

Case Study Title: Improving Productivity the Errigal Way

Company Overview | ERRIGAL CONTRACTS | errigalcontracts.com

Errigal is a specialist construction company headquartered in Monaghan. In addition to developing the 70-acre former Enkalon site in Antrim into a centre of excellence for off-site construction, Errigal is expanding its operations in Europe with permanent bases in Switzerland and Germany.

Errigal uses digital construction techniques to drive its business. Investing heavily in technology and people, positions us as leaders in bringing new technologies to market. As the company grows and diversifies, our innovative approach has been recognised, having won

one of Deloitte's Best Managed Companies 2021 where we were also awarded the inaugural 'Best in Innovation Award'. The title was awarded for our ambitious strides in achieving a superior level of business performance and our ability to adapt, innovate and progress in the fast-moving and evolving construction industry.

'The Errigal Way' emphasises our commitment to continuously developing innovative operating methods. We drive operational excellence across our business functions by combining lean methodologies with business process management philosophies.

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Overview & Background to the Lean Initiative

It is essential to have a holistic view across the entire organisation if continuous improvement is to be demonstrated and sustained. That includes examining how the business develops its strategy and how it translates that across the organisation. People, processes, and technology are the fundamental elements of 'The Errigal Way' and form the basis of building a sustainable culture of operational excellence.

A key component of Errigal's vision is implementing a data-driven business strategy by leveraging collaborative working relationships, innovative technology, and lean practices. Errigal's goal is to improve operational and non-operational processes across the company.

Our people are the backbone of the company. With 1200 operatives on site on a given day, they make up the majority of the Errigal workforce. Since labour represents the most dynamic cost element of a project, our goal is to maintain a high level of productivity. With that in mind, Errigal set up a cross-functional Lean Team to understand the operative's journey from onboarding to the site, evaluating their skills, motivation, disruptors, and well-being. This case



Figure 1: The Errigal Way.

study focuses on the work we have done to strengthen our people through process and technological improvements.

Lean Initiative Undertaken – Lean Thinking, Tools, Techniques

The define, measure, analyse, improve and control (DMAIC) framework was evaluated and chosen as the means by which we could successfully implement our improvement plan. It is a data-driven framework to identify and eliminate inefficiencies in processes, making them more predictable and improving their outcomes.

DEFINE

Enhancements in productivity are not possible without identifying

specific disruption problems, working toward their elimination, and maintaining the improvements over time. Disruptions refer to any event that occurs on-site that adversely impacts construction productivity. Simple user stories and focus group interviews helped to pinpoint these waste types, which were then classified as:

Management-related factors

- Task allocation and tracking
- Information delivery

- Worker turnover frequency
- Resources

Labour-related factors

- Disruptions
- Low worker motivation
- Fatigue, mental and physical
- Physical worker limitations
- Skilled/experienced worker shortage

This research provided us with opportunities for improvement, allowing us to set benchmarks and targets to formulate an approach.

MEASURE

Each process must have metrics that can measure its success. As the adage goes, "If you can't measure it, you can't improve it." Our first step was determining what metrics we would track and how to measure them. We planned to strengthen operative skills and enhance their well-being and management to improve productivity and deliver quality output.

Measuring wellbeing and identifying skills gaps

Feedback surveys and skill matrixes were employed to identify gaps in training and gauge operatives' overall well-being. Benchmarks established the competencies required for operatives to be effective at their tasks, with interventions to be developed to prompt positive behavioural change and healthy habits, boosting motivation and morale.

Measuring productivity

To accurately capture real-time data on-site, we have invested in ground-breaking technology to improve productivity. Mafic is a wearable safeguard device which is located on the back of hard hats. The devices use machine learning to recognise unique movement patterns of users carrying out different tasks throughout the day. It is a system that leverages big data to drive improvements. It can also be used to optimise training based on evidence.



Figure 2: Mafic device and charging station

Measuring quality and output

Productivity shouldn't come at the expense of quality. It was important for us to ensure that increased productivity levels were delivering on the quality of work we are known for. To assess quality accurately, we partnered with Oculo. Oculo is an artificial intelligence (AI) software company we have partnered with, and their software has been rolled out on our sites. It uses a 360-camera mounted on a hard hat, state-of-the-art computer vision and artificial intelligence to provide a single source of truth for on-site progress. The site manager walks the site and it generates a "street view" of our project, which means we can carry out inspections, spot issues, and make decisions faster, even when miles away from the site.

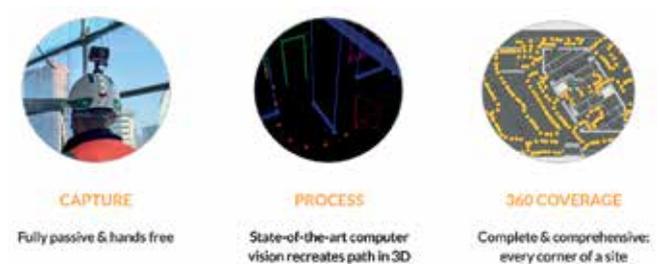


Figure 3: Oculo device and process

ANALYSE

Armed with the data collected, a cause-and-effect analysis was conducted to uncover the sources of the disruptions identified. To lead this phase effectively, an in-depth review of multiple subprojects, processes and preceding activities was required. Pareto charts were used to indicate the frequency of defects, as well as their cumulative impact. The Pareto Principle states that 80% of the results are determined by 20% of the causes. Therefore, you should try to find the 20% of defect types that cause 80% of all defects. This analysis identified the main areas for improvement as follows:

- 1. Labour Management:** Bottlenecks were identified at the start of the day, and issues with the clock-in machines, inductions, and team huddles to allocate tasks caused delays. This non-value-added time leads to an unproductive start to the day.
- 2. Training:** Paper-based onboarding process, workshops and training carried out ad-hoc was reducing productivity on site.
- 3. Productivity and well-being:** Decreased motivation and worker fatigue, causing dips in productivity.
- 4. Quality Control:** Capturing reworks and monitoring progression while validating quality across an ever-increasing number of sites across Europe.

Lean Initiative Improvements & Impact

IMPROVE

Having established the root causes, we developed solutions which could be easily applied and implemented to improve the problems identified above.

Labour Management

To combat the bottlenecks identified, our software development

team created The Errigal App. It is designed to give the operations team access to relevant information on a digital platform. It incorporates a paperless induction form and enrolling system using Near Field Communication (NFC) and facial recognition to clock in operatives. The operations team can now verify who is on site and assign daily allocations to each member. This data appears on the login screen and on the app so operatives can efficiently make their

way to their area of work and begin immediately.

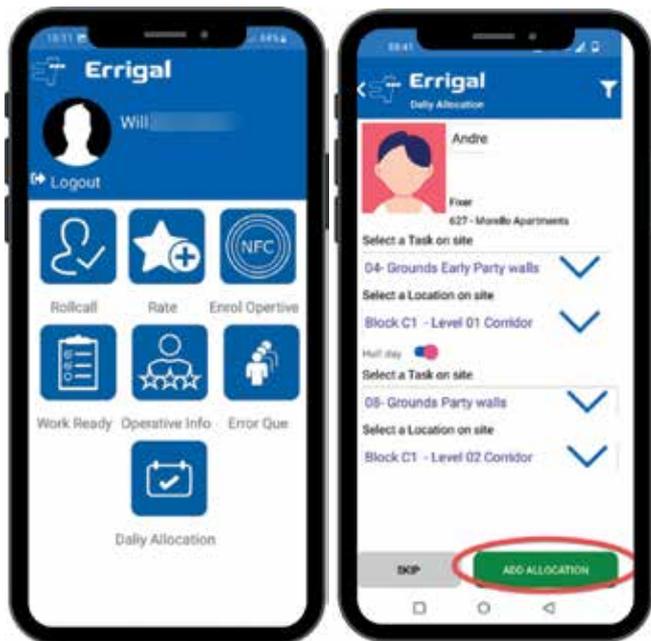


Figure 4: The Errigal App

Training

Ed App is a Microlearning platform accessible through mobile devices that reduces the amount of paper on-site and time spent performing workshops.



Figure 5: Errigal Ed App

Errigal has produced a library of bite-size 'how-to' videos for every task applicable to the operative on a particular job. The videos are delivered to the workforce through the learning app.

Operatives are given the link to Ed App with individual login details before they start on site. The site team now conducts inductions for all new starts through the app. Analytics will tell us which operatives have completed each course and how well they have done. Microlearning resulted in learner engagement soaring from 15% to 90%.

Productivity and Well-being

As well as providing us with productivity metrics, Mafic has been used to provide insights into worker well-being. Our data indicated excess fatigue towards the end of the day when there were long periods without a break. The solution was the introduction of a new shift pattern where two shorter breaks were introduced. As well as preferring two-break shift patterns, our operatives are more productive in the shorter working day.



Figure 6: Measuring the single shift against the double shift break pattern

The technology also allows us to further incentivise our workforce by introducing performance-based pay enhancements.



Figure 7: Price's Law demonstrating the output of top performers vs lower performers

Prices law states that the square root of the number does 50% of the work. Data from over 20,000 man-hours shows how productivity varies across individuals. We get seven times more output from our high performers compared to our lower performers. The challenge is to lift the bottom 30% up to the average; this will increase productivity by at least 29%. The solution was an automated incentive-based program that rewards individuals for a good day's work and drives significant productivity improvements. The bonus amount is displayed in the app so the individual can track what they earned for the work they did yesterday, motivating them today. The incentive scheme has so far resulted in a 25% increase in performance among participants.



Figure 8: Performance-based 'FAIRPAY' app and the productivity improvements it incentivises

Quality Control

Oculo has been used to mitigate issues with reworks and quality assurance. Daily site walks document progress with no extra effort. Our operative simply straps the camera to their hard hat and goes. The technology captures the surroundings and accurately locates



Figure 9: One click connection to BIM model for any scene in the Virtual job walk, with synchronised navigation within the 360° frame.

them in our drawings, resulting in no blind spots and no missed issues. We can review historical conditions, verify progress, and check alignment against the model, side by side for any spot on our site.

The technology minimises travel and inspection time through remote site viewing, reducing our carbon footprint, driving collaboration, and enabling on-the-spot decision-making. We can now avoid wasted costs through clear visual history, simplifying claims management and avoiding rework costs. Being able to monitor and verify the quality of work produced has been instrumental in improving productivity.

CONTROL

Having implemented the initiatives outlined, we work hard to ensure that they are ingrained in the organisational process. We continue to analyse the data gleaned from analytics to drive evidence-based improvements throughout our operations.

Summary and Lessons Learned

Improvements implemented through the DMAIC framework have yielded significant returns. There has been an overall reduction in project costs and completion times. The initiatives have added value to our clients while increasing profit margins.

Digitising processes means less paper-based waste, while reducing the number of site visits required. This has lowered our carbon footprint, something that we are striving for as a company.

Most notably, we have seen an increase in employee morale. Increased job efficiency and productivity are accompanied by strengthened pride in the work being done. An increase in employee enthusiasm leads to greater retention rates, which boosts project productivity even further. Our operatives are confident, capable, and motivated; they embody The Errigal Way.