

MMC – Quantitative Analysis of Irish Construction sector report – December 2020 (Phase 1 research)

Economic analysis of Productivity in the Irish Construction sector - May 2020 (published in Dec 2019) document – KPMG | Future Analytics | TU Dublin [Available online at: <https://www.gov.ie/en/publication/94929-pre-covid-19-productivityresearch-in-construction-sector/>]

Modern Methods of Construction – MMC-I-Pad-base_GOVUK-FINAL_SECURE-1 – Build Offsite UK [Available online at: https://www.buildoffsite.com/content/uploads/2019/04/MMC-I-Pad-base_GOVUKFINAL_SECURE-1.pdf]

Linesight – Market Survey sentiment report – May 2020

Farmer Review - The UK Construction Labour Model - Modernise or Die - Oct 2016

NSAI Standards – Construction Sector Standardisation Programme 2021

NSAI – Construction Standards Consultative Committee Annual Report 2018

SCSI Webinar – Modular and Volumetric Construction – 18th August 2020 presented by Arcadis and mac Skystone

CitA Modern Methods of Construction (MMC) – Case Study No.1 10th March 2020 - Dr. Barry McAuley (CitA/TU Dublin) and Dr. Alan Hore (CitA/ TU Dublin)

CitA Modern Methods of Construction (MMC) – The Power of Modular as a Catalyst for Change 22nd April 2020 - Dr. Barry McAuley (CitA/TU Dublin) and Dr. Alan Hore (CitA/ TU Dublin)

CitA Modern Methods of Construction (MMC) – Case Study No. 2 10th June 2020 - Dr. Barry McAuley (CitA/TU Dublin) and Dr. Alan Hore (CitA/ TU Dublin)

CitA BIM Gathering – DfMA and BIM presentation – Title: DfMA & BIM – hot topics or misunderstood processes? [Available at:

<https://www.cita.ie/wpcontent/uploads/2019/10/11.50-Burren-Trimble-Solutions-CiTA-BIM-Gathering-DfMARevD.pdf>]

BESA – TR39 - An offsite guide for the Building and Engineering services sector – October 2015 in association with Build Offsite, UK

CIOB – UK Construction Productivity report 2016

Build Offsite – Assurance Scheme (Lloyds Register) – August 2010 – Terry Mundy (Lloyd’s Register EMEA), David Osrin (BLP), Paul Wornell (BLP)

Offsite Production in the UK Construction Industry – A Brief Overview – Nov 2009 – Stephen Taylor: Construction Engineering Specialist Team: HSE

Research Paper: Offsite production: a model for building down barriers: A European construction industry perspective paper – March 2010 by Wafaa Nadim (Faculty of Engineering, British University in Egypt (BUE), Cairo, Egypt) and Jack S. Goulding (University of Central Lancashire, Preston, UK)

Research Paper: An examination of a modular supply chain: a construction sector perspective – Feb 2011 by Des Doran, Brunel University, UK and Mihalis Giannakis, The University of Warwick, Coventry, UK

Research Paper: CIBSE - Effects of modular Building Services distribution on construction sequence, time and cost – June 2001 by Dr. M. J. Mawdesley, G. Long, A. Brankovic, G. E. Connolly and Prof. Q. Leiper - School of Civil Engineering, University of Nottingham; Crown House Engineering; Carillion plc.

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The Build Offsite website (www.buildoffsite.com) has several useful publications, including Offsite Construction: Sustainability Characteristics and Building Offsite – An Introduction.

Lloyds Register **BOPAS Guidance Document** - A Risk-Based Competency Assessment Process for Service Providers involved in Buildoffsite Activities – Version 8.0 issued December 2019

RIAI – Plan of Work 2013 Designing for Manufacture and Assembly (DfMA) document

[Available online at:

<http://consig.org/wpcontent/uploads/2018/10/RIBAPlanofWorkDfMAOverlaypdf.pdf>].

Also reference:

https://www.designingbuildings.co.uk/wiki/DfMA_overlay_to_RIBA_plan_of_work

Offsite Fabrication: Prefabrication, Pre-assembly and Modularisation, Wiley 1999 – Gibb, A,

Offsite construction: Sustainability Characteristics, Buildoffsite, 2013 – Krug, D et al.

Implementing the prefabrication, preassembly, modularization, and offsite fabrication decision framework : guide and tool – Carl T Haas; Jongchul Song; C B Tatum; University of Texas at Austin, Construction Industry Institute, 2002.

Standard-Facility-Design – Modular Construction approach for BioPharma facilities – June 2019

Biomanufacturing facilities – A modular approach to design and construction – PM Group – June 2019 PM Group website – News section. [Accessed online: Sept 2020]

Mercury Engineering – News & Insights: Modern Methods of Construction article – 1st July 2020 [Available online at: <https://www.mercuryeng.com/2020/07/01/insightsmodern-methods-of-construction/>]

NSAI have a Construction Sector Standardisation Programme to 2021 committee (NSAI/TC 006) <https://www.n sai.ie/standards/sectors/construction-standards/> and

<https://www.engineersireland.ie/News/nsai-establishes-new-national-construction-standardsconsultative-committee> [Available online on 6th Nov 2020]

NSAI Construction Standardisation Programme Database:

<https://www.n sai.ie/standards/sectors/construction-standards/>

NSAI Standards – Construction Sector Standardisation Programme to 2021 report:

<https://www.n sai.ie/images/uploads/standards/Construction stds prog final.pdf>

MMC – Qualitative Analysis of Irish Construction sector report –

December 2021 (Phase 2 research)

McKinsey report on The next normal in construction: How disruption is reshaping the world’s largest ecosystem, June 2020, authors Maria João Ribeirinho, Jan Mischke, Gernot Strube, Erik Sjödin, Jose Luis Blanco, Rob Palter, Jonas Biörck, David Rockhill, and Timmy Andersson (a collaborative effort) Ref:

<https://www.mckinsey.com/~ /media/McKinsey/Industries/Capital%20Projects%20and%20Infrastructure/Our%20Insights/The%20next%20normal%20in%20construction/The-next-normal-in-construction.pdf>

McKinsey report on Modular construction: From projects to products, June 2019, Authors Nick Bertram, Steffen Fuchs, Jan Mischke, Robert Palter, Gernot Strube, and Jonathan Woetzel Ref:

<https://www.mckinsey.com/~ /media/McKinsey/Business%20Functions/Operations/Our%20Insights/Modular%20construction%20from%20projects%20to%20products%20NEW/Modular-construction-from-projectsto-products-full-report-NEW.pdf>

Brazil Ao Cubo Limited: Agile Constructive Solutions – Modular thinking for all types of work

<https://brasilaocubo.com/portfolio/> and <https://brasilaocubo.com/portfolio/edificio-level>

[Accessed online on 20th September 2021]

BBC Inside Out visited the ilke Homes factory to see how they manufacture amazing

Modular homes: <https://www.youtube.com/watch?v=yPCHXMck8xw> [Accessed online on 16th June 2021]

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BPS 7014 standard – BRE Standard for Modular System for Dwellings Ref:

https://files.bregroup.com/breglobal/BPS_7014_Issue_1.0.pdf

NHBC Technical document for Prefabricated Building Units Ref:

<https://www.nhbc.co.uk/binaries/content/assets/nhbc/tech-zone/nhbc-standards/nhbc-accepts/prefabricated-building-units.pdf>

Some Irish NSAI Agrément Certificates for individual Companies Ref:

<https://www.nsai.ie/images/uploads/certification-agreement/IAB080311.pdf>

ISO 21723: 2019 standard – Buildings and civil engineering works — Modular coordination

– Module Ref: <https://www.iso.org/standard/71507.html>

BS 6750:1986 standard – Specification for modular coordination in building (Current: as of 29 Aug 1986)

<https://middleware.accord.bsigroup.com/pdf-preview?path=Preview%2F000000000000158454.pdf&inline=true>

Brazil – Modular Coordination Standard for Buildings: ABNT NBR 15873 standard Ref:

<https://www.mapadaobra.com.br/inovacao/nbr-15873-entenda-a-norma-da-construcao-modular/>

BESA (in conjunction with Build Offsite) – An Offsite Guide for the Building and Engineering Services Sector, April 2015, Authors, a collaboration of: Nigel Fraser, Gay Lawrence Race, Richard Kelly, Anna Winstanley and Paul Hancock.

2019 MOC Summit: MODULAR AND OFFSITE CONSTRUCTION (MOC) SUMMIT PROCEEDING submissions) - Banff, Alberta, Canada held on 21st – 24th May 2019, Ref:

<https://journalofindustrializedconstruction.com/index.php/mocs/issue/view/7> [Accessed online on 09th February 2021]

Cygnum Building Offsite case studies, based in Macroom, Co. Cork Ref:

<https://cygnum.ie/case-studies/>

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Modern Homes Ireland (MHI) recent Projects completed for Housing solutions in Ireland.

Ref: <https://mhi.ie/case-studies/>

Dublin City Council Modular Housing Programme - 2D panelised housing units (Sisk Construction)

Ref: <https://www.johnsiskandson.com/case-studies/springvale-co-dublin?selected-locale=default>

Ref: <https://www.cogentassociates.ie/on-site-delivering-modular-housing-for-dcc/>

Recently published Property Industry Ireland (via IBEC) in early October 2021 - on INNOVATION INCREASING SUPPLY How offsite construction Ref: <https://www.ibec.ie/-/media/documents/media-press-release/property-industry-ireland---off-siteconstruction-report.pdf>

Recent News articles on Student Accommodation and Housing supplies, calling for Modular solutions Ref: DCU demands Government end student accommodation crisis and slam Housing for All plan. Ref: <https://www.msn.com/en-ie/news/other/dcu-demands-government-end-student-accommodation-crisis-and-slam-housing-for-all-plan/ar-AAOJzAR?ocid=winp1taskbar>

Warning of mass emigration if Government doesn't tackle housing crisis article Ref: <https://www.msn.com/en-ie/money/homeandproperty/warning-of-mass-emigration-if-government-doesn-ttackle-housing-crisis/ar-AAPbQ1R?ocid=winp1taskbar>

Sunday Business Post news article Re: CarlowBuild, a modular manufacturer Ref: <https://www.businesspost.ie/houses/carlow-company-delivers-prefab-homes-for-eur200000-66b66e90> [Accessed online on 21st September 2021]

ilke Homes (UK) - Modular Housing solutions: Following Homes England's £30m investment into modular manufacturer ilke Homes, in Hull, Northeast England have short YouTube video tours of their factory - see links below:

Ref: <https://www.youtube.com/watch?v=hktMBFNMK7c> (31 May 2019)

Ref: <https://www.youtube.com/watch?v=UIB7Ar22drs> (6 Nov 2019)

Ref: <https://www.youtube.com/watch?v=wHivVHqQ-Gc> (7 Nov 2019)

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Ref: <https://www.youtube.com/watch?v=yPCHXMck8xw> (7 Nov 2019)

Ref: <https://www.youtube.com/watch?v=TjsNlkqgt4> (4 Mar 2020)

MMC – Skills Needs Analysis report – January 2022 (Phase 3 research)

Farmer, M. (2016). *The Farmer Review of the UK Construction labour Model*. [online] Construction Leadership Council. UK: Construction Leadership Council. Available at: <https://www.constructionleadershipcouncil.co.uk/wp-content/uploads/2016/10/Farmer-Review.pdf> [Accessed 3 Sep. 2021].

McKinsey & Company: (2019) Bertram, N., Fuchs, S., Mischke, J., Palter, R., Strube, G. and Woetzel, J. (2019). *Modular construction: From projects to products*. [online] Available at: <https://www.mckinsey.com/~media/mckinsey/business%20functions/operations/our%20insights/modular%20construction%20from%20projects%20to%20products%20new/modular-construction-from-projects-to-products-full-report-new.pdf>.

McKinsey & Company: (2020) The next normal in construction How disruption is reshaping the world's largest ecosystem. [online] McKinsey & Company. Available at: <https://www.mckinsey.com/~media/McKinsey/Industries/Capital%20Projects%20and%20Infrastructure/Our%20Insights/The%20next%20normal%20in%20construction/The-next-normal-in-construction.pdf>.

McKinsey Global Institute (2017) REINVENTING CONSTRUCTION: A ROUTE TO HIGHER PRODUCTIVITY. McKinsey and Co.

Citb (UK) – The impact of Modern Methods of Construction (MMC) on Skills requirements for Housing: A report on the skills implications for both panelised and volumetric housing construction, April (2019)

Irish Building Magazine (2021). *Skills in the frame as WorldSkills Ireland 2022 launches*. [online] irishbuildingmagazine.ie. Available at: <https://irishbuildingmagazine.ie/2021/10/22/skills-in-the-frame-as-worldskills-ireland-2022-launches/> [Accessed online on 15 Oct. 2021].

RTE Business article - Risks of cost overruns in NDP, warns IFAC (Irish Fiscal Advisory Council) (18 November 2021) <https://www.rte.ie/news/business/2021/1118/1261601-national-development-plan/>

RTE Business article - Irish Fiscal Council urges Govt to back up 5% spending rule with legislation (1 December 2021) <https://www.rte.ie/news/2021/1201/1264049-ifac-budget/>

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RTE Business - Report identifies skills needed to meet climate targets (25 November 2021) <https://www.rte.ie/news/business/2021/1125/1263065-report-identifies-skills-needed-to-meet-climate-targets/>

Stanton, J. (2021). *Digital skills framework sets out industry's expectations*. [online] BIM+ (bimplus.co.uk). Available at: <https://www.bimplus.co.uk/digital-skills-framework-sets-out-industrys-expectations/> [Accessed online on 15 Nov. 2021].

CIF (December 2020) Modern Methods of Construction: A Quantitative Analysis of the Irish Engineering & Construction Sector Market for CSG – Subgroup on Innovation and Digital Adoption.

CIF (December 2021) Modern Methods of Construction: A Qualitative Analysis of the Irish Engineering & Construction Sector Market, including 'one-to-one' MMC Stakeholder interviews for CSG – Subgroup on Innovation and Digital Adoption.

AKERLOF (November 2020) Modern Methods of Construction: A Perspective on the UK Market. Enterprise Ireland.

Expert Group on Future Skills Needs (EGFSN) - (December 2018) Digital Transformation: Assessing the Impact of Digitalisation on Ireland's Workforce. National Skills Council.

Irish Government publication on Build 2020 – Construction sector performance and capacity Ref: <https://www.gov.ie/en/publication/c19a5-build-2020-construction-sector-performance-and-capacity/>

Irish Government publication on CSG – Building Innovation report Ref: <https://www.gov.ie/en/publication/827c7-construction-sector-group-building-innovation/>

Central Statistics Office (CSO) labour market survey – Ref: <https://www.cso.ie/en/statistics/labourmarket/labourforcesurvey/fstimeseries/>

Ernst & Young (EY) (2020), Technological advancements disrupting the global construction industry report. Ernst and Young LLP.

CitA – 5th BIM Gathering Virtual conference on 21st - 23rd September 2021 – DASBE (Digital Academy for the Sustainable Built Environment) presentation – Delivering Green, Energy and Digital Skills for Ireland <https://www.cita.ie/wp-content/uploads/2021/09/CBG-21-DASBE.pdf>

IGBC – QualiBuild programme – Foundation Energy Skills Training Running Nationwide <https://www.igbc.ie/projects/qualibuild/>

EY-DKM (2021), Detailed Description of Needs Report – MMC productivity and survey results.

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<https://www.enterprise-ireland.com/en/Research-Innovation/Companies/Collaborate-with-companies-research-institutes/Construction-Built-Environment-Detailed-Description-of-Technology-Needs.pdf>

<https://www.enterprise-ireland.com/en/research-innovation/companies/collaborate-with-companies-research-institutes/construction-sector-call.html>

Department of Public Expenditure and Reform (2020) Build 2020: Construction Sector Performance and Capacity. Rialtas na hÉireann: Government of Ireland.

Department of Public Expenditure and Reform (2020) Construction Sector Group: Building Innovation. Rialtas na hÉireann: Government of Ireland.

European Commission (November 2020) Advanced Technologies for Industry. European Commission

Effectiveness of the Modern Methods of Construction in Terms of Cost and Time: A Case Study of the United Kingdom (researchgate.net) Ref:

https://www.researchgate.net/publication/351591994_Effectiveness_of_the_Modern_Methods_of_Construction_in_Terms_of_Cost_and_Time_A_Case_Study_of_the_United_Kingdom

Modern Methods of Construction – Housing, Communities and Local Government Committee - House of Commons (parliament.uk) Ref:

<https://publications.parliament.uk/pa/cm201719/cmselect/cmcomloc/1831/183112.htm>

UK's Ministry for Housing, Communities and Local Government published – MMC Definition framework (UK) document (2019) Ref: https://www.cast-consultancy.com/wp-content/uploads/2019/03/MMC-I-Pad-base_GOVUK-FINAL_SECURE.pdf

Effectiveness of the Modern Methods of Construction in Terms of Cost and Time: A Case Study of the United Kingdom (sapub.org) Ref:

<http://article.sapub.org/10.5923.j.jce.20211101.03.html>

Demystifying the cost barriers to offsite construction in the UK | Request PDF (researchgate.net) Ref:

https://www.researchgate.net/publication/233352766_Demystifying_the_cost_barriers_to_offsite_construction_in_the_UK

Offsite Production: a model for building down barriers | A European construction industry perspective, Nadim, W. and Goulding, Jack S., March (2010), School of Built and Natural Environment, University of Central Lancashire, Preston, UK.

Barriers and Opportunities in adopting and implementing Offsite Construction (OFC) in Irish Construction Industry, Reddy, L. N., September (2020), Waterford Institute of Technology (WIT), <https://www.researchgate.net/publication/351035324>

Offsite Manufacturing as a means of Improving Productivity in the New Zealand Construction Industry: Key Barriers to adoption and Improvement measures, Shahzad, W. M., June (2011), Massey University, College of Sciences, New Zealand

Whole Life Consultants Limited (2015) The Construction Skills Network programme 2015
2017. Construction Industry Training Board (CITB, UK).

KPMG, Future Analytics Consulting, TU Dublin (May 2019) Economic analysis of productivity
in the Irish construction sector. KPMG, Future Analytics Consulting, TU Dublin – particularity
on MMC productivity.

Department of Business, Enterprise and Innovation (2020) Ireland’s Industry 4.0 Strategy
2020-2025 Supporting the digital transformation of the manufacturing sector and its supply
chain. Rialtas na hÉireann: Government of Ireland. *(as a reference point to MMC skills)*

MMC / OSM SUPPLY CHAIN CONSOLIDATION IN THE IRISH

MARKETPLACE (Recent announcements)

a. Vertiv purchase E+I Engineering for €1.8bn (Sept 2021)

Ref: <https://www.rte.ie/news/business/2021/0908/1245406-ei-engineering-bought-by-vertiv-holdings-for-1-8bn/>

b. Ardmac bought a stake in Central Engineering (July 2020)

Ref: <https://www.ardmac.com/ardmac-acquires-stake-in-modular-builder-cental/>

c. Etex acquires Horizon Offsite (July 2021)

Ref: <https://irishbuildingmagazine.ie/2021/07/09/etex-acquires-horizon-offsite/>

d. Modern Homes Ireland owned by BAM Ireland (Jan 2019)

Ref: <https://www.theconstructionindex.co.uk/news/view/bam-buys-stake-in-irish-modular-homes-business>

e. Modubuild part owned by Asgard Cleanrooms

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Ref: <https://www.asgardcleanrooms.com/links/modubuild/>

f. Vision-Built Group Ireland owned by Sisk Construction

Ref: <https://www.johnsiskandson.com/news/john-sisk-son-acquires-off-site-construction-company-vision-built-group>

Regards,

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