Redefining the Digital Landscape of Rail and Transit

Steve Cockerell
Industry Marketing Director
Rail and Road

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Ever since the first railways were constructed, rail professionals have focused effort on improving this method of travel to be the safest, fastest, and smartest means of moving people and goods. In an ever-evolving digital world and economy, however, the only way for our industry to advance is by embracing digital technologies and workflows throughout the planning, delivery, and operation of both existing and future networks, as well as the systems that support them. This kind of digital transformation will not be easy. It will likely require a profound shift of business and organizational activities, processes, competencies, and models for those involved, but without it, we will never fully realize the opportunities going digital can, and undoubtedly will, deliver in the future.

Digital Collaboration for Improved Outcomes

A significant part of this digital journey for many of the organizations involved is in establishing or adopting building information modeling (BIM) standards and processes. However, according to a report issued by McKinsey & Company, the construction industry, has yet to adopt an integrated platform that spans project planning, design, construction, operations, and maintenance. As a result, most have no single source of information relating to a project's design, cost, and schedule, or the condition of assets during operations.

BIM adoption, of course, is much more than using the latest cloud software or digital technology. It is about the people involved, the processes they follow, and, where appropriate, the supporting technology they use to achieve the required outcomes. If embraced by all, BIM methodologies can transform traditional project management—where data is unstructured and team members work independently—into a truly collaborative environment.

BIM standards and processes rely heavily on a common data environment (CDE), which offers users the single source of truth for information relating to a project or asset. A virtual environment that leverages digital workflows to enable real-time sharing of structured, reliable information for all and mitigation of risk, ensures timely progress, improved quality, and, ultimately, better and more reliable outcomes. Given these benefits, it is little wonder that governments around the world are mandating the use of BIM processes on all public infrastructure projects.

Digital Workflows Across the Whole Lifecycle

McKinsey reports that the construction industry is ripe for disruption. Large projects across asset classes typically take 20 percent longer to finish than scheduled and are up to 80 percent over budget. In a separate study, Bent Flyvbjerg, one of the most cited scholars in the world on megaproject management, and Professor at Oxford University's Saïd Business School estimated that nine out of 10 projects costing USD 1 billion or more go over budget, with rail projects going over budget by an average of 44.7 percent. Surely then, the rail industry has a tremendous amount to gain from going digital. It could be argued that going digital should be at the forefront of everyone's mind because time and cost over-runs on new capital projects and on existing rail network upgrades affect the global population.

Take, for example, London's soon-to-be-operational Elizabeth Line, currently being constructed by Crossrail Limited in the United Kingdom. At any given time, there are a significant number of varying organizations and disciplines, including civil, structural, mechanical, heating, drainage, lighting, and fire safety engineers, who are responsible for its construction and need to share information and coordinate work. Then, the addition of an estimated 200 million annual passengers using the system during operations will complicate matters further, as many of those same disciplines will need to maintain the railway safely and with minimal interruption to service.

Crossrail's holistic approach to BIM standards and processes, including those outlined in the PAS 1192 suite, not only provided a streamlined creation and management of information during design and construction, it will ensure the efficient and effective handover of information to the railway's future owner for use during operations. Widely considered as a global exemplar for its work in digital information management, Crossrail moved its CDE to a hybrid cloud-computing platform powered by Microsoft Azure in 2016. Currently, this platform provides the organization with a single location for storing, sharing, and managing information for approximately 1 million assets. The project remains on time, on budget, and is on track to be the first major UK infrastructure project to fully realize the value of BIM methods across the whole asset lifecycle.

Embracing Digital Technology

Malaysia's Mass Rapid Transit Corporation (MRTC) will be one of the first organizations in Asia to leverage digital solutions throughout the whole asset lifecycle on its Klang Valley Mass Rapid Transit (KVMRT) system's Sungai Buloh–Serdang–Putrajaya (SSP) line. The second of three planned MRT lines, the SSP Line includes a total of 37 stations, 11 of which will be constructed on the 13.5-kilometer underground section, and will serve a population of around 2 million people along its 52.2-kilometer corridor.

Embracing digital technology is central to MRTC's vision of providing relevant, trusted information wherever and whenever it is needed. To achieve this, it has mandated the UK Government's BIM maturity Level 2 be met on the project. Team members will leverage the same digital workflows outlined in PAS 1192 and a CDE to move beyond 3D modeling and 2D deliverables and enable handover of digital as-built information to operations.

Poh Seng Tiok, director of planning and design at MRTC said, "Bentley's connected data environment, bridging ProjectWise® and AssetWise®, provides a seamless solution for MRT Corporation in our BIM workflow and supports the sharing of information through the entire project lifecycle. Operating Bentley's CDE in the Microsoft Azure cloud enables our geographically dispersed project teams to collaborate as if they were all centrally located."

Realizing a Digital Future

Realizing a digital vision does not happen by chance. Benjamin Franklin once said, "if you fail to plan, you are planning to fail," and the most successful rail organizations to

navigate this digital journey will be those that set clear objectives for success, along with timelines for resolving them.

China Railway Eryuan Engineering Group Co. Ltd. is an example of an organization that has revolutionized its processes and is going digital in this way. Working on the CNY 25.7 billion Dali to Ruili Railway project, the team faced many technical, collaboration, and coordination challenges. Their use of Bentley applications enabled modeling efficiency on the tunnels, bridges, and geology to be optimized, and ensured fast and efficient transfer of the 3D design model to the construction team.

"By using the Bentley platform, the 3D collaborative design of the whole project was completed efficiently and rapidly, which brought hope and confidence for our future intelligent railway construction," BIM Centre Director for China Railway Eryuan Engineering Group Co., Ltd. Fengxiang Dong said.

When complete, the railway will incorporate the world's longest span on a railway arch bridge and Asia's longest railway tunnel. It was designed and is being constructed with the help of an integrated 3D collaborative design model. Bentley's BIM technology has enabled the team to establish a foundation for the future design and digitalization of all its railways in China.

Your Digital Journey, Your Digital Future

The entire infrastructure business is currently undergoing a digital transformation. Rail and transit is, in many ways, at the forefront of this digital journey. Our networks are full of complexity and are often spread over large distances. The teams working on these critical pieces of infrastructure not only need to create, collect, and manage increasing amounts of asset-related data, they need to do it more efficiently and effectively, to ensure the digital information held can be trusted and accessed by whomever, whenever, and wherever they may be.

For rail and transit, there is no such thing as a digital future, for there is no future without digital. It is the digital present and how organizations are "going digital" that will ultimately separate them from their peers and competition. The potential is significant, the time is now, and the possibilities perhaps endless. Throughout the CAPEX and OPEX phases of the lifecycle, the organizations involved need to do more with the same time, same money, same people, and same assets, to deliver the service, safety, and reliability that is demanded of them every day. The examples I've shared from the United Kingdom, China, and Malaysia show how global owners and their supply chains are going digital today to deliver different outcomes for tomorrow.

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