White Paper 2022-09

How to Foster Digital Data Capture during Project Construction to Enable Powerful Dashboarding

Capture of relevant digital data is the first step to enable the implementation of improvements generated by data analysis. Digitalisation for the execution of large projects encounters two main obstacles. The first is that it is difficult to encourage on-the-ground live data capture. The second is the management of organisational boundaries across the many contributors (contractors, sub-contractors) engaged in project realisation, which are also digital boundaries.

Solutions emerge that enable consistent data capture and management across the entire project, allowing reactive dashboarding at the project and even portfolio level; and paving the way for future transformations of project execution.

This White Paper explores current possibilities to dramatically increase project execution digitalisation.

Enabling operational on-the-ground data capture

To allow digitalisation, timely capture of accurate data, suitably completed by metadata is essential. All words are important in the sentence: capture needs to be timely – this ensures reactiveness and also avoids data being reported in hindsight. Accuracy is also essential not to feed misleading data in the system; this requires a minimum level of oversight and checks. Finally, data needs to be enriched through e.g. pictures and all metadata that can be captured passively from a modern mobile device: GPS location, time, user secure identification, etc.

Adding data capture tasks to project personnel is too often considered as an additional burden, not to mention a feeling of being monitored by management.

One way to avoid this is to seek automation of data capture. Data capture devices such as 3D laser measurement devices can monitor progress with some AI to interpret data; this is becoming increasingly prevalent in large infrastructure and building works. However, this approach is limited in terms of type of data that can be tracked; it is quite expensive in terms of investment. It is generally focused on getting data from existing machines (e.g. welding machines). However, while this avenue provides substantial data in operating facilities, it remains limited for actual construction work. (see our previous White Paper 2022-08 "How to include digital physical progress measurements in capital project control setups")

The other way is still to request data to be captured by project personnel while making it useful to them by generating efficiencies and more generally improving their work process. The additional value of project-level oversight is then an additional benefit.

It is the approach followed by certain successful providers. Allowing data to be captured on personal phones that effectively decrease site paperwork and increase immediate effectiveness through practical applications has proven to overcome the reluctance of data capture. Effective user interface and well-thought-out processes are essential. Site processes that can be facilitated include for example Permit-To-Work, safety reporting and management, manpower management, quality control, detailed progress reporting.

Specific challenges of on-site construction data capture

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Construction sites may present specific challenges when deploying digital capture tools such as phones or tablets.

- The application must work seamlessly when there is no internet connection (and synchronise as soon as connectivity is re-established), because many construction sites have locations of poor reception.
- In certain situations, on industrial sites, the capture devices must be certified explosion-proof (certified models are now quite widely available and relatively cheap)
- Security considerations may limit applicability (for example, prohibition to take pictures or even sometimes, GPS positioning data) and need to be managed pro-actively.

Overcoming digital boundaries

Most IT applications are limited by organisational boundaries. Reasons include conventional IT architecture restrictions, data protection and access restrictions, and the reluctance to share data with potential (future) competitors. In projects where the contracting strategy always involves many simultaneous contractors at several levels, this is a strong impediment to seamless digital process work. Two types of approaches are typically implemented:

- The owner or main contractor imposes certain tools and platforms to all contractors and subcontractors. Data is managed centrally with suitable access restrictions. This requires a very strong investment in terms of systems architecture and ongoing administration (in particular, user access and solving ongoing

issues). Some degree of access to the data must be provided to all, although the tool provider is the main beneficiary of the data capture. Practical examples include collaborative work around shared 3D models.

- A tool is being deployed by a project party (for example, the construction contractor) as a neutral platform that can be used collaboratively with a more limited scope, that does not capture critical data such as design or major cost data but facilitates essential processes across organisational boundaries.

Focusing on the second option, experience has shown that it can be applied successfully on such aspects of construction works as progress measurement and reporting, manpower utilisation, safety and quality incidents and reporting, logistics management etc. The benefits are significant when processes are involved that can be implemented seamlessly across organisational boundaries, with each step of the workflow can be performed representatives from different organisations. For example, in the field of logistics, a single process can be implemented between the main contractor, the logistics agent and potentially other third parties, all in a single phone app. Another example is quality, where a single process can be implemented involving quality inspectors, contractors, and the owner to identify and resolve quality deviations.

Even when applying the second option, sufficient data can be captured that can be exploited to produce useful dashboards for management in terms of performance, cost and progress. Of course, the first option provides the most benefits as more data including more critical data can be captured through instruction to all contributors in the project, which can be made contractual.

Exploiting captured data

Beyond their primary usage within site processes, once data of a proper quality is captured and stored in a cloud, it can be used in multiple manners through aggregation and identification of trends, and business intelligence software. Data scientists will find many useful usages for those sets of data. Some applications that have already been implemented include multi-scale dashboarding at project and portfolio level, including analysis of trends in terms of production and productivity, safety, and quality. Those applications only start to be deployed operationally, but already provide substantial benefits in terms of reactivity to those organisations that have decided to implement them. Thanks to trending analysis, projects in danger are identified earlier, allowing recovery actions to be taken early; while the performance of the overall portfolio can be monitored on a continuous basis allowing more effective leadership.

What's next?

In the next few years we can expect that capture of on-site project data will become commonplace, providing much improved visibility for managers. Processes implemented across organisational boundaries will also significantly change the process architecture on large projects, with an increased need for the owner or the main contractor to build the right infrastructure from the start around proven solutions that can be used across organisational boundaries by contributing stakeholders.

Summary

Digitalisation of construction will definitely bring substantial competitive advantage to those companies that embark on the journey, allowing a finer allocation of resources, significant increase in reactivity and tracking of issues.

The key to this transformation lies in effectively capturing site data at the source. Proven solutions exist today that enable this crucial step and therefore, all the subsequent value propositions. Implementing those solutions should be a priority in an increasingly competitive construction market.

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