# Case Study Title: Driving Lean Construction and Digital Transformation for Offsite Manufacturing

## Company Overview | ERRIGAL GROUP | errigalcontracts.com

Errigal is a specialist construction company headquartered in Monaghan. Errigal has established itself as a leader in transforming the construction industry through innovation and efficiency. The company's expertise lies in delivering high-quality construction projects while minimising waste and optimising productivity.

Following a period of growth across Europe, Errigal are now making a significant investment in Ireland and Northern Ireland to meet the demand of their increased workload. Errigal has developed its Enkalon site in Antrim into a centre of excellence for off-site construction. Within the 70 acres purchased by Errigal in County Antrim, 30 acres include a functioning distribution warehouse centre.

Errigal are actively encouraging other companies to locate around the site, creating a collaborative ecosystem to support their offsite construction development.

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## Overview & Background to the Lean Initiative

Recognising the demand for faster project delivery and increased productivity, Errigal turned to offsite manufacturing (OSM) as a solution. Offsite manufacturing offers a controlled environment that allows standardised production processes and rigorous quality checks. By shifting some construction activities to an offsite facility, Errigal aims to minimise waste and improve building component quality and on-site productivity.

To realise these lean initiatives, Errigal has established a manufacturing facility on the company's Enkalon campus. This facility was built to support pre-assembled building component production. It also provides the opportunity to introduce innovative processes and cutting-edge technologies. The facility is designed to be highly flexible and agile, allowing for rapid changes in production. This will enable Errigal to quickly respond to customer needs and market conditions. Equipped with advanced machinery, tools, and technology, the facility enables precise and efficient manufacturing processes. The off-site manufacturing facility accommodates various wall components and assemblies.

Errigal strategically selected the types of components that can be manufactured offsite based on their suitability for standardisation and efficient production.

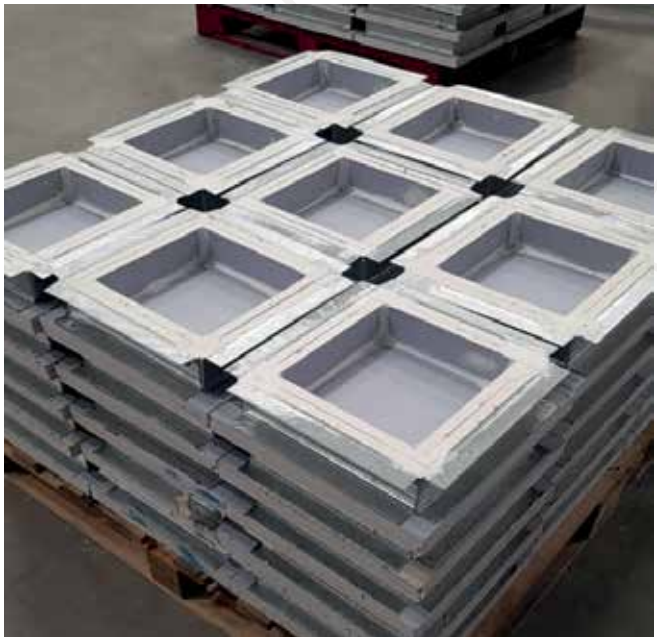

**Figure 1 & 2:** Baffle Box OSM at our Enkalon Facility

## Lean Initiative Undertaken – Lean Thinking, Tools, Techniques

To support their lean initiatives, Errigal has embraced lean thinking principles and methodologies as the guiding framework for their offsite manufacturing (OSM) and Enterprise Resource Planning (ERP) initiatives. These tools and techniques include:

**Value Stream Mapping (VSM):** Comprehensive value stream mapping exercises were used to analyse and optimise the flow of materials and information. By identifying bottlenecks, waste, and non-value-added activities, we streamlined processes and reduced lead times.

**Kanban System:** Kanban systems manage material flow. Through visual cues and inventory control mechanisms, the kanban system ensured materials are replenished just-in-time, minimising inventory holding costs and reducing stockouts or excess stock.

**5S Methodology:** The 5S methodology (Sort, Set in Order, Shine, Standardise, Sustain) creates an organised, efficient, and standardised working environment. This methodology improves productivity, safety, and overall operational effectiveness by eliminating waste, reducing errors, and promoting a culture of continuous improvement.

**Kaizen Events:** Errigal organises Kaizen events, which are focused improvement workshops involving cross-functional teams, to identify and implement rapid improvements to our processes. These events foster collaboration, creativity, and employee engagement, leading to innovative solutions and enhanced efficiency. Digital integration plays a pivotal role in Errigal's lean initiatives.

**Building Information Modelling (BIM):** We created detailed 3D models of building components using BIM technologies. These models enabled accurate visualisation, clash detection, and coordination of components, ensuring seamless integration with on-site construction activities. BIM improved communication, reduced errors, and facilitated efficient production planning in the OSM facility. ERP Systems: Integrating our OSM operations with ERP systems improves coordination, data management, and information exchange across different functions and departments. A real-time view of production schedules, inventory levels, and material requirements is provided by the ERP systems and electronic requisition forms, enabling the efficient management of resources, procurement, and logistics. The integration of OSM data with ERP systems streamlined the flow of information, minimised manual data entry, and supported accurate decision-making.


**Figure 3:** Errigal's Electronic Requisition Form

**Automatic Scheduling and Allocations:** Once the availability of a resource is determined, the ERP system can use its scheduling functionality to allocate machine times. The system can analyse the demand for each resource, consider existing reservations or allocations, and optimise machine utilisation based on predefined rules or algorithms. This ensures that machine times are effectively scheduled, minimising conflicts, and maximising efficiency.


**Figure 4 & 5:** Errigal's machine optimisation dashboards

The integration of OSM and ERP systems has also improved our supply chain visibility, streamlined procurement processes, enhanced material management, fostered collaboration with suppliers, and optimised logistics management.

**Streamlined Procurement:** ERP systems provide real-time information about material requirements, inventory levels, and

supplier capabilities. This streamlines procurement processes, ensuring that the necessary materials are ordered from suppliers in a timely manner to support just-in-time manufacturing. The system also facilitates automated purchase order generation, supplier performance monitoring, and invoice reconciliation.

**Supply Chain Visibility:** The integration of ERP systems and digital technologies allows visibility into the entire supply chain, from suppliers to the OSM facility and construction sites. This allows Errigal to track material progress, monitor production schedules, and identify any potential bottlenecks or delays. By having a clear understanding of the supply chain, we can proactively manage potential issues and optimise materials flow. This ensures smooth operations and on-time project delivery.

**Logistics Management:** Integrating with logistics management optimises transportation and delivery processes. By leveraging instantaneous data and coordination with logistics providers, we can plan efficient routes, track shipments, and ensure timely component delivery to our construction sites. This just-in-time delivery approach minimises storage requirements and reduces the risk of damage or deterioration of components, improving overall supply chain efficiency.

Digital integration and coordination efforts have improved efficiency and allowed for effective collaboration between the offsite manufacturing facility, project teams, and suppliers. Digital tools and real-time information sharing enabled better decision-making, reduced errors, and improved project coordination.

## Lean Initiative Improvements & Impact

The successful integration of these initiatives has delivered substantial improvements.

**Improved Productivity and Efficiency:** Lean thinking principles, supported by ERP systems, have optimised production processes, streamlined workflows, and increased output. This has resulted in faster production cycles, reduced lead times, and improved operational effectiveness.

**Enhanced Quality Control and Reduction in Errors:** We have prioritised quality control throughout our OSM process, and the integration of ERP systems and digital technologies has further bolstered these efforts. By leveraging BIM technology, Errigal ensures accurate visualisation and coordination of components, reducing clashes and errors. Real-time monitoring and tracking of quality parameters, ensures adherence to specifications, and minimises defects. As a result, we have consistent component quality and reduced rework.

**Waste Reduction and Cost Savings:** By optimising material use, streamlining production processes, and implementing just-in-time manufacturing, we have minimised inventory holding costs, reduced material waste, and eliminated non-value-added activities. By preassembling deflections head off site, we have reduced waste by almost 90%. They are easy to set down and store, keeping our sites clean and orderly. Using pre-cut boards around door and riser openings has reduced material waste by up to 80% and saved manpower. These efforts have led to significant cost savings, improved profitability, and a more sustainable approach to construction. Prefabricated components can be transported efficiently to construction sites, minimising multiple transportation trips, and reducing carbon emissions.

**Accelerated Project Delivery and Shorter Construction Timelines:** Scaling the use of prefabricated components has resulted in a significant reduction in man hours across our projects. Installation times are cut in half and when this saving is multiplied across each floor of a project, the cost and time savings are indisputable.

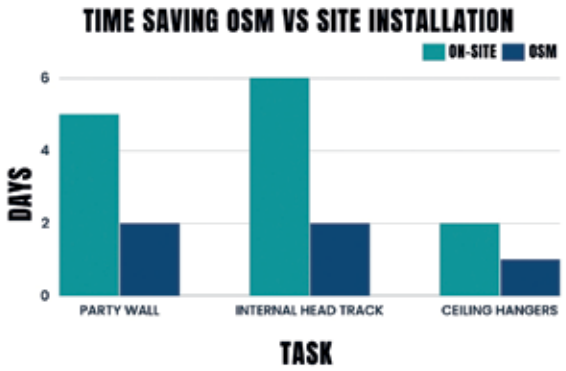


**Figure 6:** Time saving for installing prefabricated components versus on-site.

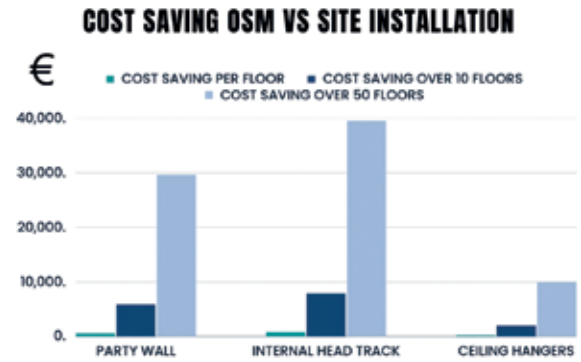


**Figure 7:** Cost saving for installing prefabricated components versus on-site.

**Improved Health and Safety Conditions:** By shifting a substantial portion of the construction activities to the controlled environment of the offsite manufacturing facility, we have reduced the risk of accidents and improved safety for workers. The standardised production processes also contribute to a safer working environment by minimising hazards and ensuring compliance with safety regulations.

## Summary and Lessons Learned

In the spirit of continual improvement, Errigal values lessons learned, and successfully implementing and integrating ERP and OSM into the company's operations has provided plenty of those such as the following:

- It is essential to align the ERP and offsite manufacturing initiatives with the company's overall strategic goals and objectives. Clear understanding and alignment with the company's vision, mission, and long-term strategy ensures that the initiatives contribute effectively to the organisation's growth and success.

- These initiatives bring significant changes to processes, workflows, and employee roles. Proactive change management is essential to address resistance, foster employee buy-in, and manage the cultural shift. Effective communication, training programs, and involvement of key stakeholders help navigate the change process more smoothly.

- Striking the right balance between customisation and standardisation is key. While ERP systems offer flexibility, excessive customisation can lead to complexity, increased costs, and challenges during upgrades. Assess the need for customisation carefully and focus on leveraging standard functionalities to maximise benefits.

- Consider the scalability and future requirements of the ERP and offsite manufacturing solutions. Ensure the chosen systems can accommodate future growth, technological advancements, and evolving business needs. Regularly assess and upgrade the systems to stay ahead of industry trends and maintain competitiveness.

By embracing digital integration, offsite manufacturing, and ERP systems, Errigal has demonstrated its commitment to pushing the boundaries of construction practices, yielding substantial improvements and impactful outcomes. Through continued efforts to drive innovation and efficiency, Errigal remains at the forefront of industry advancements, setting a high standard for others to follow.