitization in the construction industry by identifying and acting on the challenges of adopting technologies and evolving the way we work. In this connection, it is the organizations themselves, with their difficulties in managing change and their governance, that can prevent changes in scale..



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