

## Modern Methods of Construction

### Background

Digital technologies are disrupting the way the Irish industry works, and if it is to attract the next generation of professionals and seek out better value-for-money for the taxpayer, it is crucial that the government and the industry stakeholders continue to embrace change<sup>1</sup>. A number of recent publications, such as the Farmer Report, warn much of the construction industry does not make enough money, or, where money is being made, feel enough confidence it will stay profitable into the future<sup>2</sup>. Professional industry bodies such as Engineers Ireland advocate the contribution that Modern Methods of Construction (MMC) including Building Information Modelling (BIMO), can play in overcoming these barriers<sup>3</sup>.

MMC aims to improve business efficiency, quality, customer satisfaction, environmental performance, sustainability, and the predictability of delivery timescales. They engage people to seek improvement, through better processes, in the delivery and performance of construction<sup>4</sup>. They include modular building, preassembly, prefabrication, offsite production, offsite manufacturing, industrialised building, and also a range of onsite and offsite construction methods<sup>5</sup>.

The CitA Digital Transformation Series on the 4<sup>th</sup> February will provide a focus on MMC through four keynote speakers from C+W O'Brien Architects, Evulsion Innovation, KOSMOS, and Cogent Associates. This case study will give a brief synopsis of how these organisations have or plan to use MMC within their organisations.

### C+W O'Brien Architects

To deliver the best result for their clients while ensuring the most appropriate/attractive product is placed in location, C+W O'Brien Architects surround themselves with a highly qualified and experienced team in the delivery of MMC. They have gained extensive experience in all sectors of the industry and in particular, have been successful in delivering residential and residential-led mixed-use projects.

Their collaborative and efficient approach to the management of the design process is evident throughout the projects they work on. This ethos runs through the methods in which they manage their respective design teams. The team has a foundation based on research within modern methods of delivery and construction techniques. Currently, C+W O'Brien Architects are working on a number of schemes that use 2D & 3D modular construction and are due to start on site in September with Ireland's first fully modular apartment development with 197 units.



Figure 1 – Sandyford

In addition, C+W O'Brien Architect's has recently been granted permission for a scheme of 818 student beds in Sandyford, Dublin (figure 1). While this

scheme was going through the full Planning Application process within the Strategic Housing Development, C+W O'Brien Architects and their design team worked with the client and the proposed manufacturers to develop and test the modules. The result was a design that fit with the parameters of a container shipping unit which was successfully tested in France to meet the Irish and EU regulatory standards.

## Evolution Innovation

Evolution Innovation Ltd is an engineering consultancy specialising in MMC, providing structural design and product development services to the foremost MMC manufacturers and developers in Ireland, the UK, and Europe. They are recognised as leading industry experts in Category 1 Modular/Volumetric Pre-manufacturing 3D primary structural systems and Category 2 Panelised Light Gauge Steel Pre-manufactured systems. Some recent projects include a 26-storey tower building in Mapleton Crescent in Wandsworth Town in London and a rapid-build delivery of 70 houses in Drimmagh and Finglas for Dublin City Council

A significant part of Evolution Innovation's role is to advise contractors on the best and most suitable offsite technology for their projects. They outline that there is not a one-size-fits-all solution, with the most appropriate option depending upon the site and building height amongst other factors. The application of Volumetric construction is particularly attractive to the private rented sector, as this method of offsite construction will typically reduce the overall build programme by 40% over traditional methods. Volumetric modular construction is defined as the stacking and joining of factory-finished modules to form a substantially complete building.

Evolution Innovation outlines some of the benefits to the client that modular construction can offer, which includes guaranteed quality of a factory finish product as well as cost certainty. Other key benefits include the reduced number of trades on site, therefore directly impacting on safety, as well as its

suitability for logistically challenging sites in urban areas. Modular construction can limit disruption and, in addition to being the speediest option, offsite tends to be quiet compared to traditional construction.



Figure 2 – Evolution Innovation Modular Installation

When selecting technologies, it is vital the right technologies, appropriate to that particular project, are chosen and the entire build programme is managed correctly by an experienced contractor, then offsite construction can be more cost-efficient. For this to be achieved, then the main contractor's design team needs to be experienced in managing offsite construction projects.

Evolution Innovation believes that one of the drivers of offsite construction in Ireland is the ongoing labour shortage. They are now working with Tier one Contractors who have all undertaken to appoint an offsite construction director at board level within their respective organisations. The reason for this is that they realise they must embrace offsite construction in order to compete and remain relevant in today's marketplace.

## KOSMOS

KOSMOS's goal is to provide specialist commercial management services to the Danish construction industry while creating and implementing quality commercial standards and processes. In Denmark, there is no quantity surveyor (QS) profession and the project management team predominately manages the costs. KOSMOS offers the service of a traditional

QS role where they can monitor and ensure that all commercial aspects of the project under their scope are adequately managed and controlled. By bringing this role to the Danish construction industry, it can offer the client greater consistency, transparency and clarity.

KOSMOS explains that while the digital design is very progressive within the Danish construction industry, there is a lack of cost commercial focus, which can lead to poor cost estimations and planning. The Danish construction industry has no method of measurement or cost breakdown structure. They have developed coding structures for 3D modelling over the last ten years, such as BIM7AA. The purpose of BIM7AA is to develop and continuously optimise commonly developed BIM-tools, methods and processes with a focus on interdisciplinary cooperation. This system is used to code elements within the model but does not tell you how to price these elements.

KOSMOS brings standard QS methodologies to the projects and is linking these to existing coding process. They work within an integrated design delivery process as sub-consultants to the Architects and Engineers and have a responsibility to deliver the project to budget. They assist the BIM modeler in drafting the model so the final output can produce automated 5D cost plans. They are heavily involved in the delivery of the model to ensure time is not wasted on redrafting the model to meet their specialised 5D requirements.

KOSMOS notes that it is the QS's due diligence to check the quality of the model. They execute quality assurance checks on the model at each stage of the project and compare these checks against the specification i.e. investigate what has not been modelled. By having these checks in place, it can ensure that the scope and costs are on target and that there are no potential oversights between the model and specifications. This can form an essential part of the change management process and offer the client further security measures. This is achieved by having weekly meetings with design disciplines that focus on

significant cost and risk areas from a commercial perspective.

Moving forward, KOSMOS believes the role of the QS will change as we automate our working practices. This will require a change in current contracts with a focus on collaboration and integration, to ensure that access and sharing of information is fully integrated.

## **Cogent Associates**

Cogent Associates are a project and cost management consultancy that provide a comprehensive range of specialist property related services, including development monitoring and facilities management. Their projects range in motivation from commercially driven to responding to societal needs.

They are currently providing procurement and cost management services to Dublin City Council for the Design and Build of 2D Panelised, Modular housing, which will be rolled out over four sites, with a projected value of + €100million. This project is the first of its size and scale within the state of Ireland and is at the forefront of pioneering construction solutions. In addition to modular housing, Cogent Associates are working with a private developer in conjunction with a major international hotel brand, providing cost management and due diligence services on a 252 bed, true 3D volumetric, boutique hotel in Dublin. The NCR student accommodation is another modular project which comprises of a campus-style development with 402-bed residences over 9 separate blocks, ranging in height from 1 to 7 storeys. Situated on over 10,000m<sup>2</sup>, it is based on a cluster arrangement with bathrooms pods. It was delivered using modular construction methodology, using an RC Superstructure and metsec composite external leaf.

Other MMC included timber frame construction, which was used on the Three Clúid Housing Association projects in Kerry. The overall structure of the house is produced in a factory environment by

a supplier and then delivered to site. First, fix works can commence once the timber frames are delivered onsite. This form of construction allows for the structural core of the house to be delivered to site with external blockwork and plaster, then added to reinforce and weathertight the structure. This then allows for boarding, taping and joining and second fix works progress. All these can be sequenced and programmed into the construction programme accurately as the timber frames are produced in a factory that is not reliant on the weather and are delivered on-site once created.

Cogent Associates are also using Insulated Concrete Form as it allows an all-in-one system comprising of interlocking walls, floors, and roof panels to be produced in a controlled factory environment before being delivered onsite and pieced together. This enabled on a 67 house development in Kilarney, a 40% programme reduction compared to traditional build, while exceeding the nZEB standard and producing significant savings estimated at 60 % when compared with a standard house. Figure 3 below shows the process from the initial arrival on-site through to completion.



Figure 3: Initial arrival onsite through to completion.

## Conclusion

The MMC discussed in this paper can provide the opportunity to offer a service that can guarantee both cost and schedule certainty, as well as the potential for clients to have their product reach the market

quicker. If the Irish industry are to meet their challenging targets outlined in reports such as *Rebuilding Ireland Action Plan for Housing and Homelessness* and *Project 2040*, then it will be imperative that they wholly embrace new and current methods of modern construction.

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## References

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