Ferrovial is one of the world’s leading infrastructure operators and services companies, committed to developing sustainable solutions. The Ferrovial Centre for Asset Management is a community that brings together internal stakeholders such as Ferrovial Agroman, Amey, Cintra, and Heathrow Airport and external ones such as IBM, to advance the level of knowledge in the industry, provide thought leadership, and deliver innovative, first-of-their-kind projects.

Business challenge
The lifecycle of assets can span many years and involve many stakeholders. Without consistent enterprise asset management, the total cost of ownership can rise significantly.

Transformation
Ferrovial’s CAM community worked with IBM on a business value assessment and proof-of-concept at Heathrow Airport to test the value and feasibility of integrating data across the asset lifecycle.

Business benefits:

3% to 7% saving in lifecycle costs for new infrastructure

End-to-end flow of asset information enables stakeholders to collaborate efficiently

100s of hours of manual work eliminated by automating asset data management processes

“Over the lifecycle of a project, a three percent saving could potentially reduce the total cost of ownership by tens of millions of dollars.”

Teodoro Alvarez Fadon
Global Head of Innovation
Ferrovial Agroman

Ferrovial
Investigating the case for lifecycle asset information integration for infrastructure and buildings

Ferrovial
Creating a seamless flow of asset information

Large-scale infrastructure projects are often judged on the cost and timeliness of their construction. If a bridge, highway, airport or hospital is completed on schedule and within budget, the project is generally considered a success. However, leading infrastructure organisations such as Ferrovial and Heathrow Airport are increasingly coming to realise that construction is not the end of the process; it is just a milestone on the journey. A truly successful project is one that delivers assets that are cost-effective throughout their operational life—from design and build through operation and maintenance to disposal. As a result, adopting a lifecycle approach is becoming a key objective for asset owners, construction companies and infrastructure operators alike.

Teodoro Alvarez Fadon, Global Head of Innovation at Ferrovial Agroman—the Ferrovial Group’s construction division—explains: “From a construction perspective, we need to make sure we develop something that complies with the Employer Information Requirements over its lifecycle. That means we need to consider operational expenditure as much as capital expenditure. If you save money during construction, but make the building more expensive to maintain, the ultimate result may be that the lifecycle costs increase.”

One of the biggest practical problems with adopting a lifecycle approach is that most large infrastructure projects involve many participants. The architects, contractors, owners, operators and maintainers of an asset may all work for different companies, with different commercial objectives, cultures, systems and processes. When one of these participants hands an asset over to another, valuable information is often miscommunicated or lost in translation—which results in confusion, duplication of effort, and inefficiencies that increase operational costs for all parties.

Augusto Siguero Güemes, Project Manager at Ferrovial, comments: “A classic example is the handover from the contractor to the asset owner or operator. For a large facility, there might be thousands of assets that need to be manually registered in an enterprise asset management system—a job that can take hundreds of hours of work over many months. Much of this data already exists in the architect’s and contractor’s plans, but without a way to ingest it into the asset management system, the data needs to be rebuilt from scratch. And this kind of issue may occur multiple times over the course of a facility’s life, as ownership and operational responsibilities change.”

Richard Butterfield, Professional Excellence Director at Amey—the subsidiary of Ferrovial Services in the United Kingdom—adds: “If asset information can’t flow from the design and build stage to the operation and maintenance stage, it can’t flow in the other direction either. This means that operational teams don’t have an easy way to review plans or offer their expertise during the design stage—which again increases the risk of inflating maintenance costs over the long term.”

Building information modelling (BIM)—the process that enables the creation of detailed 3D models of every asset within a facility—potentially offers a solution to these problems. If BIM principles are used to create a complete model of a facility at the design stage, the model can be used in conjunction with traditional asset management systems to provide a single source of truth that all participants can rely on, and that will persist throughout the lifecycle.

However, although there has been much speculation in the industry regarding the potential benefits of BIM as a basis for lifecycle information management, Ferrovial and Heathrow found little documented evidence that it works in practice.

Andy Miller, Head of Asset Information at Heathrow Airport says: “Although the theory is attractive, we could not find many case studies that demonstrated the real-world benefits. To support our plans for construction and investment over the coming years, we must ensure we adopt the smartest and most cost-effective processes and technologies—so it was important to find out whether BIM could really justify the business case.”

Each of Ferrovial’s business divisions—construction, services, tolling and airports—had a similar interest in learning whether the concept of BIM
for lifecycle information management would work in practice. As a result, the subject was raised during a meeting of Ferrovial’s Centre for Asset Management (CAM) community.

Darren Anderson, Head of Consulting and Asset Management at Ferrovial, explains: “The CAM is a relatively small team, but it co-ordinates a large group of senior technical and business stakeholders from all areas of our community. Its role is to take a broader view of issues that affect the whole community, and initiate innovative projects where individual businesses would struggle to demonstrate the business case, or might not have the holistic capability to realise as standalone entities. The CAM community was interested in the potential of BIM, and voted to fund some research into the topic.”

Richard Butterfield adds: “BIM is a relatively young discipline, which has mostly developed in the design and construction sector, while asset management is quite a mature field, and focuses mostly on operations and maintenance. We wanted to bridge the gap between these two communities and see what we had to learn from each other.”

**Proving the concept of lifecycle asset information management**

To turn theory into practice, the CAM team—augmented by stakeholders from Heathrow, Ferrovial Agroman, Amey and Cintra—needed to find a way to objectively assess the benefits that BIM could bring to a real-world project.

Augusto Siguero Güemes comments: “We decided to look at a building that we had recently completed—the T3IB baggage handling facility at Heathrow Airport. T3IB offered a rare combination of advantages: the asset owner, Heathrow, was a member of our community; the facility was designed and built by Ferrovial Agroman, using advanced 3D modelling techniques; and Amey had provided services for similar facilities at other Heathrow terminals, so they had a good idea of the maintenance requirements. So we had all the information on assets and costs within the community already, and the building was a reasonable size, had the right level of complexity, and contained the right mix of assets to act as a fair environment for a proof-of-concept.”

To help the team deliver the project, it needed a technology partner. Darren Anderson explains: “A key enabler for the project was to integrate the T3IB BIM models with an asset management system, so we needed a partner with the right technical skills. Heathrow’s asset management system is IBM® Maximo®, so IBM was an obvious choice. However, we also knew that the main challenge of the project wouldn’t be the technology itself, but building the right processes around that technology—and finding an objective way to measure the financial and operational impact of adopting those new processes. We realised that IBM’s Business Value Assessment methodology, and the IBM Blueworks Live™ business process modelling tool, would help us overcome these challenges too.”
Teodoro Alvarez Fadon adds: “IBM acted as a trusted partner—they brought the technical expertise we needed, but they were also flexible about working with the tools we already had. They didn’t treat this project as an opportunity to sell more software, but as a genuine research project—and they were just as interested in establishing the truth about BIM as we were.”

The Business Value Assessment approach enabled the project team to model all the processes that each of the participants had originally used to deliver the T3IB project, and rigorously allocate the time and costs of the delivery to each process to provide an accurate baseline. Next, the team developed a revised set of processes that could be used to design, build, operate, maintain and decommission an identical facility—but this time, the processes were built around the concept of lifecycle asset information management with BIM methodology. By comparing the two sets of processes, the team was then able to assess the positive and negative impacts of the lifecycle approach.

Andy Miller comments: “The process modelling techniques that IBM taught us were very good—they gave us a lot of clarity about where the benefits would be, and how to align our processes to maximise those benefits. It would have been impossible to be confident in the results of the exercise without this rigorous approach.”

From a technical perspective, the project involved enriching the existing 3D models with additional asset data, setting up a new instance of IBM Maximo Asset Management in the cloud, and then loading the BIM asset data into it. Once the import was complete, users were able to navigate easily from the asset record to the 3D model and vice versa.

Antonio Garcia Fernandez, Head of Technology & Innovation at Cintra, Ferrovial’s tolling division, comments: “Although Cintra manages linear assets rather than facilities like T3IB, we were still very keen to be involved in the project—partly to provide an independent perspective, but also because we are currently deploying Maximo in our own business. We were very pleased that the project confirmed our confidence in Maximo as a flexible platform that will be able to support this kind of integration in the future.”

Teodoro Alvarez Fadon says: “Aside from the specific aims and achievements of the proof-of-concept itself, the decision to involve the entire CAM community in the analysis of the T3IB project created a lot of benefits in itself. We rarely get the opportunity to review a project in such detail with input from all stakeholders and independent experts. All parties learned valuable lessons that we will help us make future projects even more successful.”
Lifecyle approach delivers real-world results

The outcome of the Business Value Assessment showed that adopting the new processes and integrating the BIM process and Maximo would have delivered savings of between three and seven percent over the anticipated 20-year lifecycle of the T3IB facility at Heathrow. The exact level of benefit achieved within this three to seven percent range would depend on factors such as the level of BIM adoption and the quality of the models that were produced.

Teodoro Alvarez Fadon comments: “Over the lifecycle of a major infrastructure project, a three percent saving is a significant benefit—potentially reducing the total cost of ownership by tens of millions of dollars. However, independently of the figures, the most important lesson learnt is that by using this collaborative approach, it is possible to reduce cost in CAPEX and OPEX during the lifecycle of infrastructures.”

Darren Anderson adds: “Almost more important than the net savings figure is the knowledge transfer gained through this project, as well as the fact that more than 30 senior experts from all areas of the business were involved in the project, and can see where and how to realise the benefits both as an ecosystem and in their own individual areas.”

The value of the new approach is particularly evident at specific points in the lifecycle, such as handovers. By eliminating the need to populate an asset management system manually with thousands of asset records, integrating BIM and asset management from the design stage onwards could save hundreds of hours of work over many months. And more generally, having a seamless end-to-end flow of asset information enables smarter decision-making at every stage.

Antonio Garcia Fernandez says: “Better visibility and traceability means that we have greater control and understanding of the risks involved in a project, so we will be able to mitigate them earlier in the lifecycle. Moreover, we will more easily be able to prove to clients and partners that we are working in an efficient and professional manner. Having a single source of information that all participants use and trust will eliminate the majority of the misunderstandings and disputes that arise during complex projects.”
Looking to the future, Darren Anderson comments: “This project has helped us identify a real opportunity: both the technology and the standards around BIM adoption are still in an early stage of development, and we can help to shape them. It’s not about a giant leap forward—it’s about helping the industry make a series of well-considered steps in the right direction. By stripping away the hype and establishing the facts about BIM and lifecycle asset information management, we’re enabling our businesses and our clients to make the right business decisions based on realistic business cases.”

The CAM community sees the proof-of-concept as the first in a series of potential innovation projects that will explore the use of similar approaches for the construction and management of linear assets, as well as the feasibility of using BIM to model existing infrastructure.

Richard Butterfield provides some context: “Although all new government-funded construction projects in the UK are now required to use BIM, the value of existing UK public infrastructure is at least 20 to 40 times higher than the value of all the new public sector capital projects that will be built in the next five years. So by 2021, only about two percent of all existing public sector infrastructure will have been modelled with BIM. The challenge is to discover whether it is economically justifiable to create BIM models for the other 98 percent too.”

Nevertheless, the community is now convinced that the use of BIM will gradually expand throughout the construction and services sector, and is determined to maintain its position as a leader in this space.

Darren Anderson comments: “As digital asset information becomes more common, we need to be able to give our clients the best advice about how to make the best use of that information. It’s our responsibility to innovate and lead the industry.”

Richard Butterfield agrees: “It’s inevitable that we will be using BIM in the future. As a forward-thinking technology-enabled organisation, Ferrovial is well-placed to influence the BIM standards as they develop, and be in the best position when the tipping point is reached.”

Antonio Garcia Fernandez adds: “Some of our clients are already asking if they can have a 3D model that their operations teams can view on their mobile devices—so the demand definitely exists. The fact that Ferrovial is actively investing in research in these areas shows that we are moving in the right direction.”

Andy Miller says: “From Heathrow’s perspective as an asset owner, it’s important for us to take the lead in understanding and profiting from these new technologies and best practices. Working hand-in-hand with partners like Ferrovial and IBM gives us the insight we need to plan our future projects more effectively.”

Augusto Siguero Güemes concludes: “The CAM community’s broad reach across all the stages of the asset lifecycle puts us in a unique position to do this kind of research. By bringing all the participants together and learning from each other’s skills and experience, we are greater than the sum of our parts.”