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IIImace

Mace Technology Ireland (Mace) has been established in Ireland for over 10 years and has constructed two of Ireland's largest and most prestigious projects, namely Dublin Airport Terminal 2 and Project Cln, a hyper-scale data centre campus in Clonee, Co Meath.

Mace operates not only as a general contractor here in Ireland, but also provides professional construction services such as cost management and programme management for blue-chip clients such as Microsoft, Irish Water, Citrix, and Invesco.

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Overview & Background to the Lean Initiative

The Digital Control Room

Mace deploy a collaborative approach to manage the programme and production control management system. Mace has learned that Visual Management (VM) tools are key to identify and focus on critical areas to manage risks and opportunities in production control.

VM is identified as an important tool to develop a high-performance multi-disciplined team. To assist the forming of the team, a "Big Room" environment was developed to allow teams to communicate and collaborate effectively, to develop a learning work environment,and to build trust and promote transparency between teams.
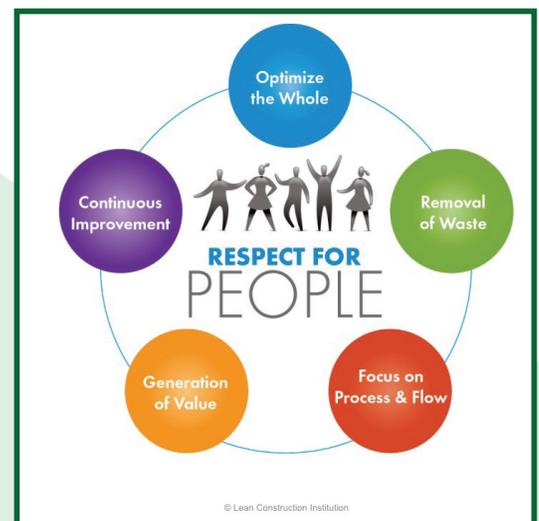
Figure 1. Lean Construction Principles

Lean Initiative Undertaken – Lean Thinking, Tools, Techniques

The control room allowed multi-disciplined teams to communicate and collaborate so as to better manage project risks and identify opportunities for project improvements. This approach broke down barriers and allowed teams to integrate and identify areas to focus on collectively. The control room dashboard meeting was a structured meeting where in package information was formatted and presented similarly across all packages. The information was displayed on a series of magnetic whiteboards with marked-up drawings and pdf worksheets to show the current state of the packages. Here, package information could be presented and interrogated in a collaborative fashion.

However, as the teams became more disciplined, it became apparent that the volume of data that was being collected on the project could not be displayed and updated efficiently in the room. As a result, it was difficult to effectively manage a hyper-scale data centre using analogue tools.Therefore, a digital collaboration control room was developed.
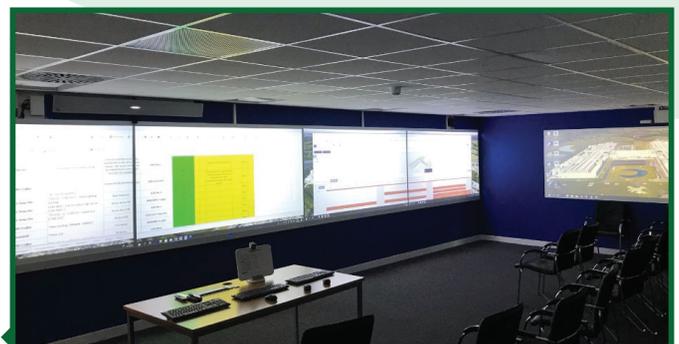
Figure 2. Digital Control Room

Optimise the Whole

Respect for People is the cornerstone of Lean thinking as people transform ideas and materials into final useful value. Respecting the contribution of each individual is necessary to tap this resource. In addition, people are central to the success of Lean project delivery, and the production management-based approach of Lean project delivery encourages all efforts to make transparent and then optimise all processes and flows within design and construction work.

Visual Management

VM is applied as a holistic system supporting the visualisation of information to help teams and individuals to gain a better understanding of their role and contribution within the larger frame of a project.

The control room is a dedicated co-location space developed to create a transparent and open environment for people to communicate effectively. VM is a key component of the room as people are usually attracted by what they see. The objective is to use visual aids to make communication simple and attractive. Correct representation of information can help mitigate the complexity of production systems, even in chaotic and unpredictable production environments. Among the benefits of VM are that it directly supports other management functions, such as production management, safety management, performance management, and workplace management, allowing optimisation of the process and work flows.

In addition, the use of VM tools improves our ability to process information and reduces feedback time for action taking, such that control can be integrated into execution. A digital platform allows virtual tools to be introduced to improve the transparency of planning and to act as an aid for collaborative use in planning and control meetings. Their other benefits include greater discipline in the workplace, continuous improvement, and work facilitation.


Figure 3. Collaborative Meeting

Removal of Waste

Waste can be defined as any task that does not add value. Value-added tasks are tasks that meet the following three criteria:
• Meets end customer needs.
• The task changes the shape or form of a product or service.
• Executed right the first time.

The ability to identify and remove wastes from all production is a key facet of a Lean production system. Studies have shown that approximately 70% of the activities performed in the design and construction industry are non-value-add ("waste").

The volume of the data processed on the project, and the use of digital field tools to track safety quality, commercial, and programme activities, required a more agile VM solution. In parallel with the improved production control meetings, it was clear that the weekly package dashboard meetings also needed improvement.

There were large volumes of issues which were not managed efficiently due to the diverse range of information required to present at the package dashboards. All this information was available digitally and was downloaded and printed to make up the composition of the dashboards. This proved inefficient and often included information that was not the latest available information for the review.

Project Manager time was ineffectively used to gather and present the content for the whiteboards. The volume of information made it difficult to process in the meeting. There was a number of meetings required between each discipline working on a package to collate and present the package KPIs. The information was gathered and presented by each package where it was difficult to present the whole project risks and opportunities. This resulted in critical information that was not presented or updated.

Overall, this represented substantial waste in our production control system. The collected information was not sufficiently integrated, which hampered making identification of multi-disciplined dependencies visible. This also raised issues for wasted project improvement opportunities. To increase agility and respond rapidly to unexpected problems, it was essential to shorten the communication time between workers and decision-makers.

A digital control room was identified to replace whiteboards in the Big Room meeting. This allowed for collaborative dashboards to be produced and presented digitally. The information displayed was live current package information covering all KPIs for the package. This also did not take away from the VM standard to view the entire project status at a glance. Here all project information could be presented clearly and all stakeholders could identify make-ready-needs. This improved the flow of information as critical information could be actioned in a timelier manner.

Figure 4. Control Room Dashboards
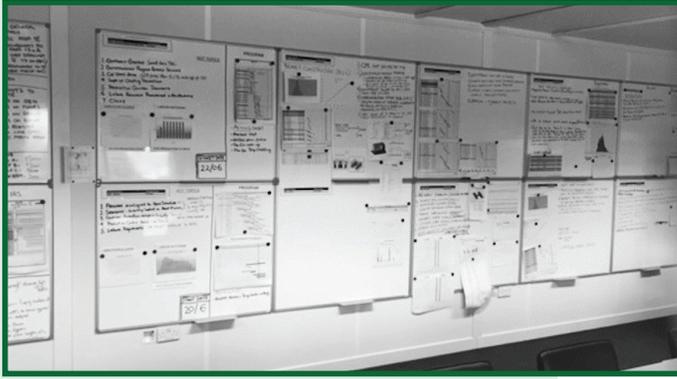
All information is sourced from a central database, and this eliminated the waste of replicating the works to display on the whiteboards. The number of meetings required to prepare the package dashboards was reduced. The effectiveness of the collaborative meetings improved to the point that all packages could be reviewed in the allotted meeting time.

Process and Flow

Information was formatted and displayed where the current state was easily visible. This structure allowed for presented material to be interrogated and referenced to provide project clarity. This allowed the senior leadership team to make informed decisions to progress the project effectively by mitigating risks and maximising opportunities.

The importance of making tasks ready cannot be understated in managing flow. The ability of multi-disciplined teams to work in a form where a rich source of digital information is displayed and can be interacted with.

As construction projects are large and complex, the current state is not obvious. Improving the ability of project teams to react and manage projects in an agile fashion increases the project team's overall effectiveness to manage complex construction projects.

As modern construction projects consist of multinational stakeholders, including clients, design houses, and specialist trade contractors, using a co-location model is not always practicable and can be logistically difficult to sustain. Using a digital format allows for remote collaboration and maintains a creative link between remotely working teams.

Lean Initiative Improvements & Impact

Generation of Value

Working with a greater volume of information that was presented in a usable way provided greater clarity and allowed all stakeholders to identify and evaluate opportunities for improvement internally whilst also identifying make-ready-needs associated with upcoming tasks. As principal contractors, Mace was able to use this information to provide direction to its trade contractors and increase the productivity of all site operations.

Weekly meetings were reduced in length and delivered increased productivity. This increased the volume of information that could be interrogated at the dashboard meetings, standardised the information displayed, and increased the quality of the information displayed. This allowed areas to be managed in greater detail and improved inputs and outputs from the collaborative meetings.

With the larger weekly volume of activities being identified and made-ready, a more efficient system was required to manage weekly work plans and short-term look-ahead plans. We decided to digitise the system fully and use a cloud-based collaborative platform on which we could display a larger volume of tasks.

This led to the introduction of cloud-based software, developed on the project, to manage the LPS. This allowed the team to upload and co-ordinate their 6-week look-aheads to one platform. This in turn provided greater transparency of look-aheads that allowed contractors to be more informed when creating their weekly work plans. The digital wall was used in collaborative weekly work plan meetings where multiple displays could provide models, plans, programmes, and weekly work plans to improve collaboration at the weekly work plan meetings.

Using a digital platform put more emphasis on packages preparing look-ahead plans and identifying make-ready-needs to improve the accuracy of weekly work plans. Using a digital collaborative platform also improved the quality of the actual weekly work plan review meeting as a greater volume of tasks could be reviewed efficiently. This dramatically affected the quality and quantity of weekly planned committed tasks.

With this increased information, the quality of weekly work planning meeting improved. There was a shift from the silo mentality of producing a work plan and look-ahead plan in isolation solely focusing on a package rather than a project progress. With greater transparency, a more informed look-ahead plan could be produced for review collectively.

Figure 5. Control Room Digital Collaboration

Continuous Improvement

Continuous improvement ("Kaizen") is a highly dynamic capability that can be viewed as an organisation-wide process of focused and sustained incremental innovation. VM serves as a basis for continuous improvement, and perhaps more importantly stimulates employee involvement to manage and improve safety and quality.

The use of digital dashboards provided a rich source of information. This allowed a more agile approach to construction management. Teams presented tasks in progress and planned works in a controlled and organised manner. The integration of the make-ready process and the utilisation of the Big Room environment allowed management to share project updates and to focus on upcoming challenges. The ability to utilise the huge amount of digital information to capture the project KPIs allowed for a smooth and informed project delivery method.

This allowed packages to work as a team to identify risks and opportunities to the current site production. Constraints that were outside the control of the package manager level could more effectively be communicated to senior management to provide direction and mitigate if necessary. The greater transparency allowed teams to articulate issues effectively, which provided an opportunity for all project stakeholders to effectively communicate and react to live project conditions.

The result was an efficient weekly production system that could provide predictability and reliability to the project progress. The efficiencies from work crews provided opportunities for increased off-site manufacturing plans because of the reliable delivery of construction activities.

This allowed teams to forecast resources effectively and ensure specialist contractors were available when tasks became ready.

This inclusive environment strengthened the Lean culture in the team. Digitisation of the project management system provided a leaner and more inclusive platform for the team to utilise. This in turn allowed for greater stakeholder collaboration with the shared information providing a single source of truth.

The initiative to use a digital wall greatly increases our ability to prepare for collaborative meetings, and it has greatly improved the quality and efficiency of team meetings. This allows teams to challenge each other and to continuously improve throughout a project. As a result, teams are now able to focus on opportunities for improvement and to develop quickly and effectively into high-performing construction teams that deliver greater value-add for our clients and for our supply chain partners.