

COMPANY OVERVIEW



COMPANY WEBSITE
www.bamcontractors.ie

Operating successfully for over 60 years, the bedrock of BAM’s success has always been an understanding of our clients’ needs and a willingness to deliver innovative solutions that ensure cost savings and surpass environmental expectations. BAM Ireland is the top Civil Engineering company in Ireland and it is in the top two of the country’s largest construction businesses. We employ 2,000 people directly and indirectly with a forecast turnover for 2018 of €550M. Operating across all construction sectors and throughout the complete project lifecycle, our principal activities are building contracting and civil engineering in the public, private, and PPP sectors. Other activities include

facilities management (FM), property development, and rail infrastructure.

It is BAM’s mission to build sustainable environments that enhance people’s lives by enabling the right people to capitalise on state-of-the-art knowledge, resources, and digital technologies while also providing solutions across the total construction lifecycle for BAM’s clients and generating maximum value for its stakeholders. We are a member operating company (OpCo) of Royal BAM Group of the Netherlands – a stock market listed PLC that is answerable for performance – which has a turnover of €6.6Billion and employs 19,500 people worldwide. At BAM we are building the present while creating a sustainable future for all.

AUTHOR



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OVERVIEW OF THE LEAN INITIATIVE

This initiative is a brief overview of BAM’s journey to date to learn the Lean methodology and culture from the manufacturing industry and translate them into the more traditional construction environment. In Ireland, this journey has been evidenced on the following projects:

- Semi-Conductor Facilities – East Coast.
- Schools Bundle Programme – PPP Nationwide.
- National Children’s Hospital – Dublin.
- Brewery Quarter Development – Cork.
- Horgan’s Quay Development – Cork.

BACKGROUND TO THE LEAN INITIATIVE

In 2012, the BAM Group recognised that the construction industry was changing and we had to change too. Traditionally construction projects are cost-driven and not task-readiness-driven. BAM Ireland took the initiative to look at how projects were delivered and what improvements could be made. Focusing on safety, quality, material waste, and time and motion studies, we identified many opportunities to improve traditional construction practices.

BAM’s Lean journey started in 2014 with the launch of the Lean Construction Ireland (LCi) community of learning and practice comprising clients, construction companies, and individuals willing to share knowledge and the successes of Lean. The idea was for LCi to act as a catalyst to transform the construction industry in Ireland. Additionally, whilst working at a major semi-conductor client site, I personally became aware of the success of Lean manufacturing principles and could see how

Lean principles and techniques were an opportunity to transform construction as we knew it. Since then, BAM has embraced and implemented Lean principles on several pilot projects, and, together with the development of our 2020 Digital Vision, Lean implementation is having an immediate effect improving safety, quality, waste, and cost savings.

Our Lean journey will take time, but we all understand that it is a necessity for the industry to both survive and thrive in our modern world. BAM’s journey is one of progressive and evolution-based learning that is guiding our cultural growth towards a more effective and efficient model for the construction environment. Over the 6 years since 2012, BAM has taken the initiative to look at how we deliver our projects and we have worked hard to constantly improve that delivery. By 2014, BAM leadership had realised the benefits of Lean methodologies and moved to implement them across the Group.

LEAN INITIATIVE UNDERTAKEN – LEAN THINKING, TOOLS, TECHNIQUES

As a construction company we could clearly see the Lean Pillars and foundations as they applied to our industry at the most fundamental levels. So, the application of these principles led to the rationalisation of our processes and the development of our “2020 Digital Vision” and the “BAM Digital House”.

In a very traditional industry that has historically resisted the advantages that modern technology can bring, BAM made the decision to take advantage of the upheaval that results from the inevitable cultural change and to implement both Lean thinking and digital technologies simultaneously. This bold strategy touches all aspects of our business and accounts for both the inertia of implementing such a cultural shock and the benefits of the evolution. BAM’s 2020 Digital Vision has set the foundations of our company’s path into a future where we will deliver projects in the most collaborative, efficient and effective manner possible.

For BAM Ireland, our primary goal was the successful deployment of digital technology (BIM) to our sites which was key to the on-time delivery of the Schools Bundle Programme and the collection and delivery of the asset information for the subsequent facility management requirements. In parallel to our digital deployment (BIM) was the design and



Figure 1. BAM Digital House.

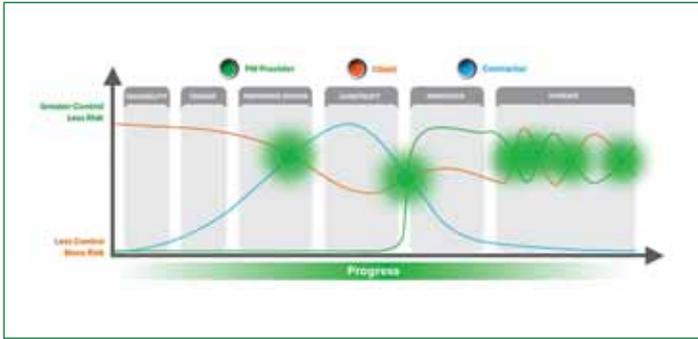


Figure 2. Traditional Project Lifecycle.

implementation of our internal processes to meet the international standards for construction PAS 1192, and defining this process was a key milestone on our 2020 Digital journey which received accreditation and then the awarding of a BSi Kitemark for our PAS1192 Level 2 BIM process.

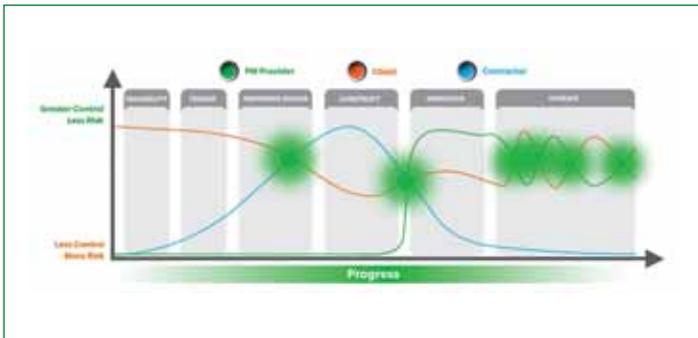


Figure 3. BAM Envisioned Project Lifecycle.

Having implemented Lean culture and digital processes we have seen the cultural change across our projects, and we are currently deploying Lean methodologies like the Last Planner® System (LPS) directly to projects, prioritising centralised stakeholder satisfaction, and adopting JIT delivery for certain processes is being explored for future projects.

Lean Fundamentals

When BAM was looking to implement Lean Construction principles on site, we looked at what it would mean for us as a company and how best to implement it, and we started with simple definitions like what it is:

- Lean is a philosophy.
- Lean involves simple common sense principles.
- Lean is doing more and more with less and less.
- Lean improves time, cost, quality, and safety without a trade-off.
- Lean builds a relationship of trust between client, suppliers and contractors.

From this we developed simple strategies that we could implement:

- Clear strategy, working for the one goal.
- Introduce Lean environment for construction process and delivery (via BIM & LPS).
- Introduce smart technology to site.

Digital Deployment & BIM

To implement our strategy, we introduced a Mobile Site Management System (MSMS) and Production/Pull Planning that allowed the following:

- Review drawings/data sheets on site.
- Interrogate BIM model on site.
- Raise RFIs in real time.
- On line Productivity tracker.
- Complete various check lists.

- Provide transparency to aid communication.
- Greatly reduce paperwork and duplication of effort.

All of the above happened within a single environment that all of the project stakeholders had access to – which greatly increased the level of communication. It also greatly reduced the silo effect of tribal and specialist knowledge, which in turn led to more efficient communication and resolutions of issues. By putting the latest information in front of the relevant party (for example, an up-to-date 3D model and drawings in the hands of the site engineer) decisions could be made to resolve issues in greatly reduced timeframes. This process was carried through on all aspects of the project, from design to site housekeeping and asset management for final handover.

In addition, the use of the MSMS greatly reduced the duplication of work through automated reporting and the use of digital media. Travel times were greatly reduced – on site where all documentation was carried on iPads and accessible when required, and off site where site visits were on a need only basis not a scheduled basis – leading to savings for all stakeholders. All aspects of the project were recorded and communicated, leading to exemplary on-time delivery to the Client.

The Schools Bundle Programme included a requirement for all schools to be delivered to the highest level of BIM (7D facility management). This was the first time the Client Authority included such a challenging requirement in any of its PPP projects to date. As this project was nationwide and had multiple design and delivery teams, BAM's Virtual Design & Construction (VDC) department was tasked with providing all stakeholders within the project – the Client, design teams, site staff and FM personnel – with structured training around each of their roles and responsibilities for the successful delivery of a Level 2 BIM project. The use of BIM during the bidding stage of the competition had many benefits, all resulting in a Lean delivery.

Last Planner System and Pull Planning

Having embraced Lean construction and its principles, BAM recognised the importance of adapting Lean tools, techniques, and cultural change to improve the productivity curve and eliminate wasteful activities in the construction industry. With the successful implementation of our MSMS, BAM is gradually introducing Lean tools and techniques on all its sites. We are aware this journey will take time, but are comfortable with that as Lean itself is a never-ending process of continual improvement.

Since the launch of the LCI, I am personally noticing a significantly better understanding of Lean Construction within the industry – with LPS in particular now used by a number of contractors – and the respect and value that accompanies being Lean. In 2014, BAM adopted LPS in Ireland and the UK. The projects involved design, build, and facility management for 25 years, and these projects were seen as an opportunity to engage early with the full project team, including, Client, designers, sub-contractors, suppliers, and FM. BAM employed an experienced Lean consultant to coach/train the project team, Director PMs, foremen, trade supervisors, and key specialist sub-contractors (Last Planners) in Lean concepts.

Last Planner System Techniques/Pull & Production Planning Implemented

A Pull session was convened facilitated by the Lean Consultant. This set the initial milestones and the strategic objectives and expectations for the construction projects. Several sessions were conducted with the project team. The master plan was approved with the commitment of all parties. Within the master plan, the look-ahead plan was developed by the project manager in collaboration with the project team, this plan forecasts 6-weeks in advance and identifies the work that has to be cleared of any constraints. A weekly plan established the

detailed work that will be done during the following week, only work that can be done is considered through promises of the entire team.

The Pull controls implemented include:

- Weekly – Pull Planning, agree weekly work plans/Logistics just in time deliveries
- Fortnightly – Make ready planning, constraint removal so

work can be done.

- Daily huddles – Team report outs/Safety / Road block Removal
- Weekly – Measure progress
- Weekly – Safety/training review
- Fortnightly – Principles Safety Leadership team meeting

LEAN INITIATIVE IMPROVEMENTS & IMPACT

The implementation of Lean Construction and digital technologies has impacted all aspects and at all levels of personnel, from subcontractors to project management.

From bid stage, BAM implemented a compliant CDE (Common Data Environment) on the project (single source of information for any given project, used to collect, manage and disseminate all relevant approved project documents for multidisciplinary team in a managed process) Ref. section 3.13 PAS 1192-2:2013. BAM's CDE fully leveraged all standards compliant meta-data such as correct nomenclature which allowed for the automated registration of all project documents, be they reports, drawings, or models.

The structured information, a compliant CDE, and use of the above standards led to a consistent level of information delivery including documentation, non-graphical data, and of course graphical model information across the project, which in turn reduced time spent in locating information on the project. This is a practical example of how the application of a Lean based Level 2 process improved workflows and was not a model centric process.

BAM estimate that over the course of the SB4 project from bidding through to handover, the following improvements can be attributed to the compliant Common Data Environment (CDE):

- Time searching for information: Reduction of 92%*
- Number of support calls for information management: Reduction of 85%*
- Construction errors attributed to outdated information: Reduction of 72%*
- Information release control: Reduction of 35%*
- Stakeholder engagement: Engagement with CDE at 95% across all four schools (previously at approx. 50% with many stakeholders using e-mail or Dropbox for information transfer)*.

*Survey conducted (Jan 2016 across BAM operatives and extended supply chain) and compared to actual performance metrics from BAM's delivery of SB3.

We have also seen improvements in wasteful activities, including:

- Reduced number of defects.
- Reduction in waste off site.
- Reduction in material transportation.
- Reduction in material damaged.

A simple example of improvement relates to our scaffolding contractors, who, once trained-up on the system:

- Prefer to use a digital system and see the benefits.
- Have even invested in their own iPads because they recognise the benefit of operating in a Lean working environment.
- Increased their value to BAM as their commitment to this improvement puts them on our preferred bidder list.
- Quality & Safety: iPad in hand, scaffolders on our projects now inspect and sign off on installations via digital checklists.

- Can alert the greater site team to raise any issues that may impede or hinder their progress.
- Report their progress to the wider project team.
- Time: work is signed off and issues are addressed in a common collaborative space saving time and miscommunication.

- Daily Pull sessions ensure that the work for that day is resourced and committed for completion with any impediments or roadblocks visible.

Overall, the implementation of Lean concepts and practices has been a very positive experience. From a technical and financial perspective, the projects were finished on time and within budget; however, the greatest improvement is the collaborative environment that comes from adopting Lean techniques on such projects. For me personally, completing work in the correct sequence and a commitment to complete "own work" to allow follow-on trades do what they are supposed to, is an indicator that a cultural change is not only possible but is well underway.

Striking amongst these "softer" aspects is the improved morale and teamwork. There was a reluctance to engage at first, the team continuously improved with practice and a majority of the trades could see the benefits for all in adopting LPS. The daily huddles are a team effort, and they created an organised workplace and consistently reliable work flows. Trade contractors are more productive and with the increased ownership in the construction program they are happier to engage, thus contributing to the overall success of the project.

Where a safety culture is a priority from the top down, it can be seen the moment you walk onto a site – the site is clean, housekeeping is good, and everyone works towards everyone else getting home safe at the end of each day. We have seen with the safety culture over the past two decades that without leadership from the top there is no culture – when safety is not a priority, incidents on site go up and risk is not contained. There is an expectation at each level that everyone will be monitored for best practice and that the outcome is a positive one for all.

The Lean Culture for the reduction of waste is no different – without leadership from the top, there is no expectation of positive results, and with no expectation there will be no return on the investment in the implementation of Lean. That Lean leadership may happen on individual projects, but without Lean leadership across an organisation, any of the benefits will live and die within each particular project. However, I am delighted to witness the evolution of the Irish construction industry which is making great strides in embedding Lean thinking and practices not only on large complex projects, but crucially within the organisations themselves.

Greater collaboration between all stakeholders is key to success in the coming years. No one can do Lean on their own – everyone has to be involved!