WHITE PAPER

BEST PRACTICE COLLABORATION

Executive Summary

The architecture, engineering and construction (AEC) industry was once almost synonymous with inefficiency and conflict, and was generally regarded as a low-tech business sector. Over the past two decades, great strides have been made in revolutionizing project delivery processes, and in using technology to enable effective collaboration. Web-based platforms provide a powerful means to centralize information for use throughout project delivery -from the earliest conceptual stages where the project brief needs to be developed, through detailed design and construction, to hand-over of a fully-documented new asset to the owner-operator.

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BEST PRACTICE COLLABORATION

In the second decade of the twenty-first century it is increasingly difficult to imagine working in the architecture, engineering and construction (AEC) industry without the internet. Today, almost every organization has its own website, email has become the universal choice for day-to-day written communication, social media is passing from 'fad' to normal, and many of us routinely access the internet 24/7 via smartphones and tablets.

Twenty-five years ago, it was a very different story. CAD (computer-aided design) had yet to replace manual drafting, word-processing was gradually making typewriters obsolete, and the fax and (later) email were accelerating communication. Additionally, some once-laborious design, visualization and analysis tasks were being automated, and we had bulky mobile telephones and desktop devices. Despite these adventurous strides in technology, the initial industry tendency was inevitably to turn the end product back into paper.

Project delivery was also a largely sequential – and often inefficient procurement process. For example, a client might seek professional help on preparing some initial plans to meet a perceived need. A design team would then spend time developing the conceptual proposals to an advanced level of detail before seeking a contractor (and its supply chain of subcontractors and suppliers) and, after a bidding process, beginning the job on site. The main contractor and supply chain would then construct the project and upon practical completion hand it over to the client who then assumed responsibility for the asset's operation and maintenance. Despite 'lean thinking' impacts in other industry sectors, construction project teams seldom shared information with their supply chains. From the outset, specialist suppliers, contractors and sub-contractors were often unable to contribute to design development, build-ability, or future asset operation and maintenance of the client's asset.

The disconnected nature of many project teams was also a factor in the industry's inefficiency. For example:

- Teams were usually assembled only for the duration of an individual project
- Only a small portion of the total team might ever meet or be co-located on site
- Technology constraints limited the ability to share information freely (even if teams overcame adversarial, mutually suspicious contractual mind sets)
- Project perspectives were colored by the type and volume of information shared between individual team members
- At the end of the project, teams were disbanded, often dispersing the collectively acquired knowledge.

The AEC industry has always been highly information-dependent, and sharing accurate, timely information is critical for all participants. Yet, in the late 20th century, many projects were delivered late, over-budget or falling short of client expectations. Expensive and time-consuming litigation often resulted as customers, contractors, consultants and supply chains – and their lawyers – sought to appropriate blame for wasted time, cost overruns and/or construction defects - issues that could almost always be traced back to poor co-ordination caused by late, inaccurate, inadequate or inconsistent information.

Moreover, most of the industry's IT applications did little to improve matters, being developed as stand-alone tools (example: CAD was separate to scheduling, which was separate to cost control, etc.) with little integration between them. With most team members widely dispersed and mobile, what was needed was some means to communicate, centralize and share that information more quickly and efficiently.

Partnering, integration and collaboration

Fortunately, during the 1990s, the construction industry saw the need to address these problems.

Within a notoriously conservative industry, some contractors and consultants recognized the value of establishing long-term relationships with customers and other members of the supply chain. Instead of working on single projects, some owners began building more long-lasting, strategic relationships on the grounds that they were also capturing information, experience and best practice by working repeatedly with a small number of framework suppliers. They realized that knowledge created during project delivery was a valuable 'whole life' asset that could be used to enable better planning, continuous performance improvement and risk reduction across their current and future property portfolios – an ambition that is today reflected in the push to adopt Building Information Modeling (BIM).

The rise of online collaboration

So, by 2003, the future direction of the construction industry was being tied to the adoption and implementation of more collaborative and integrated methods of working, underpinned by new collaborative forms of contracts. And the key role of IT was also being repeatedly stressed by industry change initiatives, particularly as progressive owners were already harvesting the benefits of new web-based technologies.

The development in the late 1990s/early 2000s of new internet-based collaboration platforms – so-called 'project extranets' – had already heralded a new era. Unlike previous technologies such as FTP, groupware or LAN/WAN-based electronic document management systems, these did not tie end-users to particular networks, and did not compromise corporate network security by allowing outsiders to penetrate firewalls, etc.

Moreover, being mainly serviced by independent collaboration software providers such as Viewpoint Construction Software, they freed clients or project team members from committing IT resources to a system's acquisition, implementation and support. The systems also did not require any major investment by other end-users in new hardware or software to access the system (an important factor, perhaps, when partnering with smaller suppliers and other project participants). Information could be made available from a project-specific website hosted at the vendor's facility, and remained private, securely managed and only accessible by authorized team members.

Broadly, all such systems can be accessed through a computer equipped with a standard browser and a working internet connection. The same basic functions are common to all. Authorized users, no matter where they are located, can get immediate 24/7 access to a single, secure, central repository of project data that grows as information about the project or program (a building, a road, a bridge, a water treatment plant, etc.) is developed by the team. Feasibility studies, budgets, sketches, CAD drawings, approvals, schedules, minutes, photographs, specifications, standards, procedures, digital models, etc., can all be viewed. Team members can add comments, issue notices, instructions and requests for information (RFIs), and publish drawings and documents, singly or in batches. Everyone works on the most up-to-date, accurate and relevant information – "a single version of the truth" – backed by all the archive material, with all versions and interactions tracked and documented in a secure audit trail.

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Ultimately, these web-based applications offer a way to improve the management of key project information. The goal is that project times, costs and risks (as well as post-project claims and litigation) could be reduced, and efficiency, communication and quality improved.

As adoption grows, vendors such as Viewpoint, with their Viewpoint For

Project Collaboration product, were able to provide more functionality to support different stages of the procurement process, from pre-construction, through construction to post-completion.

Pre-Construction

A construction collaboration platform can help the project team share key information at the initial conceptual and planning stages when the project brief may still be in development, and when there may be different options to satisfy the project owners need (for example: refurbish or extend an existing facility rather than build a new one). The brief can be reviewed by end-users, including those – such as facilities managers – who will ultimately be responsible for operation and maintenance, and their post-construction information requirements can begin to be incorporated.

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Feasibility studies, site surveys, ground investigations, utilities information, site access routes and other information can be collated to support the initial project team's deliberations, and early design concepts can be developed to form part of the tender information issued to prospective contractors. Plus, once contractors and their supply chains are appointed, they can advise on potential build-ability and logistics issues before construction starts, and develop detailed plans to mobilize on site.

In the meantime, engagement with planning and building control agencies can be simplified by giving them controlled access to the information they need to grant the necessary permissions, and local consultations might also be supported by communications (website, newsletters, etc.) based on information on the platform.

Construction phase

Once construction starts, the collaboration platform will handle the constant exchange of information between all project team members, supporting common processes such as RFIs, change orders, instructions and notices. With information stored in one place, finding the latest versions of drawings and other documents is simplified -search and reporting tools allow any authorized user to view the current status of any aspect of the project.

If users haven't logged into the system recently, email alerts highlight matters that need their attention, while the system's audit trail constantly records who does what and when. Site photographs (including webcam outputs) can be captured in the system to help non-site-based team members monitor progress or resolve particular issues.

Contract change management workflows can be tracked to give project managers and the client more accurate forecasts of schedules and budgets, adjusting for weather events and other unpredictable factors.

Drawings, documents and workflow information on the collaboration platform can also be accessed via mobile devices when the user is out on-site. Structured data can also be captured in the field – for example, during inspections for health and safety, or construction quality control.

As-built information, inspection reports and compliance certificates can be progressively assimilated into a structured 'Health and Safety File' to meet CDM requirements for post-completion operation and maintenance purposes.

Post-Completion

From the project's inception, information about the asset can become an indivisible part of what is ultimately handed over to the owner-operator. While some of the detailed exchanges of information during design and construction may have little value for future operation and maintenance, the client will at least have a complete archive of the project, including an audit trail of all communications to review should there be any claims or disputes relating to the final output (project team members can also receive an archive recording their involvements with the scheme).

More importantly, the project owner will have a detailed electronic record,

including graphical and written information, about what has been handed over. Some of this data can be re-used for facilities management purposes, with the as-built information capable of being updated when any repairs, maintenance, refurbishment or extension works are undertaken. Such information might also be augmented by data (historic and real-time) from operational systems, providing a 'dashboard' view of the facility at work. Such feedback, combined with the brief that emerged, may be useful if the client strives to deliver an even better project in the future.

A collaborative caveat

The achievement of these benefits throughout a project, however, remains dependent on adopting an open and collaborative approach:

- Collaboration requires a combination of people, processes and technology/information
- Successful collaboration is 80% people and processes and 20% technology or information1

In other words, successful collaboration is much more dependent on the culture of the team than it is on the technology it employs. Collaboration in the built environment is also different from collaboration in other fields: it involves individuals representing different professions with different goals, objectives, even beliefs. Architects, engineers, clients, property managers, and others who comprise a design team rarely share a common educational foundation, and often differ on what is important and what is not; in turn, those involved with regulatory work, with construction activities, with supplying materials and products used in the project, and with long-term responsibility for the asset's operation or maintenance will have different perspectives and motivations to those in the design team. A construction project involves temporary groupings of independent organizations who join forces to accomplish a specific, relatively short-term project. While they work together to achieve the common goals of the project, each organization also has its own, long-term goals, which may conflict with the project goals. Collaboration in construction also tends to stretch out over a long period time, often beyond the involvement of the initial participants, though their decisions and actions may still affect the project. Equally, some team members may only have a transient input during a project, but their involvement and the legacy of their actions can still leave a lasting impact.

So what is purported to be collaboration may not be collaboration at all, particularly if a project team is unable or is not prepared to collaborate. Team members may look to configure or customize their applications to mimic traditional project information controls and so electronically restrict access by some team members to certain types of information. Such teams might achieve one-off savings on tangible costs such as postage and printing, but will miss out on the significant efficiency (time, cost and quality) improvements arising from adopting more integrated and genuinely collaborative approaches.