

Ardmac is an international construction specialist delivering complex and high-value workspaces and technical environments. Headquartered in Dublin, and with offices in Manchester, Craigavon, and Brussels, Ardmac employs over 300 people and provides specialist services to the commercial fit-out, life sciences, and data centre sectors.

Ardmac's vision is to be "the contractor of choice for clients, and the workplace of choice for great people". Ardmac's mission is "to consistently provide the ultimate solution for high value working environments through continuous investment in the best people, technology, and processes".

Author



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Overview & Background to the Lean Initiative

Productivity improvements in the construction sector have been historically modest. It is a well-known fact that when compared to other sectors, construction does not perform well in terms of innovation, the use of technology, or improvements in productivity. In recent years, the use of Lean Construction (LC) principles and Building Information Modelling (BIM) have become more popular. There is significant research demonstrating that organisations that adopt these platforms, either independently or in tandem, observe significant benefits.

Hence, Ardmac started its journey to adopt Lean, BIM, and other digital technologies in order to streamline workflows and improve productivity. Ardmac leverages

technology to support Lean Construction principles. There is such an abundance of technology today that it can be overwhelming. There are trends such as Pharma 4.0, Artificial Intelligence, Automation, and the Internet of Things that are already reshaping the construction sector and changing the way in which we all do business. At Ardmac, technology is implemented to improve processes that add value to customers, improve efficiencies, and solve specific problems. In order to do this, there is a big focus on gaining customer insights, understanding needs, and reframing those into desired outcomes. Once these desired outcomes are validated, solutions are delivered that address these unmet needs. We call this approach "Building SMART".

Lean Initiative Undertaken – Lean Thinking, Tools, Techniques

Productivity Tracking – Digitally

The company introduced Lean in 2015, and we have adopted several Lean initiatives across the company since then. We have been particularly successful with the adoption of Last Planner® System (LPS) which allows the proactive sequencing of works and setting of productivity targets. The targets are set using crew size and labour norms, and they are tracked daily and any deviations are monitored. Ardmac has been tracking field productivity for many years, and "Building by Numbers" is the terminology we use across the business as it is a simple and effective concept. Up until 2020, field productivity was monitored using a bespoke Excel tracker. Site Managers would track progress daily, and this data was inputted to a master tracker to highlight any trends and create a forecast at completion based on current production rates. This system,

whilst reliant on paper-based information and double data entry, worked adequately for many years. Recently the process was digitised by working in conjunction with some software vendors, and now, using a function of the field management software (FMS) platform, progress, timesheets, and productivity can be monitored using any mobile device and site teams can now track the progress of crews in real-time in the field. The tool then provides instant feedback to the site team on their daily productivity, and this data is also visible to management and any downward trends can be rapidly analysed and steps taken to resolve any issues.

Safe Deployment of Labour

Managing labour on a project can be a significant challenge using traditional processes. Paper-based timesheets, inductions, logging credentials, and maintaining training registers can all take significant administration time, are prone to human error, and result in downtime which could have otherwise been used productively. Eliminating individuals arriving on site, either unannounced or without the necessary paperwork, is a significant time saving benefit for construction companies.

Using time and attendance technology, it is now possible for a new start to receive, in advance of their start date, a link to an online induction for both safety and quality that are site-specific. To complete the site induction, all essential credentials are first uploaded by the inductee, and the system also logs the expiry date of each credential. The process also includes reading and signing any specific Risk Assessment Method Statements (RAMS) relative to their role. The person is then issued a QR that allows them access to site.

There is, of course, a need for a site tour and familiarisation meeting with all new starts upon arrival, but the time is now greatly reduced as all paperwork is completed online. The time involved can now be better spent focusing on the crucial safety messages for the project rather than on scanning paper certs, logging details, and taking photographs. This process is equally effective for management, direct employees, and sub-contractors. The security entrance infrastructure can be scaled depending on the size of the project, and it can range from turnstile type barriers with biometric or facial scanners to mobile apps for smaller projects.

Implementing these systems alone delivers excellent results, but by linking multiple platforms together through custom built integrations, even further benefits can be achieved. Linking the deployment software to the FMS platform has multiple efficiencies as the site daily diary can be updated automatically, thus providing a record of site attendance on any given day. Site management can use the attendance register to assign the hours accrued by each person to the task they undertook on that day through the field productivity feature.

This real-time system provides management with crucial immediate records of who is on site, the workers safe deployment to the job site, and their productivity. Armed with this knowledge (on any mobile device) managers can devote more time to making decisions and being in the field supporting the project and less time at their laptops inputting data or reviewing spreadsheets that are immediately outdated.

Using LPS allows work to be planned effectively, removes constraints ahead of time and enables management to focus on productively delivering projects. By monitoring field productivity daily, variances can be tracked and LPS provides the facility to categorise these variances, and thus

identify trends. Understanding field productivity in real-time and identifying trends from LPS is truly Building by Numbers and a SMART way of working.

Collaboration & Field Management Software

The use of largely paper-based information is one of several factors that contribute to the lack of efficiency in the construction sector. The traditional siloed approach restricts collaboration by creating barriers between parties to control information flow to mitigate risk for private parties. At Ardmac we wanted to source a platform to remove these silos and improve the flow of information on our projects.

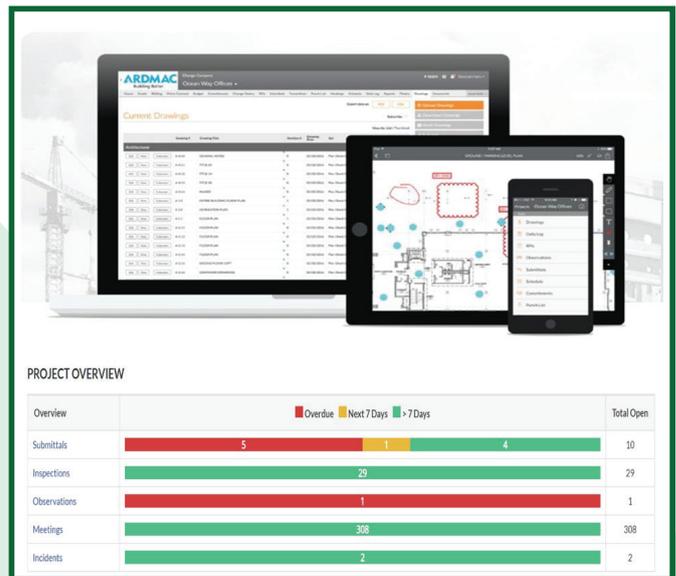


Figure 1. Project Health Dashboard

A new collaboration and FMS went live on all projects in February 2019. This provides a central cloud-based platform to share and manage project information, there is also a very strong inspection, quality, and safety management aspect to the software which enables the completion of inspections and audits using any mobile device. Project performance data is now captured in real time on all projects, which gives clients great insights into potential issues and thus focuses on proactive rather than reactive analysis.

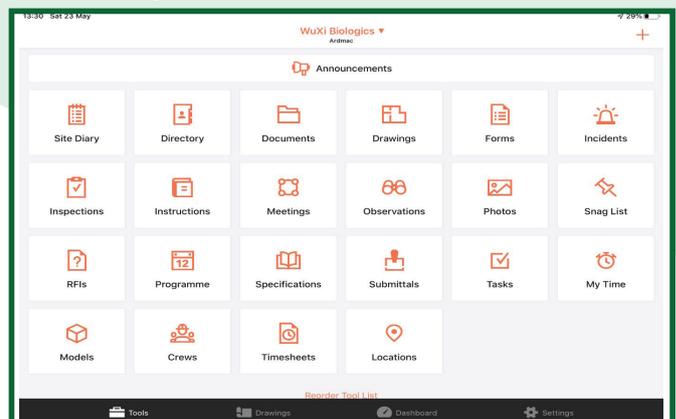


Figure 2. Tools & Features

On-site is where most of the benefits of this technology implementation are realised. Efficiencies are greatly improved by removing the need for walking to and from the site office for information. Communication among all project teams has become streamlined. Each of the tools on the platform manage a specific part of the project, and all data is controlled via role-based permissions.

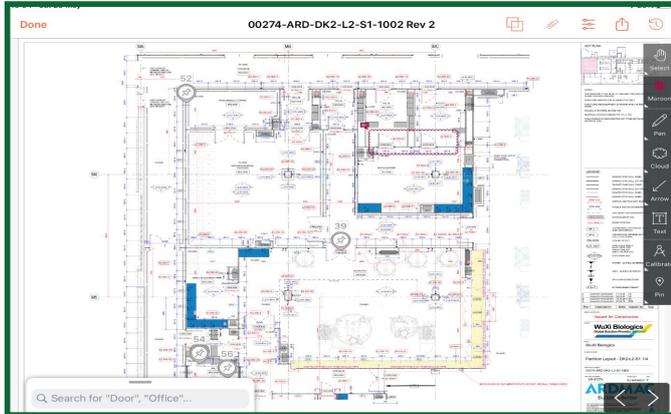


Figure 3. RFIs & Observations Linked to Drawings

Building Information Modelling (BIM)

Ardmac has been delivering projects through BIM for over 10 years. At first, this started with the creation of 3D models for coordination and clash-detection purposes. Over time and through experience and extensive training, BIM capability was increased on projects, including highly detailed and information-rich 3D models up to LOD500. Ardmac has since achieved ISO 19650-2 Certification with BRE, which demonstrates both commitment to BIM excellence and the capability to deliver projects using BIM.

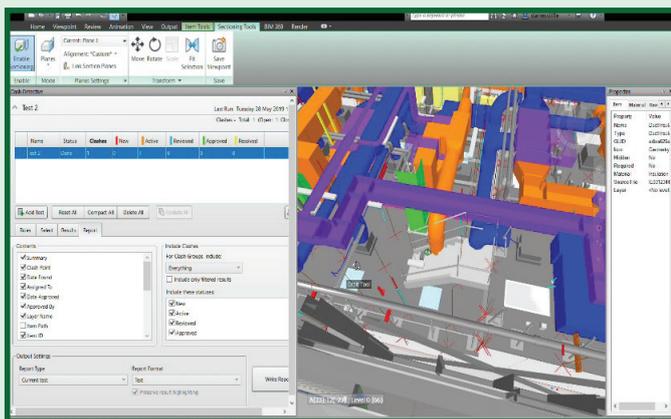


Figure 4. Navisworks Clash Detective

It is increasingly common for specialist contractors to be engaged at an early design stage of a project to form part of a multi-disciplinary design team. Cloud-based collaboration is enabling design teams to work together remotely from different locations. As buildings become more complex, it is crucial to have detailed expertise at an early stage to influence the facility design. This Lean approach reduces waste and possible rework further in the construction

process.

Ardmac primarily use Autodesk products such as “Revit” for design, model generation, and layout drafting. “Navisworks Manage” is used for coordination with other trades and clash-detection (Figure 4). Project models are stored on BIM360 for cloud-based coordination of model files. We are working on several BIM initiatives across the organisation such as Design for Manufacture and Assembly (DFMA), 4D BIM, and BIM Viewers for tablets.

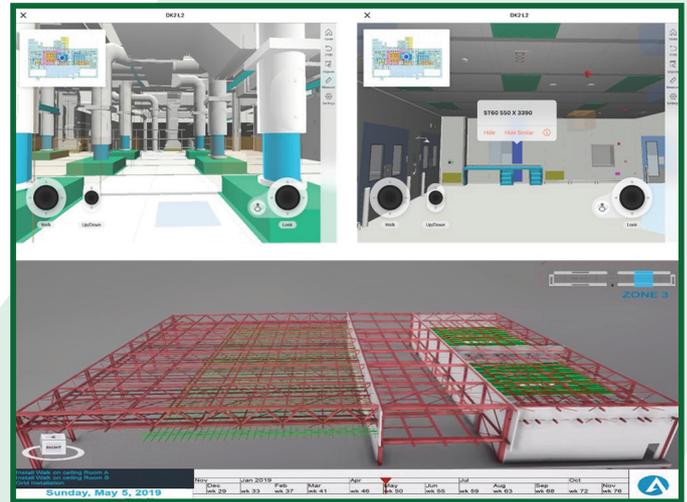


Figure 5. Mobile Model Viewer & Synchro used for 4D BIM

Lean Initiative Improvements & Impact

Building SMART

At Ardmac we define Building SMART as combining the three pillars of LPS: our Collaboration, our FMS Platform, and BIM. By implementing these tools and processes on all projects, there is a strong foundation for success. Clients are involved in the process and can see project performance in real-time. Information flows from one department to another both internally and across the company. Technology is only leveraged to solve specific problems which allows for the understanding of what works well and what does not. Ardmac is acutely aware that technology has the power to drastically change the face of the construction sector and we are committed to staying ahead of the curve. It is true that technology will support and improve existing processes at Ardmac rather than completely replace them.

Summary of Benefits

To summarise, we apply Lean Construction Principles and Technology to everything we do at Ardmac. By focusing on problems to be solved, we can apply technology in a specific and focused manner. The problems can come from a variety of sources such as customer insights, feedback from our site teams or market research, and we analyse these in

a structured innovation process that allows us to understand the next steps. We have a dedicated digital construction team to continue the trialling of technology with the goal of digitising all processes in the company, and we aim to deliver a paperless jobsite by 2022.



Figure 6. SMART Pillars

Our employees now link continuous improvement to Building Smart, and Lean Construction, BIM, and Field Software are at the heart of everything we do at Ardmac. We have found that linking all the three pillars enhances the results by bringing greater clarity. Groups and people across disciplines work in tandem rather than in conflict as we work towards common goals, and this allows people at all levels of the organisation to make decisions that help us become more efficient through linking their efforts to Building Smart. The use of digital tools has also been a massive benefit for us during the current pandemic and has allowed large portions of our support teams to continue to be productive whilst not being physically present on our sites.

This has a positive effect on our supply chain also. We collaborate with supply chain partners in the same manner using the same systems, and they also benefit from having access to clear and current information filtered to their specific scope of works. This greatly reduces frustration in sourcing information or the impact of additional costs due to rework. We believe that our supply chain is a crucial part of what we do and we are happy to support them in this manner.

Finally, we are very much client focused and maximise value for our customers. All these initiatives are implemented with the customer in mind. Customers can see real-time project information on any mobile device and the approvals processes can be managed easily including RFIs, Submittals, and Punches. These digital processes not only improve efficiencies for Ardmac but also for our clients. They enable us to be more competitive at tender stage while allowing us to deliver projects faster without compromising safety or quality. Building Smart allows us to consistently deliver excellence across multiple sectors and geographic regions.