

2020-05-01

Economic analysis of productivity in the Irish Construction sector

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Recommended Citation

KPMG Ireland, Future Analytics Consulting, Murphy, R., & Behan, A. (2020). Economic analysis of productivity in the Irish Construction sector. Technological University Dublin. DOI: 10.21427/WG66-QR57

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Funder: DPER

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Economic analysis of productivity in the Irish construction sector



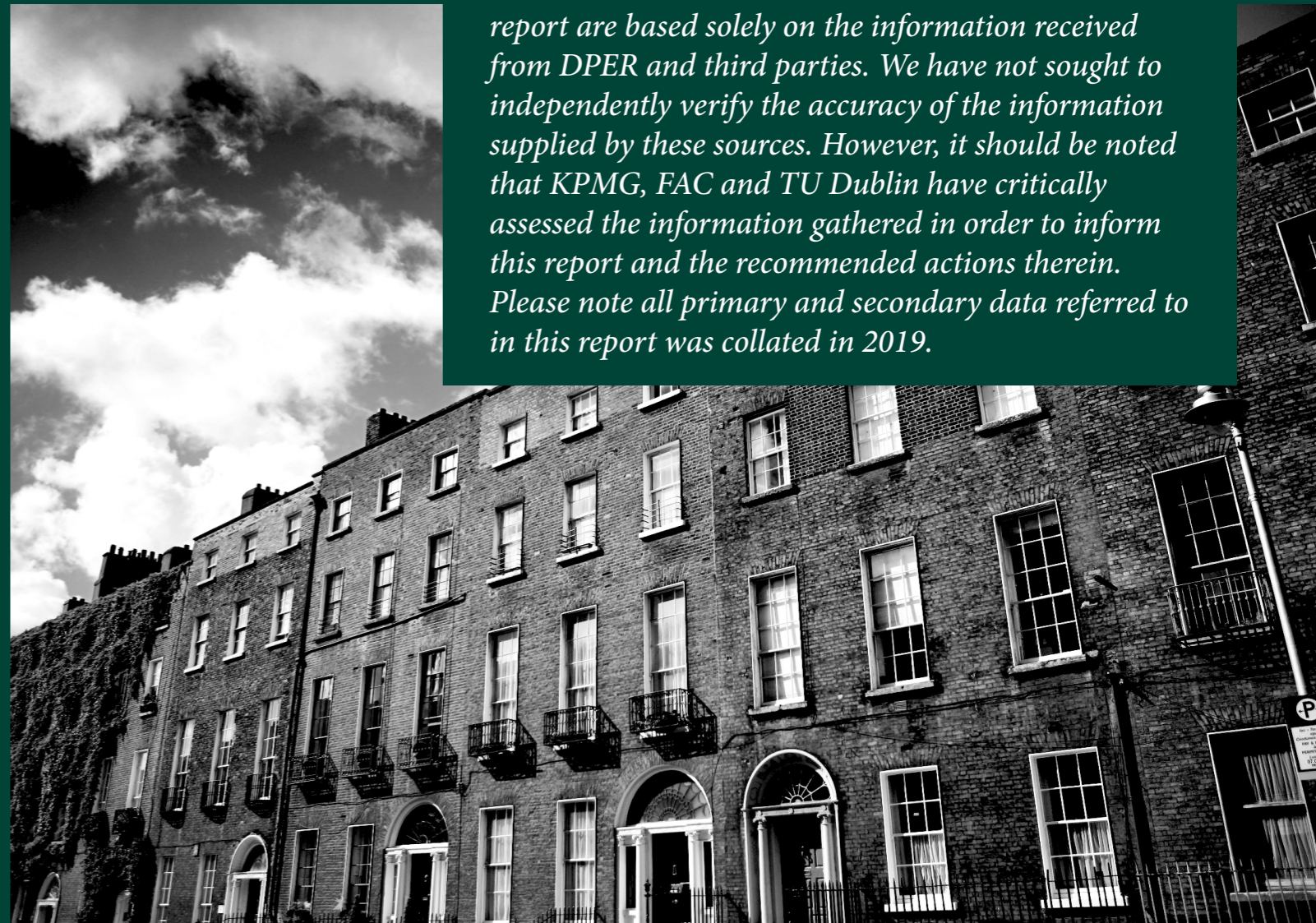
Economic analysis of productivity in the Irish construction sector

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Executive Summary

BACKGROUND AND CONTEXT

Important strides to enhance productivity in the construction sector have been taken by both industry and Government in recent years. However, a collaborative, sectoral wide strategy to drive further increases in productivity is required, with the coordinated participation of all stakeholders across the full life cycle of a project. This report, commissioned by the Department of Public Expenditure and Reform (DPER), produced by KPMG and Future Analytics Consulting Ltd. (FAC) and peer reviewed by TU Dublin, aims to understand and address the reasons for low levels of productivity in the Irish construction sector and identify specific recommendations and actions that can be undertaken to address these issues. All research was undertaken in 2019.

A collaborative, sectoral wide strategy to drive further increases in productivity is required



The work involved a number of strands, which were conducted in parallel, as follows:

Issue of a survey, (with over 500 respondents), to elicit participant's views on the causes of, and potential actions to improve, productivity in the construction sector;

A review of the Irish construction industry dynamics and factors contributing to existing productivity and performance in the construction sector, including a review of recently published relevant Irish reports;

Preparation of an international comparative report which analysed the economies, construction sectors, key challenges and attributes/initiatives driving construction productivity in Australia, Belgium, Denmark, the

Netherlands, New Zealand and the UK (the reference countries); and

A consultation stage with a wide range of stakeholders across government and industry incorporating consultation meetings and submissions from interested stakeholders.

The information was then analysed by the project team with regard to current economic performance of the sector both in Ireland and in reference countries, from which an evidence base on the causes of low productivity in Ireland was formed. Finally, a suite of recommendations and actions was formulated to address identified causes and to drive increased productivity into the future. All primary and secondary data collated as part of this research was analysed in Q3 and Q4 2019.

Irish Construction Sector Review

The following infographic sets out key indicators for the Irish construction industry. Trends in the Irish construction sector are discussed more fully in section 2.1 of this report.

Estimated Population Growth



Real GDP Growth



Construction employment ...grew



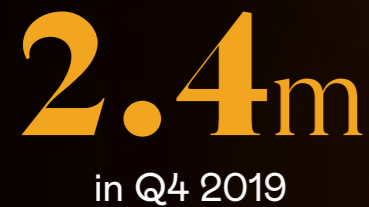
There are only 14 construction companies in Ireland that employ more than 250 employees. The remaining consist of

Loans to Irish Companies



63% of company's experienced challenges in accessing finance

Total Employment reached



Irish Construction Sector Review

Gross Fixed Capital Formation*Housing in 2019*

Listed prices
decreased by
1.2%
in Q4 2019 from the
previous 12 months

Compound Annual Growth Rate (CARG) from 2012 to 2017*European innovation scoreboard 2019*

International benchmarks

Table 1 below sets out the Gross Value Add per hour (GVA) from construction for Ireland relative to the reference countries. This illustrates how Ireland lags behind other countries in relation to productivity per labour hour worked. Additional metrics as well as key challenges identified as part of the international review are discussed in Section 2.2 with additional information provided in Appendix 4.

Table 1: GVA for construction in Ireland and in the reference countries

2018	IRELAND	AUSTRALIA	BELGIUM	DENMARK	NETHERLANDS	NEW ZEALAND	UK
GVA per hour	€22.30 (2015)	n/a	€45.51	€37.60	€33.16	€25.90	€27.03

Note: GVA per Hour is calculated as GVA divided by the total number of hours of both the self-employed and the employees as per the CSO.

Causes of low productivity

A range of causes of low productivity in the construction sector in Ireland have been identified. These causes have been considered across three main stages of the project lifecycle, as set out below:

Initiation and Planning Stage

Cyclical nature of construction sector: The consequent challenges that arise as a result of volatility in demand for both private and public capital works affects the sustainability of firms, employment security and capacity to invest in people and resources, which has a significant impact on productivity;

Pipeline: Lack of clarity on forthcoming public and private sector work impacts firm confidence to invest in resources, technology, training and upskilling. This then impacts firm's appetite for the development of specialised areas such as off-site production;

Complex planning system: Current approval processes for planning in Ireland are lengthy and require a significant administrative effort with a resulting impact on time and resources and a consequent adverse impact on productivity;

Procurement and contracting: Issues raised as part of this review include the bureaucratic and onerous nature of Ireland's public procurement processes, exclusionary qualifying criteria, poorly defined project briefs, unrealistic budgets, a lack of understanding of the complexity of the construction stage on the part of clients, a lack of collaboration with all members of the supply chain and sub-optimal risk transfer mechanisms; and

Fragmented nature of the sector: While not unique to Ireland, the complexity of the supply chain with dependency on subcontractors and agency workers can greatly reduce productivity with multiple parties working to different schedules and budgets. This can lead to poor decision making at initiation, planning and execution stages of a project.

Execution Stage

Under-investment in technology and innovation: While a strong appetite to embrace technology advances is evident, there has been a low uptake of funding and training supports for technology and innovation development;

Under-utilisation of off-site production: The use of production systems which provide a greater degree of standardisation and modularisation with the bulk of construction work taking place in factories off-site, is a growing sector that offers huge scope for expansion which can address labour shortages and improve quality and productivity;

Limited certification of training skills in the sector: The absence of a formal system to require, track and award skills competency or CPD training for tradespeople can impact on the quality of output, lead to higher incidents of defective work which is costly to remedy and can lead to delays which cause budget over-runs;

Poor recruitment and upskilling: An industry that is primarily comprised of SMEs and micro enterprises is mitigating against the recruitment of trained staff, the upskilling and training of staff and management, and

the number of apprenticeships on offer with employers often unable to afford the cost of taking on an apprentice;

Precarious working conditions and bogus self-employment: The findings of this research indicate that workforce rights, and specifically precarious working conditions is an issue of concern particularly for construction trades. Safe and fair working conditions are baseline requirements for labour productivity which if absent place a limit on the quality and timely delivery of work, health and safety, employee well-being, benefits of employment such as pension entitlements and disability cover, career progression and innovation. Ultimately growth and development of the sector is severely impacted;

Inefficient treatment and management of construction waste. The construction sector is responsible for a significant level of waste which requires careful treatment and management to minimise any environmental impact. Consideration of opportunities to embed circular economy practices in projects at all stages of the project from design to construction and demolition is required from all stakeholders.

Performance and Monitoring stage

Difficulties measuring productivity:

The CSO measures productivity for the total construction industry. However, there is no data available on the productivity of the industry's component sectors (i.e. civil engineering, non-residential and residential). With the absence of detailed datasets on productivity, the targeting of actions to specific areas is difficult;

Low uptake of education and training for digital transformation and sustainability:

Current CPD and upskilling programmes for existing tradespeople and professionals must offer opportunities to train in the use of new technologies and processes. While a variety of supports are available, these need to be reviewed and uptake encouraged. This is critically important to the success of developing specialisations including off-site production;

A broad range of education and training supports are available.

These include Skillnet Ireland's Management Development provision and Enterprise Ireland's management development offerings (Management4Growth,

Leadership4Growth, Lean). Other supports in this area include the mentoring, business advise clinics and training courses offered by the nation-wide network of Local Enterprise Offices and are supported by recent increases in funding for construction-related training and education via the National Training Fund, however there has been a low uptake by industry in recent years across the board from trades level to managerial level; and

Poor public perception of built environment careers:

Construction in particular, but also the wider professions in the built environment such as planning, design, architecture, engineering, surveying etc. are perceived as being risky careers prone to redundancies and insecure employment.

High Level Principles

The selection of actions to address the causes of low productivity identified above, has been guided by three high level principles that this research has identified as critical to productivity in the sector. These are set out in Table 2.

Challenges and High Impact Actions

Consideration of the causes of low productivity, in the context of what is currently underway in Ireland and international best practice, has informed the selection of key actions that can be taken to support productivity enhancements in the construction sector. A proactive and collaborative approach to tackling challenges to productivity is required to prevent an increasing decline in productivity with knock on adverse impacts for public infrastructure and the economy.

A summary overview of causes or key challenge areas, and high impact actions to address these is set out in Table 3. The causes and actions encompass all stages of the project lifecycle. These actions are considered most likely to drive productivity in the construction sector. More detailed information on the causes of low productivity are included in Section 3, with a range of additional actions also set out.

Leaders and supporting bodies have been identified and agreed for each action as well as a timeline for implementation, details of which are set out in the Roadmap for Delivery in Section 4.

Table 2: High level principles underpinning the recommendations and proposed actions

PRINCIPLE 1	A collaborative and mutually supportive relationship between clients and delivery partners that promotes and fosters: <ul style="list-style-type: none"> » full lifecycle thinking across the sector; » leadership and timely decision making; and » efficient processes and a productive work environment that minimises waste, carbon emissions and enhances the circular economy.
PRINCIPLE 2	A valued and engaged workforce recognising the skills and experience of all participants in a transparent and consistent manner.
PRINCIPLE 3	World class standards in digital technology and innovation based on cutting edge research and development activities.



This report provides a high level, qualitative analysis of the overall built environment rather than a quantitative study of specific elements or sub-sectors.

Table 3: Challenges and High Impact Actions

PROJECT LIFECYCLE STAGE	INITIATION AND PLANNING		
KEY CHALLENGE AREAS	1. Planning	2. Pipeline of Works	3. Public Procurement & Contracting
KEY ACTIONS	1.1 Integrated approach to the delivery of housing and critical infrastructural projects with coordinated planning and delivery across local authority boundary areas	2.1 Improvements to Investment Projects & Programme Tracker	3.1 Ongoing review and reform of procurement mechanisms and processes as part of the next generation of the Capital Works Management Framework (CWMF)
	1.2 Digitisation of the planning process		3.2 Public contracts to support, value and reward innovation through use of BIM, ISO 19650, Lean processes and Modern Methods of Construction (MMC)

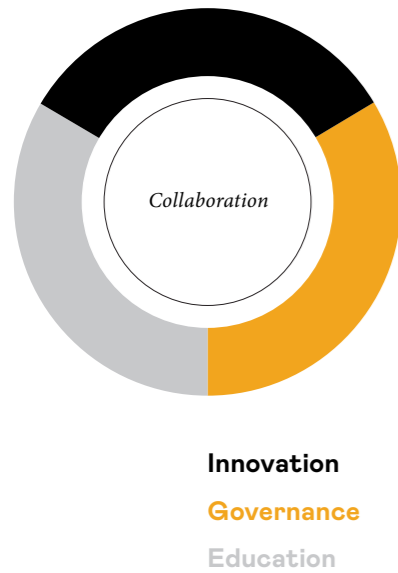
PROJECT LIFECYCLE STAGE	EXECUTION		
KEY CHALLENGE AREAS	4. Policy and Regulation	5. Operational Management	6. Technology & Innovation
KEY ACTIONS	4.1 Place the Construction Industry Register of Ireland on a statutory footing	5.1 Supply Chain Optimisation: Main contractor and sub-contractor to adopt a proactive, mutually supportive and collaborative relationship with upfront liaison on work, payment scheduling and resource capacity	6.1 Establishment of Joint Working Group to guide the development of the off-site production sector
	4.2 Enhance monitoring, investigations and compliance nationwide, including inspections by DEASP Inspectors and the recently established Employment Status Investigation Unit (ESIU) to detect and tackle the misclassification of workers		6.2 A renewed focus and commitment to support the widespread use of BIM by the sector in Ireland

PROJECT LIFECYCLE STAGE	PERFORMANCE & MONITORING	
KEY CHALLENGE AREAS	7. Education & Training	8. Image of the sector
KEY ACTIONS	7.1 Advance plans for Build Digital	8.1 Joined-up approach by all stakeholders to improve the image of the sector
	7.2 Advance plans for a National Centre of Excellence	8.2 Industry to work with educational partners to promote built environment options within primary and post-primary curricula
	7.3 Ensure apprenticeship curricula and modes of delivery keep pace with technological and process changes in the construction sector	



Conclusion

Figure 2: Key Action Elements



The unique attributes of the Irish construction industry relative to other sectors include its sectoral and regional split, fragmentation of firms across a wide number of micro and small companies, slow uptake of new technologies, varying construction processes and projects, and associated difficulties in accurately measuring productivity and activity. These features, when combined with the continuing consequences from a severe recession and specific sector challenges, have contributed to the current low levels of productivity. A cultural emphasis of “client versus supplier” and an inclination for sector participants to operate on a silo basis has added to these challenges.

On the positive side, a welcome feature of the report’s findings has been the high level of engagement by individual companies, organisations and government bodies in identifying and addressing these challenges. A common theme from the consultation process has been the recognition by all stakeholders that more steps need to be taken urgently, on a collaborative basis, to ensure that all sectors of the construction industry work together to drive the construction industry forward.

This theme of collaboration across all stakeholders is central to the suite of actions identified in this report. The individual actions, while considered important and necessary to address industry challenges, are in isolation insufficient to drive productivity. The key actions need to be implemented as a collective to ensure effective change is realised. The actions can be grouped between three key elements required to drive productivity in the construction industry – Innovation, Governance and Education – as illustrated in the graphic below.

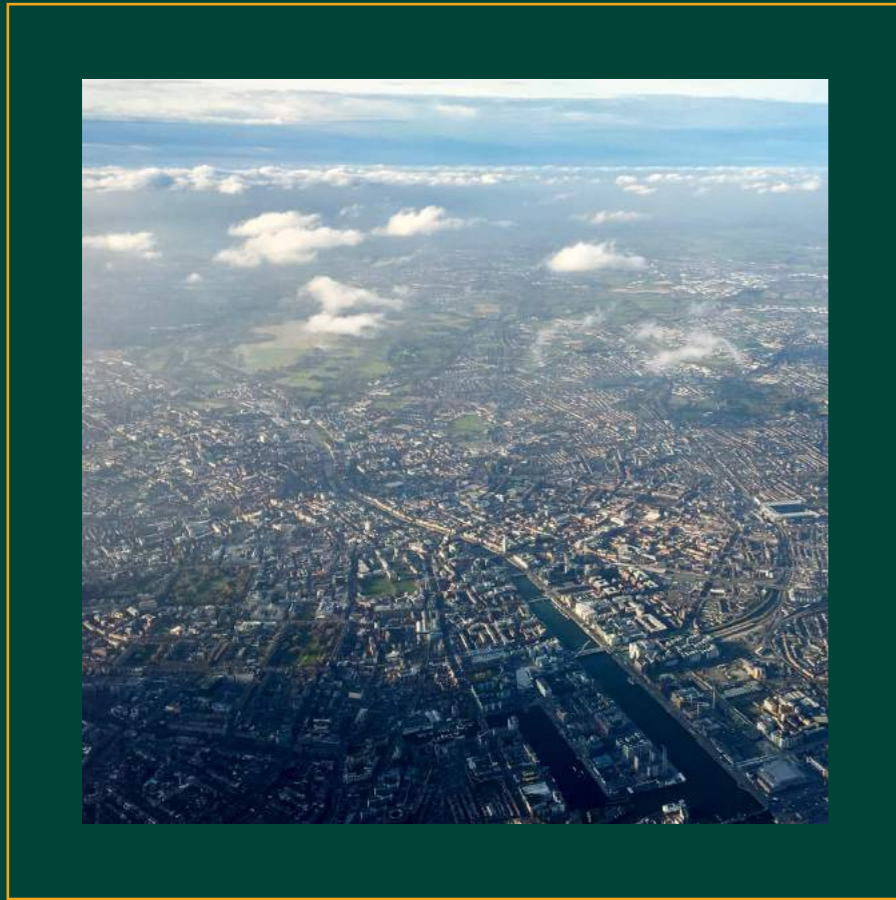
Only by addressing these issues as a collective, with both industry and the Government acting in partnership, can the construction industry successfully adapt to the requirements of a new digital environment and ensure the timely delivery of privately led developments and the critical infrastructure projects set out in Project Ireland 2040. The Construction Sector Group (CSG) will have a key role to play in monitoring the implementation of the proposed actions and ensuring a sustained momentum for the improvement of productivity in the construction sector.



Only by addressing these issues as a collective, can the construction industry successfully adapt to the requirements of a new digital environment and ensure the timely delivery of privately led developments and the critical infrastructure projects set out in Project Ireland 2040



Economic analysis of productivity in the Irish construction sector



10

BACKGROUND AND CONTEXT

Background and context

1.1

Introduction

The Project Ireland 2040 Delivery Board, jointly chaired by the Secretaries General of the Department of Public Expenditure and Reform (DPER) and the Department of Housing, Planning and Local Government (DHPLG) has identified the capacity of the Irish construction sector to produce the required infrastructure on a value-for-money basis as a risk to the successful implementation of the National Development Plan.

The most recent government report on productivity in the construction sector is included in the Build: Construction Sector Performance and Prospects 2019 report (the Build Report). This report highlights that there has been limited productivity growth in the construction sector between the years 2000 and 2016. It also states that if the construction

sector had kept pace with productivity growth in other sectors, gross value added would be some €3.1bn higher.

The Construction Study Group (CSG) was established following the launch of Project Ireland 2040 and the National Development Plan (NDP) in February 2018. The role of the CSG is to ensure regular and open

dialogue between Government and the construction sector and identify areas for action.

DPER have commissioned this report to consider the causes of current low levels of productivity in the construction sector and develop specific relevant actions to be pursued by both government and industry.



1.2

Scope of work

KPMG, Future Analytics Consulting (FAC) and TU Dublin (providing a peer review function) were appointed by DPER to undertake an economic analysis of productivity in the construction sector and advise on future policy and industry strategy.

This report provides a high level, qualitative analysis of the overall built environment rather than a quantitative study of specific elements or sub-sectors. The report also considers the construction sector to include the whole of the built environment, i.e. from planners and designers to contractors on site along with operations and maintenance. The term construction sector in this report should be thus considered in this context.

The key objectives of the research are:

To set out industry dynamics and operational factors which are contributing to existing productivity performance in the construction sector in Ireland;

To undertake an international comparative analysis of productivity in the construction industry. This is to include a comparison with countries with similar characteristics to Ireland yet with higher productivity in construction. The analysis should identify the causes of the relative differences in performance;

To identify a suite of policy options and actions for industry and professional representative

bodies based on leading international practice which can improve efficiency in the sector;

To document a clear implementation plan for industry, professional representative body and public sector actions including;

Timelines; and

Roles and responsibilities for each action.

To examine the scope for the use of more environmentally sustainable materials in the construction process and new procedures to minimise waste, carbon emissions and enhance the circular economy.

1.3

Construction productivity definition

The standard definition of labour productivity is output Gross Value Added (GVA) per hour worked. GVA is determined as the value of outputs less the value of intermediate consumption. Labour productivity is then calculated as the gross value added divided by the number of hours worked in the sector.

This definition encompasses the sector as a whole and does not consider productivity within sub-sectors or take into account the sector type or firm size, which can experience different levels of productivity on an individual basis. A consideration of the different elements of the construction sector are set out below.

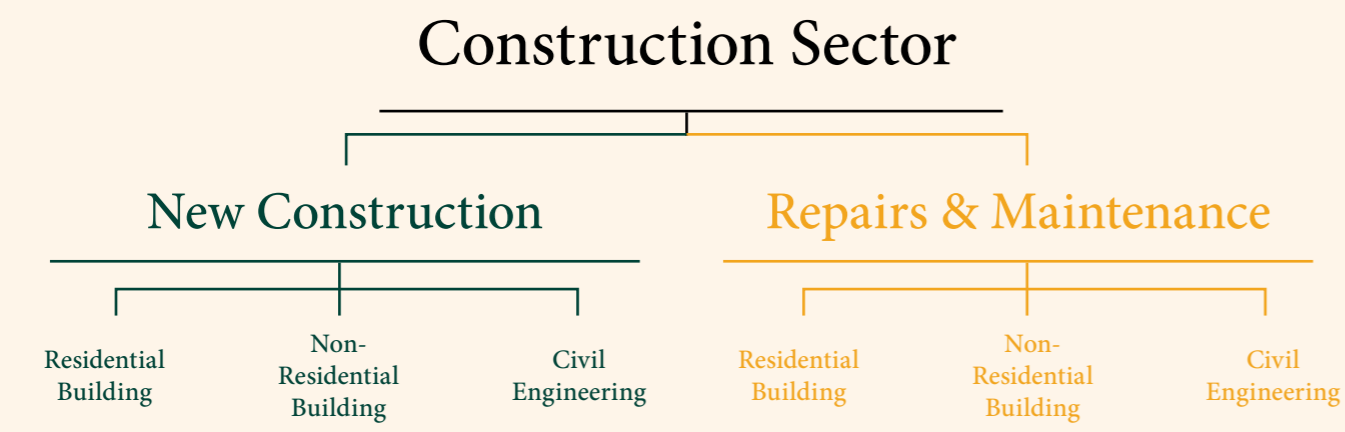
Element 1

The Irish construction sector, in line with EU guidance on statistical reporting, is split into two work types (New Construction and Repairs & Maintenance) each with three categories of work (Residential Building, Non-Residential Building and Civil Engineering) as illustrated in Figure 3 below:

Residential Building encapsulates Local Authority & Voluntary Housing, Affordable Housing and Private Housing.

Non-Residential Building includes Education, Health and other public or semi-state buildings, Commercial, Industry, Agriculture, Tourism, Sport and Recreation, and other Non-Residential construction not elsewhere classified.

Figure 3: Construction Industry Scope



Civil Engineering includes Roads, Public Transport, Seaports/Airports, Water, Sanitary, Energy, Telecommunications and other civil engineering activities not elsewhere classified.

Element 2

Within each of these sectors, a number of construction processes take place at different stages of the project lifecycle and include initiation and planning, execution, and performance and monitoring. These processes are undertaken by a wide range of stakeholders across government and industry with different issues, perspectives and risks.

Element 3

Construction activity can then be considered across the different levels of construction, i.e. activity at a macro level e.g. development of project pipeline for Project Ireland 2040, the industry level e.g. this can range from planners, to architects, surveyors, engineers, contractors and developers and all areas in between, the firm level in relation to the level of activity each individual firm can undertake and finally the actual project activity itself.

Element 4

Finally, the sector is also influenced by construction demography issues with a highly fragmented market. In 2017, 97% of the 57,255 construction enterprises were classed as micro enterprises, i.e. 0-9 persons engaged¹. In addition, construction activity is spread regionally across the country. Dublin has benefited from the increased levels of activity in commercial development with significantly higher number of the construction population employed in the capital.

This fragmented construction sector profile is not unique to Ireland and applies globally:

All but 0.2% of enterprises operating in the EU-28 non-financial business sector (which includes construction) in 2016 were SMEs. These SMEs employ 93m people and generate 57% of value in the sector. Almost 93% of SMEs are classed as micro SMEs². SMEs within the EU construction sector accounted for 87.6% of employment in 2016.

EU construction stakeholders have identified the main challenges for the construction eco-system as including:

Significant labour shortages exacerbated by ageing workforce and the unattractiveness of the sector to young people;

The impact of decarbonisation requirements;

The need for sustainable construction (construction and demolition waste currently account for 25-30% of waste generated in the EU);

The impact of digital transformation;

The need for innovative business models and investment; and

Increasing demand for infrastructure maintenance and investments that connect to national transport, energy and digital infrastructures and the growth of urban development³.

¹ CSO (2016) Statistical Releases - Construction Sector by Persons Engaged. Available at: <https://statbank.cso.ie/multiquicktables/quickTables.aspx?id=baa13> Accessed 13/12/19

² European Commission (2017) Annual Report on European SMEs 2016/2017. Available at: <https://op.europa.eu/en/publication-detail/-/publication/0b7b64b6-ca80-11e7-8e69-01aa75ed71a1/language-en/format-PDF>. Accessed 13/12/19

³ European Construction Industry Federation (2019). Construction 2050 Building Tomorrow's Europe Today. Available at: <http://www.fiec.eu/en/cust/documentview.aspx?UID=2fb4f61f-fea7-40f5-a049-6b9e703e2463>. Accessed 05/12/19

The absence of granular productivity data that captures the myriad forms of construction activity, processes and subsectors creates difficulties in understanding productivity. Furthermore, offsite construction is not measured within typical construction parameters. This presents a measurement challenge for the industry that should be addressed to ensure accurate data on productivity of the sector is available.

Accurate and complete data sets are difficult to access, apart from data collected and analysed by the Central Statistics Office (CSO). This has been highlighted in the SBA Fact Sheet 2017, which identifies the challenge associated with acquiring robust statistics from Ireland in all areas. “This issue has not improved over the years and is to the detriment of Irish SMEs as the limited data may not reveal all the problems companies face”⁴.

Notwithstanding the inherent complexities associated with national and international construction sectors, there are a number of key themes underpinning low productivity in the Irish construction sector. These include, but are not limited to the following:

The lack of integration of digitalisation and technology uptake by all firms;

Cyclical nature of projects resulting in **discontinuous demand** which can be mitigated through a pipeline of visible and committed public, as well as private sector investment;

Skill shortages as a direct consequence of the economic crisis which is constraining the ability of firms to increase adoption of innovation and technology;

Lack of focus in public procurement of public projects on the opportunities to drive increased use of modern methods of construction, provide viable opportunities for SMEs and encourage increased collaboration amongst all stakeholders rather than litigation and mistrust; and

The impact of regulation from both a national and international perspective influences procurement, planning, design, construction and maintenance and can both hinder the construction sector and offer opportunities to boost productivity, for example through the rollout of a program to retrofit public buildings and houses in line with EU requirements and Government policy.

⁴European Commission (2017) Small Business Factsheet. Available at: <https://dbei.gov.ie/en/Publications/Publication-files/2017-SBA-Fact-Sheet.pdf>. Accessed 6/12/19.

1.4

Research framework

Set out below is the research framework adopted for the purposes of this report. More detailed information on the different stages is also provided along with references to appendices with supporting information. Some of these stages occurred in parallel.

Stage 1



Issue of survey and review of results

Stage 2



Review of reports and articles relating to construction productivity published both in Ireland and internationally.

Stage 3



Analysis of construction sectors in the reference countries to understand economic environments, key challenges and identify attributes or initiatives undertaken in these countries to boost productivity.

Stage 4



Individual meetings with relevant stakeholders who expressed an interest in engaging on the report, as well as a workshop with all stakeholders to validate and agree recommendations and actions on a collaborative basis.

Stage 5



Review of submissions and analysis of data collected.



STAGE 1 SURVEY

A high-level survey was developed which was intended to gauge participant's demographics, organisation background, understanding of causes of low productivity across a number of themes and the proposed solutions which resonated with them the most. A comment field was also available for participants to make additional comment on productivity in the construction sector.

The survey was administered to the membership of CSG member representative bodies in Q3 of 2019 (5 membership bodies in total).

Responses were received from 540 participants, with 54% fully completing the survey.

The survey findings must be considered in the context of this response rate.

STAGE 2 REVIEW OF PUBLISHED REPORTS AND ARTICLES

A significant number of reports and articles have been written in relation to the construction industry and productivity in general. Over 80 publications were reviewed during this process both to inform the authors' understanding of the economic and operational environments operating within the Irish construction sector but also to inform the international review in relation to the six reference countries, i.e. Australia, Belgium, Denmark, Netherlands, New Zealand and the UK.

STAGE 4 STAKEHOLDER CONSULTATION

An invitation was issued to all members of the CSG Growth and Productivity Sub-Group to engage in individual consultation sessions in Q3 of 2019. The multi-disciplinary background to the CSG was intended to facilitate an understanding of the issues that affect stakeholders at different stages of the project lifecycle.

The main aim of these consultation meetings was to identify the key challenges directly affecting the individual organisations and to discuss potential solutions that in their opinion would boost productivity.

The findings from these consultation meetings were reviewed and analysed for similarities in issues and the identification of solutions that aligned with findings from Stage 2 and from the international review.

Draft actions with designated action leaders proposed from the overall review were collectively agreed and validated with stakeholders through both individual meetings/calls and through a workshop held in October 2019 and again in January 2020.

These actions were reviewed and updated to reflect current engagement by stakeholders and to ensure the actions were practical and capable of implementation and measurement.

A full list of all interviewee organisations is included in Appendix 1 and includes both public and private bodies across the built environment.

STAGE 3 INTERNATIONAL REVIEW

An international comparative analysis of construction productivity across a number of countries with similar characteristics or outlook to Ireland was undertaken. These countries, as agreed with DPER in advance were Australia, Belgium, Denmark, the Netherlands, New Zealand and the UK.

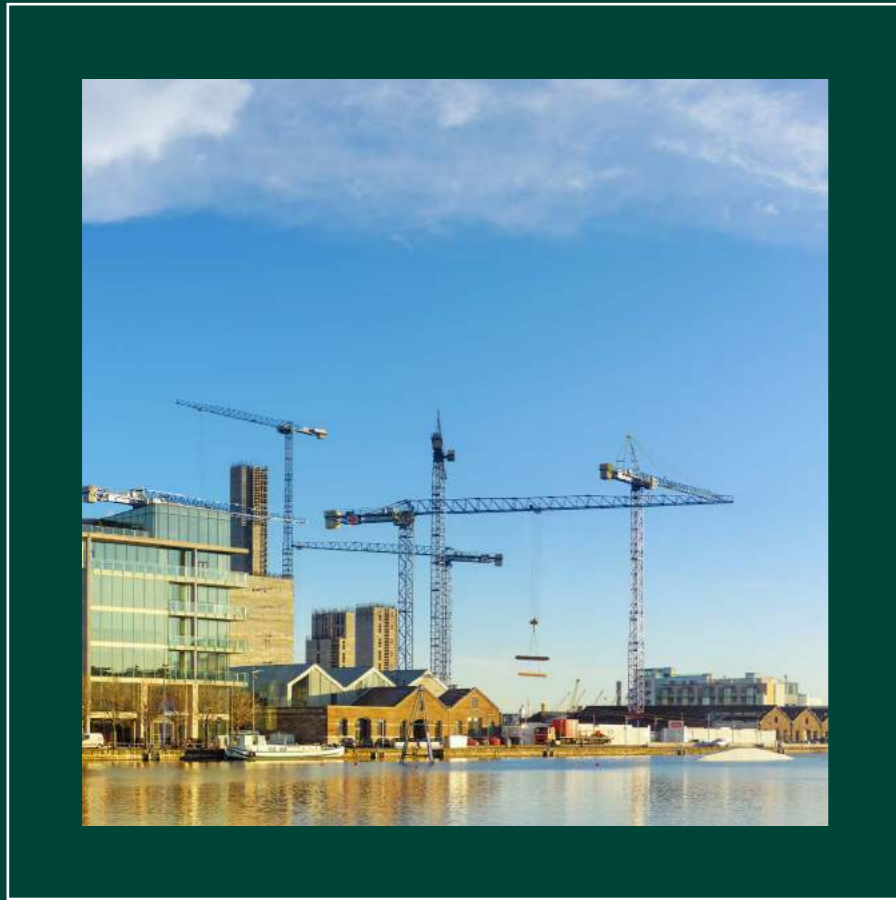
This analysis was performed through a desktop review of publicly available information derived from published reports, and European publications such as European Construction Sector Observatory Reports.

An analysis of the international economic environments is included in Section 2.2 with examples of initiatives undertaken included as part of Section 3's analysis to understand address construction productivity.

STAGE 5 REVIEW OF SUBMISSIONS

Separate to, and following the consultation meetings, submissions were received in relation to the report. These submissions were used to assist in formalising the concerns and opportunities raised at consultation meetings and to provide additional context and background to particular issues.

The output from the evidence base above was considered in the light of current economic performance of the construction sector both in Ireland and in the reference countries and combined with the team's analysis to identify some of the causes of low productivity in Ireland. This resulted in the suite of recommendations and actions to drive increased productivity into the future, as set out in Section 3 and 4 of this report.



ECONOMIC AND INDUSTRY REVIEW



2.1

Overview

This section presents an overview of key economic trends defining the industry including GDP growth, population change, employment growth, productivity, investment, housing and access to finance.



2.1.1 GDP GROWTH

The Irish economy has been performing strongly for several years – GDP is estimated to have been €343 billion in 2019, from a low of €167 billion in 2010, growth of 105%⁵. In its October 2020 Budget document, the Department of Finance projected Real GDP growth of 0.7% for 2020. Growth was forecasted to increase to 2.5% in 2021, increasing in 2022-2024, and settling at 2.6% in 2025⁶.

This growth positively impacts the construction sector as higher public expenditure can be made available for infrastructure and companies are better positioned to invest in buildings and fixed assets. Ireland is exposed to changes in the international economy, however. Potential downturns in the US and Germany and the consequences of Brexit could cause an inward shift in future demand for Irish exports, which in turn will have a negative impact on economic growth⁷.

2.1.2 POPULATION CHANGE

Ireland's population reached 4.9 million in the year ending April 2019⁸ and grew at a Compound Annual Growth Rate of 0.9% from 2013 to 2018. Population growth is expected to slow up to 2023, with the population forecasted to reach 5.25 million in 2030 and 5.8 million by 2050.

The age profile of the population is also expected to change with the working age population (15 - 64) expected to shrink from 65% (2016) to 56% in 2050. According to the National Planning Framework (NPF), the population aged over 65 will more than double to 23% of the total population by 2040, While the under 15 age group will decrease by approximately 10%⁹. In the absence of positive net migration, these population trends would reduce future workforce resources. However, current levels of net migration are very positive with an approximate level of 34,000 being experienced per year in 2018 and 20110.

A growing population will require the additional housing, schools, healthcare, etc., and increased provision of and access to infrastructure and government services requiring increased output from the construction sector. The NPF states an average annual output of 25,000 new homes will be required between 2018 and 2040, with a minimum annual output of 30,000 homes in the years up to 2027 to meet projected population growth.

⁵ Central Statistics Office (2019). Quarterly National Accounts Q3 2019. Available at: <https://www.cso.ie/en/releasesandpublications/er/na/quarterlynationalaccountsquarter32019/>. Accessed 12/19.

⁶ Department of Finance (2019). Budget 2020 Economic and Fiscal Outlook. Available at: <http://budget.gov.ie/Budgets/2020/2020.aspx>. Accessed 12/19.

⁷ EESRI (2019). Quarterly Economic Commentary, Autumn 2019. Available at: <https://www.esri.ie/publications/quarterly-economic-commentary-autumn-2019>. Accessed 12/19.

⁸ CSO (August 2019). Population and Migration Estimates, April 2019. Available at: <https://www.cso.ie/en/releasesandpublications/er/pme/populationandmigrationestimatesapril2019/>. Accessed 12/19.

⁹ Government of Ireland (2018). National Planning Framework: Project Ireland 2040. Available at: https://www.housing.gov.ie/sites/default/files/publications/files/project_ireland_2040_npf_7mb.pdf. Accessed: 12/19!

¹⁰ CSO (August 2019). Population and Migration Estimates, April 2019. Available at: <https://www.cso.ie/en/releasesandpublications/er/pme/populationandmigrationestimatesapril2019/>. Accessed 12/19.

2.1.3 EMPLOYMENT GROWTH

Nationally, total persons employed has been increasing in recent years with 2.3m people employed in Q3 2019 which represents an increase of 2.4% on the previous twelve months. This also highlights a continued reduction in unemployment with unemployment levels of 128,000 in Q3 2019 which represents the twenty eighth quarter in succession where unemployment has declined on an annual basis. The current (December 2019) unemployment rate stands 4.8%, which is close to full employment.

The construction industry experienced a significant reduction in employment levels during the recession. However, the industry has shown some signs of recovery with 150,00 people employed in the sector Q3 2019 compared to just 88,000 in Q3 2012. This represents growth of 59.0%.

Employment in the construction industry as a percentage of total employment has increased to 6.4% in Q3 2019 from a low of 4.2% in Q1 2013¹¹. The fragmented nature of the construction sector, as evidenced by only 14 construction companies¹² in the country employing over 250 employees and over 47,000 SMEs in operation in the sector, may inhibit smaller companies' ability to increase employment levels as SMEs may not be able to offer employment certainty

to employees and often they are contracted on a project by project basis.

Housing is a significant part of Irish construction output. There has been a 3% total increase in construction sector employment between 2000 and 2018 against a backdrop of a 60% total reduction in house completions¹³ over the same period. This suggests a greater proportion of construction employees are engaged in commercial building and infrastructure activity and projects rather than residential building.

Larger construction organisations were in a better position during the recession to diversify into different construction areas and markets allowing them to maintain much higher levels of employees than SMEs. This allowed them to leverage off developments in BIM and other technologies and thus better position themselves to benefit from the recent increases in commercial activity.

The Trade and Apprenticeship Skills Survey (2018)¹⁴ highlighted the reluctance of employers to take on construction apprentices as one of the primary reasons for the lag in apprenticeship numbers compared to construction employment levels. Apprentice registration numbers

in construction accounted for 1% of construction employment in 2018 compared to 0.7% in 2016, which illustrates this slow growth in take-up. SOLAS also warns of potential shortages in the 'wet trades' area, particularly brick/block layers and plasterers. In spite of increased residential activity, apprentice registrations in these areas remain low¹⁵. This would also apply to plumbers although apprentice registrations in this area are growing steadily (89% increase from 345 in 2016 to 693 in 2018)¹⁵.

The Expert Group on Future Skills Needs is undertaking a study on the skills needs of Ireland's construction sector, as well as the scale of demand for skills within the sector, up to 2030. This study, which will be completed by mid-2020, will further inform Government and industry on how best to plan for the future skills needs of the sector. While this is only one of many reasons why apprenticeship numbers have lagged behind the growth in employment levels (others may include the cost of off-the job training and onerous regulation requirements), the subsequent result has been that, as indicated by the survey results, 63% of existing trades employers do not employ apprentices. This suggests a lower number of skilled employees in the future.

2.1.4 PRODUCTIVITY

In 2006, the construction sector's GVA¹⁶ peaked at 10.7%¹⁷ of GDP to become the second largest contributor to national economic output. GVA has been steadily increasing since 2010 in the construction sector with an increase of 12.4% in between 2017 and 2018 to reach €8.6 billion. In 2018 the sector accounted for 2.6% of Ireland's GDP, making it the twelfth largest contributor to economic output.

The number of hours worked in the sector increased by 4.4%¹⁸ from 2013 to 2018 as illustrated below. This resulted in labour productivity growth of approx. 5%. Ireland's construction sector was ranked 14th in the Euro Area in 2016 in terms of labour productivity. According to the CSO report, Productivity in Ireland, construction made a 0.4% contribution to growth in GVA in 2017. The annual total GVA growth

was 8.7% in 2018 for Ireland.

The Society of Chartered Surveyors Ireland's (SCSI) latest Tender Price Index indicated that national construction tender prices increased by 3.4% in the first half of 2019, with a 2.9% increase forecasted for the second half of 2019.¹⁹

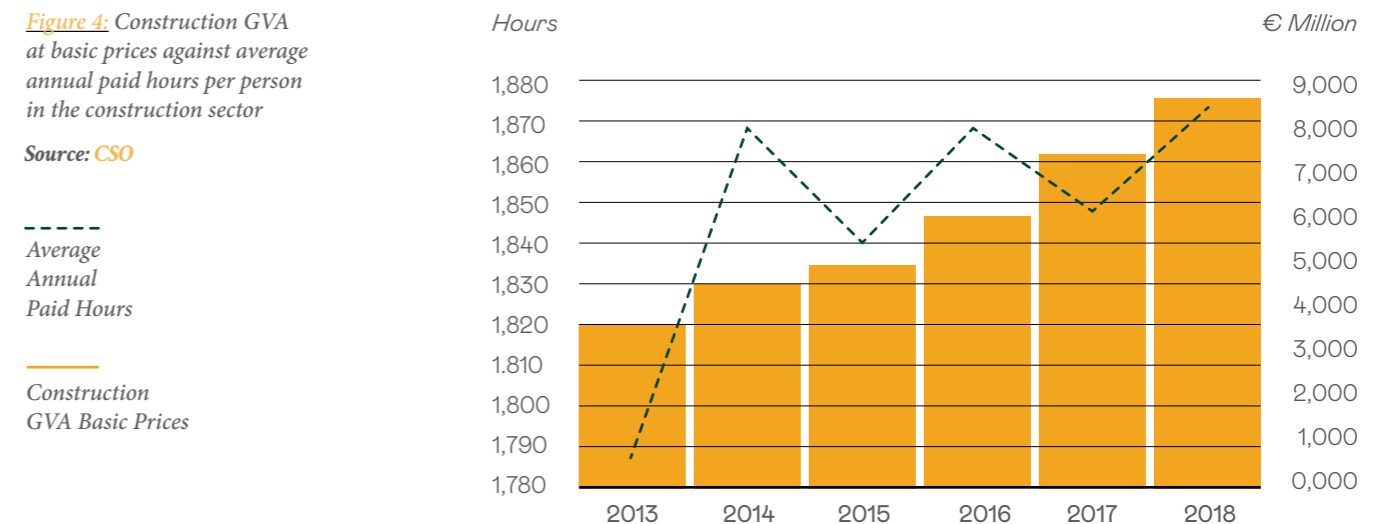
Construction costs for residential buildings increased by 1.4%²⁰ in Q3 2019 on the previous twelve months which is just below the 2.3% increase in the EU (28 countries) growth rate over the same period. Cost inflation appears to be slowing given the 3% annual increase in 2018. A slowing growth rate is an opportunity for productivity. If the cost of labour and capital inputs grows at a slower rate than output, productivity gains can be achieved as output per unit input is higher.

The Wholesale Price Index for Building and Construction Materials provides a general indicator of price trends in the sector. Average prices increased by 1.5% in December 2019 relative to 12 months earlier.²¹ Wide variations in inflation are observable across material type: the cost of sand and gravel grew by 15.6% while the cost of stone fell by 1.7%. This highlights that different sectors face different materials cost bases. Average hourly labour earnings in the construction sector increased by 1.1%²² in Q3 2019 compared to 12 months earlier, below the rate of growth across all sectors of 3.4%. The average number of weekly paid hours fell by 1.6% over the same period.

Theoretically, for labour productivity to increase, output per worker must grow. The cost of labour is of less concern if output is growing at a faster rate.

Figure 4: Construction GVA at basic prices against average annual paid hours per person in the construction sector

Source: CSO



²⁰ Eurostat (2019). Construction cost of new residential buildings. Available at: <https://ec.europa.eu/eurostat/databrowser/view/teis510/default/table?lang=en>. Accessed 12/19

²¹ CSO (2019). Wholesale Price Index. Available at: <https://statbank.cso.ie/px/pxeirestat/Statire/SelectVarVal/Define.asp?maintable=WPM288PLanguage=0>. Accessed 12/19

²² CSO (2019). Earnings Hours and Employment Costs Survey Quarterly. Available at: <https://statbank.cso.ie/px/pxeirestat/Statire/SelectVarVal/Define.asp?maintable=EHQ03@PLanguage=0>. Accessed 12/19.

¹¹ Government of Ireland (2019). Build: Construction Sector Performance and Prospects 2019. Available at: <https://assets.gov.ie/6659/3312cd28edf04f4c83666ac76b534c45.pdf>. Accessed 12/19.

¹² Construction Industry Federation (2019). Budget 2019 Submission. Available at: <https://cif.ie/wp-content/uploads/2018/08/CIF-Pre-Budget-Submission-Report-2019-LR.pdf>. Accessed 12/19. ¹³ Build: Construction Sector Performance and Prospects 2019

¹⁴ O'Murchadha and Murphy (2018). Trades and Apprenticeship Skills Survey: An Employers Perspective. Available at: <https://arrow.tudublin.ie/beschrecrep/20/>. Accessed 12/19

¹⁵ SOLAS (2019). National Skills Bulletin. Available at: <https://www.solas.ie/fj/70398/x/a6c2780d38/national-skills-bulletin-2019.pdf>. Accessed 12/19.

¹⁶ For the purposes of this study, 'Gross Value Added' (GVA) is defined as a measure of the added value generated in an economy by the production of goods and services and is measured prior to adding product taxes but includes product subsidies

¹⁷ Eurostat (2019). Construction cost of new residential buildings. Available at: <https://ec.europa.eu/eurostat/databrowser/view/teis510/default/table?lang=en>. Accessed 12/19

¹⁸ CSO (2019). National Income and Expenditure 2018. Available at: <https://www.cso.ie/en/releasesandpublications/ep/p-nie/nie2018/gvaa/>. Accessed 12/19.

¹⁹ Society of Chartered Surveyors Ireland (2019). Tender Price Index, July 2019. Available at: https://www.scsi.ie/documents/get_lob?id=14748&field=file. Accessed 12/19

2.1.5 INVESTMENT

The official measure of construction investment is Gross Fixed Capital Formation (GFCF)²³ in building and construction, defined as acquisitions less disposals of fixed assets, including all new buildings and major reconstruction of existing buildings, including civil engineering and infrastructure works. GFCF itself includes R&D and non-construction related investment and can be split between dwellings, improvements and other buildings and construction, e.g. roads, which constituted 16.5%, 12.2% and 71.3% respectively of the €25.5 billion investment in 2018.

Investment in the Irish construction industry has been growing steadily since 2011, following the economic downturn, with dwellings constituting 16% of government investment. As detailed in Budget 2020 the overall public capital allocation for 2020 is €8.1 billion, which represents 13.1% of total expenditure. This capital spend is expected to grow to €9.3 billion in 2022²⁴.

Investments arising under Project Ireland 2040, will be underpinned with the Government planning on investing €116 billion in Exchequer funding up to 2040. The availability of an active

and robust public project pipeline is essential to support the objectives of Project Ireland 2040 and to encourage companies to invest now in resources and technologies. Figure 5 sets out the recent trend in investment.

The Ulster Bank Construction PMI rose to 52.0 in December 2019 from 48.2 in November (where over 50.0 signals expansion). This was the first increase in construction output since August, potentially related to less uncertainty around Brexit. Expansion could be seen in both commercial activity (53.6) and housing activity (51.8), and contraction in civil engineering (43.1).

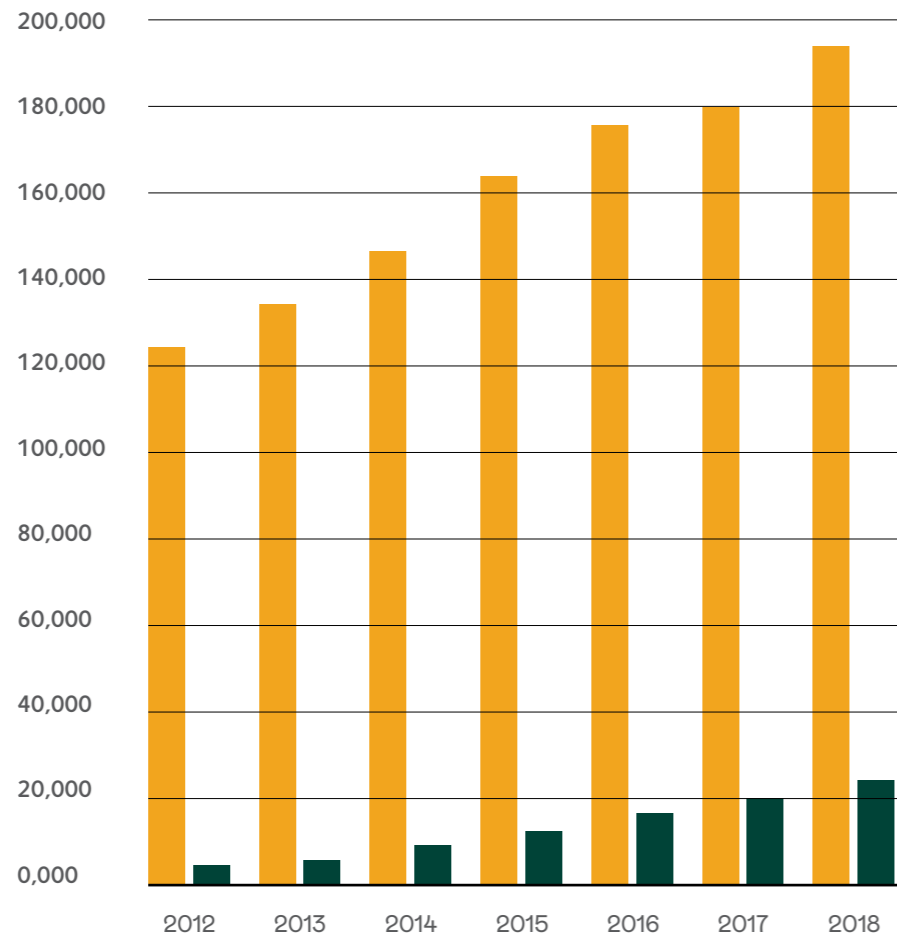
Buildings and Construction against Modified Gross National Income

Figure 5: Buildings and Construction output against total Modified Gross National Income (GNI*) in €million at current market prices

Source: CSO

GNI*
Building Information Construction

Note: Buildings and Construction figures are calculated as a sum of fixed capital spend on dwellings, roads, other buildings and construction and costs associated with transfer of land as buildings. CSO (2019). National Income and Expenditure 2018. Available at: <https://www.cso.ie/en/releasesandpublications/ep/p-nie/nie2018/tables/>. Accessed 12/19



2.1.6 RESIDENTIAL HOUSING

The Irish residential market is characterised by a low supply of houses for sale due to the very small volume of houses built during the recession, which is significantly outweighed by the demand for houses in the country. This demand is mainly driven by increasing population and migration trends.

Shortages in the housing market led to significant house price growth in recent years. This appears to have moderated recently, with prices growing by 1.4% in the year to November 2019, compared to growth of 7.2% in the 12 months to November 2018. Prices in Dublin are broadly stable (0.7%) – though with growth of 3.0% in Fingal and a decrease of 6.3% in Dún

Laoghaire Rathdown – while prices outside Dublin are growing by 3.6%.²⁵

Mortgage rates in Ireland have been declining over recent years, in line with declining Euro interest rates. This decline appears to have plateaued with the variable interest rate of 3% on new housing loans remaining relatively static since 2017 at 3 - 3.5%.

The stringent central bank lending requirements (typically mortgages limited to 3.5 times salaries) have been designed to control house price inflation which previously improved the feasibility and profitability of housing construction. With house price increases remaining at a sustainable level developers and construction

contractors have had to focus on cost efficiencies, time efficiencies and location to deliver profit margins.

The ability of the construction sector to produce high quality housing at a lower cost will be enhanced through the adoption of modern methods of construction such as off-site construction, use of technologies such as BIM and Lean and investing in upskilling employees which in turn will drive productivity in the sector. This investment will also be enhanced through Government efforts to streamline the planning approval process through the adoption of digital technologies, improvements in education and training and the planning objection system.



"The ability of the sector to produce high quality housing at a lower cost will be enhanced through the adoption of modern methods of construction, BIM and Lean technologies..."

²³ GFCF in Building and Construction is the official measure of investment for statistical and accounting purposes as defined by the European System of Accounts (ESA 2010)

²⁴ Department of Finance (2019). Budget 2020 Expenditure Report. Available at: [http://budget.gov.ie/Budgets/2020/Documents/Budget/Parts%20I-III%20Expenditure%20Report%202020%20\(A\).pdf](http://budget.gov.ie/Budgets/2020/Documents/Budget/Parts%20I-III%20Expenditure%20Report%202020%20(A).pdf). Accessed 12/19.

²⁵ CSO (2019). Residential Property Price Index. Available at: <https://www.cso.ie/en/statistics/prices/residentialpropertypriceindex/>. Accessed 12/19

2.1.7 ACCESS TO FINANCE

Loans to Irish construction companies have been continuously declining post the economic crisis. Irish construction SMEs were especially affected by the recession, with a decline in the total outstanding credit provided to them reducing by 71.8% over the period 2010 - 2016²⁶. They also have the highest loan default rate although there have been some improvements in this in recent years.

A survey carried out on behalf of the CIF in Ireland in 2017 suggested 63% of company's surveyed experienced difficulties in accessing finance and as a result only 33% of housebuilders relied on bank finance with the majority relying on their own resources for investment. A recent report by the Central Bank indicates most SMEs apply for credit to fund working capital with a large majority of micro, small and medium firms financing investment from internal funds²⁷.

The establishment of entities such as the Strategic Banking Corporation of Ireland whose goals are to ensure access to funding for Irish SMEs, through the delivery of lower cost, long-term, innovative and accessible funding, may help to alleviate some of the challenges accessing finance for companies in the sector. Other initiatives such as Home Building Finance Ireland, which has been established for the purpose of funding new home construction, and Activate Capital, backed by the Ireland Strategic Investment Fund and KKR, which provide debt capital for property development, have also been introduced.

2.1.8 BUSINESS ENTERPRISE, RESEARCH AND DEVELOPMENT.

Ireland continues to be classed as a "strong" innovator as per the European Innovation Scoreboard 2019²⁸, with €2.2m invested in R&D activities in 2017. Understanding the R&D activity in the construction sector is key to identifying productivity and efficiency opportunities. Sixty-four percent of this innovation activity is performed by foreign firms operating in a small number of sectors. The level of intensity of R&D activity as a percentage of GDP is at small and decreasing level and suggests increased innovation needs to take place within domestic firms to ensure they do not fall further behind other EU countries. Given Ireland's ranking in terms of innovation there is an opportunity for the construction sector to continue to leverage off this experience and expertise to improve its levels of innovation. This is echoed by the EU Council Recommendations for Ireland which indicate that while business research and development expenditure continues to grow, it remains below the EU average and is mostly concentrated in foreign-owned firms. Stronger links between domestic and foreign firms could help to diffuse innovations throughout the economy²⁹.

Private investment in the sector plays an important role in driving productivity, particularly in the areas such as Lean Construction and BIM where client expectations are focused

on optimising efficiencies and project delivery. At present over 30 companies of different scales and with different target markets are members of Lean Construction Ireland.

Over 160 organisations are members of the Construction IT Alliance (CitA) and have the shared goal of driving productivity with a focus on digital transformation (including BIM). The requirements of the pharmaceutical sector, for instance, demand time and cost certainties which have resulted in the adoption of Virtual Design & Construct (VDC) methods, where a digital environment is used to first design, simulate and test all construction elements before transfer onto site. The restrictive physical spaces available in retrofit projects, such as at high capacity manufacturing plants, as well as the requirements of rapid construction (e.g. data centres) have driven off-site manufacturing (through use of engineering modules). This has also been driven by work in unstable environments or even more limited skills availability e.g. a facility has been set up in Carlow to manufacture modules for transfer to a brewery in Africa or to data centres in the Middle East. Some companies have adopted the use of Last Planner and other Lean tools as well as a company-wide lean adoption programmes to increase productivity to meet market demand for pharma and clean room builds in Ireland, the UK, and Europe as well as North America.

²⁶ European Commission (2019). *European Construction Sector Observatory - country profile Ireland*. Available at: <https://ec.europa.eu/docsroom/documents/40290>. Accessed 12/19

²⁷ Central Bank of Ireland (2019). *SME Market Report 2019*. Available at: <https://centralbank.ie/docs/default-source/publications/sme-market-reports/sme-market-report-2019.pdf?sfvrsn=9>. Accessed 12/19

²⁸ European Commission (2019). *European Innovation Scorecard 2019*. Available at: <https://ec.europa.eu/docsroom/documents/35896>. Accessed 12/19

²⁹ European Council (2019). *Recommendation on the 2019 National Reform Programme for Ireland*. Available at: <https://op.europa.eu/en/publication-detail/-/publication/a1bea762-8848-11e9-9369-01aa75ed71a1/language-en>. Accessed 12/19

2.2 Overview of international economic indicators and trends

As part of this study a high level international comparative analysis of productivity in the construction sector has been undertaken amongst a reference group of six countries, namely, Australia, Belgium, Denmark, the Netherlands, New Zealand and the UK (the "reference countries").

A number of key areas were analysed which included:

- Economic indicators which involved a review of trends in GDP, population and employment;
- Overview of the relevant construction sectors to include market size, productivity trends,

government investment, housing completions and mortgage rates and access to finance and level of innovation in the sector; and

Key challenges and success factors associated with the construction sector within each country.

Set out below are some of the key metrics identified as part of this international review.

This analysis identified a number of attributes and initiatives, which appear to encourage improved levels of productivity within the construction sector. These are considered as a follow-on from the review of individual Irish challenges in Section 4. The key attributes or initiatives on a thematic basis, along with comparison activities undertaken in Ireland is included in Appendix 4.

Table 4: Key economic indicators across reference countries ranked from lowest to highest GVA/hour³⁰

2018	AUSTRALIA	BELGIUM	DENMARK	IRELAND	NETHERLANDS	NEW ZEALAND	UK
GVA per hour	n/a	€45.51	€37.60	€22.30	€33.16	€25.90	€27.03
Population (million)	25.6	11.4	5.8	4.8	17.2	4.89	66.8
Employment in construction ('000)	1,153.9	332	176.4	149.9	497.0	247.7	2,341.0
Construction employment % total employment	9.0%	6.1%	6.1%	6.4%	5.2%	9.3%	7.0%

Sources: ABS, CSO LFQS, Stats NZ, ONS, CBS, DST, StatBel, OECD

³⁰ Data is based on latest available figures as at November 2019

2.2.1 INTERNATIONAL ECONOMIC INDICATORS

Table 4 below sets out key metrics identified across a range of indicators which illustrate Ireland's position in relation to the reference countries.

Ireland has a similar population and construction production values to New Zealand, yet construction

employment levels are approximately 50% lower. In terms of employment numbers, Ireland is similar to Denmark but has a relatively lower production value and a 68% lower GVA per hour worked. In fact, Ireland's GVA per hour is lower than all of the reference countries. Ireland's construction

employment levels as a percentage of total population indicates a close correlation with other smaller EU countries, slightly higher than the UK and significantly behind New Zealand and Australia.

2.3

International success stories

A high-level overview of the success factors of reference countries is shown below. Broadly, labour markets face

similar challenges across comparator jurisdictions in the reference group analysed, and successful policy

responses can be considered in an Irish context.

Table 5: Key success factors identified in reference countries

CHALLENGE	AUSTRALIA	BELGIUM	DENMARK	NETHERLANDS	NEW ZEALAND	UK
Adequate supply of skilled & unskilled workers		○			○	
Affordable labour costs				○	○	○
Affordable construction costs		○	○			
High profit margins		○	○	○		
Efficient use of digital technology	○		○	○		○
Timely payments	○		○			○
Administrative procedure times below OECD average	○		○		○	○
Access to finance	○				○	○

2.3.1 LABOUR



Labour markets face similar challenges across comparator jurisdictions...

Amongst the reference group, the Irish construction sector has had the greatest rate of growth in employment in recent years, with 55.1% growth between Q4 2012 and Q3 2019³¹. The sector accounts for 6.4% of national employment,³² recruited 38% of recent skilled hires in 2018,³³ and has the lowest vacancy rate across all Irish business sectors in Q3 2019.³⁴

In Australia, the sector supports training to increase labour productivity. The sector in Western Australia has its own training fund: The Construction Training Fund (CTF), a 100% industry-funded scheme funded through a Building and Construction Industry Training Fund (BCITF) Levy applicable to all construction projects in the region. CTF can subsidize up to 80% of training costs and provides grants up to €15k (AU\$25k) if a construction firm employs an apprentice.³⁵ Since its inception, the CTF has supported the training and employment of more than 60,000 apprentices and trainees and has helped over 500,000 industry workers to upgrade their skills.

In the UK, the Construction Industry Training Board (CITB) and

contractors and their supply chains are cooperating to address skills needs by focusing on encouraging careers, promoting standards and qualifications and training and development. A CITB Grants Scheme provides support for apprenticeships and construction-specific training. CITB also leads the National Skills Academy for Construction, a project-based and demand-led training concept, where the client and contractor determine the required skills based on a practical live project. In 2017, the Government introduced an Apprenticeship Levy at a rate of 0.5% of an employer's annual payroll cost greater than £3m. It aims to boost UK productivity by investing in human capital development, developing vocational skills and increasing the quality and quantity of apprenticeships.

New Zealand's labour productivity index increased from 1263 in 2010 to 1360 in 2018 (base = 1000, 2010),³⁶ and the Business Operations Survey (BOS) finds that there is one manager or professional per 7 employees. It is noted that lower ratios facilitate better processes and workforce motivation, supporting higher productivity.

³¹ CSO (2019). Labour Force Survey Quarterly Series. Available at: <https://www.cso.ie/en/releasesandpublications/er/lfs/labourforcesurveyqlyquarter32019/>. Accessed 12/19

³² Ibid.

³³ Solas (2018). National Skills Bulletin 2018. Available at: <https://www.solas.ie/f/70398/x/da278b4ad3/national-skills-bulletin-2018.pdf>. Accessed 12/19

³⁴ CSO, (2019). Job Vacancy Statistics. Available at: <https://www.cso.ie/en/statistics/earnings/jobvacancystatistics/>. Accessed 12/19

³⁵ Construction Training Fund. See: <https://ctf.wa.gov.au/industry/bcitif-levy/>. Accessed 12/19

³⁶ Stats NZ (2019). Labour productivity growth eases. Available at: <https://www.stats.govt.nz/news/labour-productivity-growth-eases>. Accessed 12/19



2.3.2 BUILDING INFORMATION MODELLING (BIM)

The Netherlands is a leader in embedding Building Information Modelling (BIM) in the construction sector. The government has made it mandatory to use BIM in public projects since 2011, and there are efforts to spread its adoption to the private sector. As per European Architectural Barometer, BIM adoption in the Netherlands was greater than 60% in 2017, with the country ranking first in BIM adoption in Europe³⁷. By bringing together open BIM standards into one coherent system, the BIM Locket system allows stakeholders to reduce their maintenance costs. The project is funded by the Building Information Council (BIR),³⁸ the central and local governments, as well as private corporations and had a budget €790,000 for 2016 and €810,000 for 2017.

The UK ranks second in terms of BIM adoption in 2017, as per the European

Architectural Barometer. A survey conducted by the UK BIM Task Group in 2016, shows that 54% of construction professionals were using BIM in the industry – 23% higher than the 2012 rate.³⁹ The sector in the UK is working towards implementing BIM Level 3 – a dimension dedicated to the entire life-cycle management of a building – by 2020.

Australia has been adopting BIM, prefabricated parts and digital project management tools in construction activities. BIM's market penetration rate is 33%, followed by prefabricated parts and digital project management tools – 29% and 25% respectively. There have been initiatives to enhance BIM technology adoption through the establishment of the Australian BIM Advisory Board. In June 2019, the government announced €1.24

million (AU\$2 million) funding to start a collaborative lab for designing prefabricated buildings.⁴⁰

Denmark has legislatively mandated BIM-requirements in public procurement since 2007. Over 65% of construction firms that use BIM – predominantly larger players – expect to use it for all projects from 2020 to 2025, driven by a range of perceived benefits including value-creation on sites, improving collaboration and cooperation across all parties, and environmental sustainability. It has taken 7–8 years for full benefits of BIM to be observed, taking account of the need to on-board all contractors and for handover. Public sector promotion of BIM is considered one of the key success factors through the use of a national and well-coordinated strategy to ensure a coherent approach to digitalisation.

2.3.3 INNOVATION

The Belgian Building Research Institute (BBRI), a private research centre founded with the support of the National Federation of Belgian Building Contractors (NFBBC), supports research and innovation in the construction sector. The centre provides technical support for innovative activities, tailored to the specific needs of construction SMEs. The centre also conducts research, funded by the government, which includes the assessment of the innovation potential in the building sector (e.g. acoustics), establishing practical solutions to reduce the cost of new construction and the use of composite structures and glass. Its members include more than 90,000 construction firms of all sizes. The BBRI and NFBBC have both introduced voluntary sustainable and quality construction certification

systems that have encouraged R&D investment and innovation. In 2018, the Belgian government implemented Construction Demonstrator 4.0 with the aim of raising awareness among companies and to encourage the use of digital technologies in order to improve their profitability and productivity.

The Netherlands has a strong focus on innovation and is classified as an Innovation Leader as per the European Innovation Scoreboard 2019. To boost innovation in the construction sector and scaling-up, several initiatives have been launched. A notable success is Building Campus (Bouwcampus) – a public-private initiative networking stakeholders to address issues in residential construction, infrastructure, commercial buildings and public spaces.

2.3.4 FAVOURABLE ADMINISTRATIVE PROCEDURES

Australia and Denmark are leaders in administrative efficiency, and therefore supporting productivity growth, ranking 4th and 3rd in the World Bank's "Ease of Doing Business 2019" report. Specifically, in relation to "Dealing with construction permits", Denmark ranks 3rd and Australia 9th. In Australia, obtaining a warehouse construction permit takes 11 procedures and 121 days, lower when compared with averages for high income OECD countries i.e. 13 procedures and 153 days respectively. The official cost for completing the procedure is 0.6% of the value of the new development, approximately half the average cost observed across OECD countries at 1.5%.⁴¹ For context, costs associated with construction permits in Ireland are estimated at €102,000 – the majority of which relates to the cost of obtaining planning permission.⁴² This is 580% more costly than in Australia⁴³ and 30% more costly than the Netherlands.⁴⁴

Australia has strong building quality control procedures pertaining to quality of building regulations, quality control before, during and after construction, liability and insurances regimes, and professional certifications.

³⁷ European Architectural Barometer (2019). Available at: <https://www.usp-mc.nl/en/insights/usp-shop/european-architectural-barometer/>. Accessed 12/19

³⁸ See: <https://www.usp-mc.nl/en/insights/usp-shop/european-architectural-barometer/>.

³⁹ NBS (2016). National BIM Report 2016. Available at: <https://www.thenbs.com/knowledge/national-bim-report-2016>. Accessed 12/19

⁴⁰ Architecture Design (2019). Australian prefab building industry gets a \$2m filip. Available at: [https://www.architectureanddesign.com.au/news/australian-prefab-building-industry-gets-\\$2m](https://www.architectureanddesign.com.au/news/australian-prefab-building-industry-gets-$2m). Accessed 12/19

⁴¹ OECD (2019). Economy Profile: Denmark; Doing Business 2019. Available at: <https://www.doingbusiness.org/content/dam/doingBusiness/country/d/denmark/DNK.pdf>. Accessed 12/19

⁴² OECD (2019). Economy Profile: Ireland; Doing Business 2019. Available at: <https://www.doingbusiness.org/content/dam/doingBusiness/country/i/ireland/IRL.pdf>. Accessed 12/19

⁴³ OECD (2019). Economy Profile: Australia; Doing Business 2019. Available at: <https://www.doingbusiness.org/content/dam/doingBusiness/country/a/australia/AUS.pdf>. Accessed 12/19

⁴⁴ OECD (2019). Economy Profile: Netherlands; Doing Business 2019. Available at: <https://www.doingbusiness.org/content/dam/doingBusiness/country/n/netherlands/NLD.pdf>. Accessed 12/19

⁴⁵ The World Bank, Doing Business Data (2019) Dealing with Construction Permits. Available at: <https://www.doingbusiness.org/en/data/exploretopics/dealing-with-construction-permits>. Accessed 16/12/19

Table 6: Time and cost involved to obtain permission to build a standard warehouse⁴⁵

2019	OECD HIGH INCOME REGION	IRELAND	AUSTRALIA	BELGIUM	DENMARK	NETHERLANDS	NEW ZEALAND	UK
Time to complete (days)	152.3	164.0	120.5	212.0	64.0	161.0	93.0	86.0
No. of procedures	12.7	10.0	11.0	10.0	7.0	13.0	11.0	9.0
Cost as a % of warehouse build cost	1.5	4.1	0.6	0.9	0.6	3.6	2.2	1.1

2.3.5 TIMELY PAYMENTS AND ACCESS TO FINANCE

In Denmark, 90.7% of Danish construction firms are paid promptly, the highest rate in the EU.⁴⁶ Bad debt loss as a share of total annual revenue is low at 0.8 per cent, while the average across the EU is 2.3% (2018). Denmark implemented the Late Payment Directive in 2018, which allows longer payment terms. If B2B transaction exceed 30 days of payment terms, this needs to be agreed in writing by the two parties concerned.⁴⁷

In the Netherlands, the government brought in a ban on long payment terms in July 2017 as a support mechanism for SME sized sub-contractors. The regulation limits the payment term limit at 60 days. Other recent Dutch Government policies include:

Launch of a microcredit institution – Qredits

Online one-stop-shop for entrepreneurs, a knowledge and capital sharing support platform

Dutch Growth Co-Investment Programme - supports innovative and fast-growing SMEs and mid-cap enterprises

Guarantee Scheme for SMEs – facilitates access to loans for SMEs with insufficient capital. The Exchequer guarantees up to €1.5 million, lowering risk for financial institutions.

Australia's healthy start-up ecosystem fundamentals provide a solid platform from which Construction-Tech start-ups can launch. VC investment in construction-Tech start-ups amounted to 8.9% of total VC investment since start-2016. It is estimated that more than \$100 million has been invested by venture capitalists in Construction-Tech start-ups in that period.

Broadly, access to finance can be a valuable tool to supports SMEs in periods when economic buoyancy is subdued.

2.4

Conclusion

Those countries like Denmark, the Netherlands and the UK that have embraced digital technologies and innovation appear better placed to meet productivity challenges than countries like Ireland. Further discussion of how they are engaging in the digital transformation of the sector is set out in Section 4.

Table 10 in Section 3.2.3 illustrates that while the length of time and number of procedures involved to obtain a permit to construct a warehouse in Ireland are just below the OECD average of 153.1 days and 12.7 procedures, they lag behind other countries, in particular our nearest neighbour, the UK, where it only takes 86 days and 9 procedures. The table also illustrates the estimated costs associated with construction permits. Ireland at €102,000 (the majority of which relates to the cost of obtaining planning permission), is 580% higher than the lowest cost country, Australia and 30% higher than the next most expensive country, the Netherlands.

This review of the Irish economy suggests an improving and stabilising position for the construction sector. Strong forecasted economic performance (not accounting for the impact of a hard Brexit), provides an opportunity for future sectoral growth underpinned by the capital investment associated with Project Ireland 2040 of €119bn. Employment

in the construction sector is increasing reflecting increased activity and growth in new apprenticeship registrations, although from a very low base.

The continued strong demand for housing has significant economic and social impacts with a minimum of 30,000 residential units per annum required over the next 10 years. The ability of the construction sector to meet this demand, and wider Government infrastructure plans, will require increased levels of productivity and adoption of technologies and modern methods of construction to maximise efficiencies and optimally leverage a skilled labour force.

Ireland is not alone in trying to address these challenges and much can be learned from international best practice. The attributes and initiatives identified for the reference countries, as set out in Appendix 4, meet many of these success criteria. The consultation, survey and research undertaken all highlight the absence, or low levels, of many of these factors in mainstream construction activities which contributes to the low level of productivity in the sector.

The following section sets out a detailed discussion on the causes of low productivity, considers what strategies are already being implemented or explored currently in Ireland and what we can learn from other countries. The resulting key recommendations, set out in Section 3 and summarised in Section 4, aim to boost productivity by identifying success factors elsewhere, which can be applied to the Irish case.

⁴⁶ Intrum (2019). *European Payment Risk Report 2019*. Available at: <https://www.intrum.com/publications/european-payment-report-2019/>. Accessed 12/19

⁴⁷ European Parliamentary Research Service (2018). *Directive on late payments in commercial transactions: European Implementation Assessment*. Available at: [https://www.europarl.europa.eu/RegData/etudes/IDAN/2018/621842/EPRS_IDA\(2018\)621842_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/IDAN/2018/621842/EPRS_IDA(2018)621842_EN.pdf). Accessed 12/19



UNDERSTANDING AND IMPROVING CONSTRUCTION PRODUCTIVITY

30

Understanding and improving construction productivity



3.1

Overview

A key element of this study has been attempting to understand the underlying causes of low or stagnant productivity in the Irish construction sector and identifying a suite of actions to address these challenges.

A review of recent international and national research papers and strategies prepared by various industry and public sector bodies highlighted a broad range of issues that present a challenge to productivity. Consultation with public and private sector stakeholders, as well as feedback from the survey, further clarified the nature and extent of these challenges and suggests

many of the global causes of low productivity are endemic within the Irish environment.

The collection of issues identified were then independently reviewed by the project team to determine the issues of most pertinence to productivity. Issues that were frequently cited by a range of consultees (both as part of the

interview series and through the online survey) and that were also recognised in international research as factors affecting productivity, are considered in this report. A balanced and impartial approach has been rigorously pursued in identifying the key challenges and devising the related set of recommendations and actions to drive productivity growth in the sector.

3.1.1 GUIDING PRINCIPLES AND OVER-ARCHING ACTIONS

The selection of recommendations and actions has been guided by three high level principles that this research has identified as critical to productivity in the sector, as set out below.

Table 7: High level principles underpinning the recommendations and proposed actions

PRINCIPLE 1	A collaborative and mutually supportive relationship between clients and delivery partners that promotes and fosters: <ul style="list-style-type: none"> » full lifecycle thinking across the sector; » leadership and timely decision making; and » efficient processes and a productive work environment that minimises waste, carbon emissions and enhances the circular economy.
PRINCIPLE 2	A valued and engaged workforce, recognising the skills and experience of all participants in a transparent and consistent manner.
PRINCIPLE 3	World class standards in digital technology and innovation supported by cutting edge research and development.

In addition, four overarching actions are proposed to enhance current processes for measuring productivity on both a macro and micro level. These actions will foster collaborative partnership approaches and support a higher level of accuracy in identifying, monitoring and tracking of factors that affect productivity.

Overarching Actions

COLLABORATION, TRUST AND UNDERSTANDING

- I. Foster relationships between clients, design teams, main contractors and subcontractors that value collaboration, trust and understanding of the complexities of each phase in the construction of a project. This will facilitate the agreement of design specifications before work commences to ensure timely and efficient delivery at the build stage. The implementation of actions set out under Recommendation 3 on public procurement and contracting reform, Recommendation 4 on improvements to policy and regulation, Recommendation 6 on technology and innovation and Recommendation 7 on education and training will also assist in the implementation of this action. This over-arching action is reflective of Principle 1 above.

PRODUCTIVITY MEASUREMENT

- II. Work with the CSO to extend the range of data sources for measuring productivity so that granular information on different components of productivity can be compiled. This should include the collation of data on subsectors of the industry – residential, commercial, public infrastructure etc. and by company type (micro, SME or large firm). This will support the deployment of targeted measures to address underperforming areas within the sector.
- III. Government to work with industry bodies on the development of cost and performance benchmarks for a variety of measures including labour capacity and productivity. For example, the UK Infrastructure & Projects Authority team have established a benchmarking team that aims to deliver cost and delivery benchmarks and performance assessment measures, amongst other objectives.
- IV. At firm level – continual improvement of internal processes and data collection is required. Industry bodies to provide guidance to construction companies on identifying SMART metrics to monitor progress on project delivery. Metrics should be assigned to key performance indicators (KPIs) linked to goals and objectives for short term (daily), medium-term (monthly), and long-term. Existing tools such as Enterprise Ireland's Company Health Check (CHC) can also be used to measure company competitiveness and improve productivity.



*Foster
relationships
that value
collaboration,
trust and
understanding*

.....

3.1.2 THE PROJECT LIFECYCLE APPROACH

The challenges, recommendations and actions have been organised in the context of different stages of the project lifecycle – i.e. Initiation and Planning, Execution and Performance and Monitoring.

Initiation and Planning: Issues, recommendations and actions relevant at a high-level strategic policy level are categorised under this theme. This includes market forces and finance such as the cyclical nature of the market, the fragmented nature of the sector, profit margins, the public sector pipeline, factors pertaining to the planning system, procurement and contracting.

Execution: This describes issues that manifest primarily at individual firm level including conditions of work, issues arising in relation to labour and skills, digitisation, technology and innovation aspects. Recommendations and actions to address these issues are then set out.

Performance and Monitoring: Issues affecting productivity from a measurement, educational, training and promotion perspective are discussed under this theme. Recommendations and actions relate to the capacity for upskilling the existing workforce, career progression, apprenticeships, reputation and promotion of the sector.

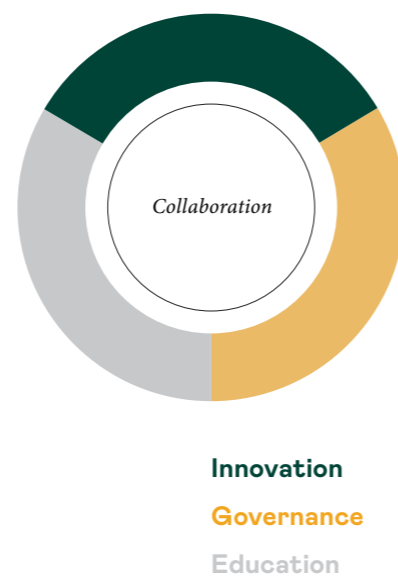
The results of the online survey confirm that productivity challenges facing the construction sector in the major cities can differ from those

in smaller urban/rural areas (63% of respondents agreed). The most commonly cited reasons for this relate to labour productivity, security of employment and opportunities for career progression, education and training. The majority of respondents agreed that challenges to productivity vary across the sector (72%) with some cross sectoral specificities were highlighted. However, a close review of the survey results indicate similarities in the issues raised by respondents with clear commonalities across subsectors – residential, commercial, retail, education, hospitality and leisure and public infrastructure (please refer to Appendix 3 for the survey results).

Clear parallels exist between those issues highlighted by Irish-based firms, industry bodies and government departments, and issues identified as affecting productivity on an international level (in the reference countries).

The theme of collaboration across all stakeholders is central to the suite of actions identified in this report. The individual actions, while considered important and necessary to address industry challenges, are in isolation insufficient to adequately drive productivity. The key actions need to be implemented as a collective to ensure effective change is realised. Many of the actions are linked to each other and can be grouped between three main elements that can drive productivity in the construction sector – Innovation, Governance and Education – as illustrated in Figure 6.

Figure 6: Key Action Elements



3.2 Initiation and planning stage

This section sets out the challenges that arise on a governmental or industry policy level that affect productivity at the initiation and planning stage of the project lifecycle. A series of actions that seek to address these challenges and improve productivity are also discussed. A summary overview is presented in Table 8 with high impact actions included. Additional supporting actions to address issues encountered at initiation and planning stage are provided in Table 9.

Table 8: Challenges, Recommendations and Actions at Initiation and Planning Stage

PROJECT STAGE	CHALLENGE AREA	RECOMMENDATIONS AND HIGH IMPACT ACTIONS
Initiation and Planning Stage	Cyclical nature of sector	<p>Recommendation 1: Improvements in the planning system</p> <p>1.1 Integrated approach to housing delivery across Local Authority boundary areas</p> <p>1.2 Digitisation of the planning process</p> <p>Recommendation 2: Improved transparency of public sector works</p> <p>2.1 Improvements to Investment Projects & Programme Tracker</p> <p>Recommendation 3: Public procurement and contracting reform</p> <p>3.1 Ongoing review and reform of Capital Works Management Framework</p> <p>3.2 Proportionate requirements for use of modern methods of construction and circular economy initiatives in public procurement contracts</p>
	Lack of clarity on private and public pipeline of work	
	Planning system complex and poorly resourced	
	Fragmented nature of sector	

Table 9: Additional supporting actions

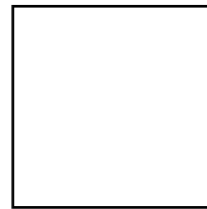
PROJECT STAGE	ADDITIONAL SUPPORTING ACTIONS TO ADDRESS CHALLENGE AREAS AND IMPROVE PRODUCTIVITY
Initiation and Planning Stage	<p>Recommendation 1: Improvements in the planning system</p> <p>1.3 Irish Planning Institute to partner with Planning Schools and Planning Practitioners to provide targeted training in a number of areas</p> <p>1.4 Publication of a template series for planners and designers on standardised layouts for developments such as housing etc. Such use to be discretionary rather than mandatory</p> <p>Recommendation 2: Improved transparency of public sector works</p> <p>2.2 Maintain a stable and balanced level of public capital investment</p> <p>Recommendation 3: Public procurement and contracting reform</p> <p>3.3 Explore opportunities for more integrated project delivery</p> <p>3.4 Introduction of a digital procurement passport</p> <p>3.5 Develop a sustained training programme for public procurers to enhance awareness and understanding of commercial skills and best practice approaches</p> <p>3.6 Flexible procurement frameworks to allow for the batching of similar type of work across a number of Local Authorities</p> <p>3.7 Implementation of recommendations from Construction Waste Resource Group with regard to measurement, management, treatment and enforcement of construction waste</p>

Set out below is an analysis of the key challenges identified as arising during the planning and initiation stage. Relevant strategies already underway are also discussed. This analysis has informed the identification of actions to complement initiatives already in place and to further drive productivity in the construction sector.

Challenge



Recommendation



Actions



3.2.1 CYCLICAL NATURE OF SECTOR

The consequent challenges that arise as a result of volatility in demand for public and private capital works affects the viability of firms, employment security and capacity to invest in people and resources, which has a significant impact on productivity. Survey results indicate that the cyclical nature of the sector is one of the core concerns of respondents as indicated by the range of comments received on general issues impacting on productivity.

The huge drain on difficult to replace skills, ability and experience that occurs during economic downturns, provides verification of this concern with significant adverse effects arising for productivity of the labour force that remains. Furthermore, the viability of companies is immediately impacted on when there is a drop in demand for construction, and where funding / schemes are closed without any alternative solution for construction companies who service and may have specialised in different sectors, an example being

the closure of the REFIT renewable energy support scheme.

Maintaining a sustainable level of investment in upskilling around new markets, technologies and opportunities is required to address this challenge e.g. retrofit skills, and knowledge is needed across all skills levels from craft to professional to managerial. The European Commission Horizon 2020 programme has a broad range of applied research programmes designed to encourage the participation of SMEs including those in the construction and wider built environment sector on themes such as energy, BIM, sustainability etc. Many of these research projects require practical case study examples and so the participation of firms to collaborate with academic and private research partners, is particularly encouraged. With projects on these programmes typically lasting for a period of 3-4 years, they can provide an important, regular source of funding during periods of economic downturn.

3.2.2 CAPITAL PROJECT PIPELINE

The key challenges identified under this heading include:

Lack of clarity on forthcoming public and private sector work – restricts confidence to invest in resources, technology and training and upskilling, and the development of specialised areas such as off-site production; and

Current initiatives such as Investment Projects and Programme Tracker are not user friendly and do not appear to be well-recognised by industry.

A clear pipeline of future development is crucial to project planning, employment security, and the growth and development of business across the built environment. Visibility of both the private and public sector pipeline strengthens confidence in the sector, and directly influences investment decisions on training and innovation. Conversely, as well as discouraging investment in upskill training in established career progression areas, a lack of clarity on the future pipeline of work also impacts certainty and the ability to make future looking investment decisions in innovative areas such as off-site production and the recruitment of additional employees and apprentices.

Confidence in the economy and capital markets is therefore considered a critical driver for business development. This is echoed by the views of industry stakeholders with greater certainty on public sector works frequently highlighted as a requirement to support productivity growth by stakeholders (through all consultation channels adopted as part of this study – i.e. survey, submissions, interviews).

With a strong political and societal focus on responding to the housing crisis and delivering key infrastructural developments, and with advancements in supportive policy frameworks, most notably Project Ireland 2040, the Government is now working closely with industry through the CSG to support the sector so that it can respond efficiently and competitively in delivering much needed development for a growing population.

In particular, the NPF has presented an opportunity to provide certainty, and a long-term vision to ensure development is planned and delivered in combination with essential supporting infrastructure. The Investment Projects and Programme Tracker/NDP offers a pragmatic solution to allow greater transparency on forthcoming public works. It follows similar initiatives in the UK, which has maintained a National Infrastructure and Construction Pipeline since 2011, as well as New Zealand and Australia who are experiencing higher levels of construction productivity.

However, feedback received as part of this research indicates that further work is required to promote this facility and to update it so that is easier to navigate for users. In this regard, it is relevant to note the Global Infrastructure Project Pipeline is a free digital platform that allows governments to promote public infrastructure projects to a global investor network⁴⁸. Current efforts by the Government to address some of these challenges and the imminent release of the updated and improved Project Tracker will be welcomed by the construction sector as a whole.

⁴⁸ Global Infrastructure Project Pipeline (2019) Available at: <https://pipeline.github.org/UserInfo>. Accessed 06/09/19

The inclusion of lower value projects (not limited to programmes/projects greater than €20 million) would also be welcomed, particularly by micro firm and SMEs. Administrative requirements of many public procurement frameworks often include minimum turnover levels and evidence of previous experience that restricts the participation of micro firms and SMEs. In this context, visibility of the pipeline for lower cost projects is important.

International benchmarking on infrastructure projects trackers, undertaken by KPMG, highlights the added value of interactive features such as mapping tools, the capability to produce reports, current stage and target timelines and regular updates, as illustrated in Figure 7 below.

The full list of public sector capital projects including all Local Authorities and semi-state bodies

such as the Land Development Agency (LDA) and IDA Ireland should also be included on the tracker. This would create a centralised facility for information on forthcoming projects that can be accessed by companies across the private sector from planning and design through to construction and operation phases.

In this regard, the introduction of more detailed forecasting of future development requirements as part of initiatives arising from the NPF, such as Housing Need Demand Assessments (HNDA), is encouraging. This will, if effectively communicated to industry via a centralised facility, support improvements in the capacity of suppliers to plan in response to the type, quantum and location of housing required across the country.

It is relevant to note that in 2019 the Department of Public Expenditure and Reform is to commence a Capability

Review of Public Sector Bodies. This review will be carried out with support from the EU Structural Reform Support Service.

The review will:

Learn lessons from the high performing sectors, for example roads, which can be applied to other areas; and

Strengthen and build new structures and skills to develop and modernise the State's project delivery practices.

3.2.3 PLANNING SYSTEM

The key challenges identified under this heading include:

Improvements required to support efficiencies in the planning system – the SHD process is welcome but reform is required;

Complexity of planning and regulatory landscape; and

Inconsistencies in online planning systems and a stronger focus on digitising the planning system.

A concentration of efforts at planning, design and procurement stages is perceived as the second biggest cause of low productivity in the sector (according to the results of the online survey conducted as part of this research – refer to Appendix 3 for more detail). Furthermore, planning and regulatory obstacles was the third most cited reason for low productivity in the sector. This includes the difficulty and delays that can often arise in seeking utility connections essential for development. Measures to improve the efficiency of planning processes were also the third most popular way of improving productivity from a legal or policy perspective (following improvements to procurement and contracting processes).

As set in Table 6 earlier (section 2.3.4), the cost of obtaining a construction permit as a percentage of the national warehouse cost of circa €2.5m at 4.2% is significantly above that of the other reference countries which suggests a disproportionate burden on companies.

The time to complete and the number of procedures involved in Ireland are slightly better than the OECD high-income average, however, they represent a more burdensome approach than for some of the other reference countries.

Recent initiatives to support a more efficient planning system, both in terms of forward planning e.g. the NPF, and on the development management side e.g. the Strategic Housing Development (SHD) Regulations, 2017, which will now be extended to the end of 2021, are largely welcomed by the sector. Since the introduction of the SHD arrangement, approximately 16,000 homes (houses and apartments) have received planning permission (as of early October 2019). However, refinements are required to maintain the effectiveness of the process as a 'fast track' mechanism to deliver housing. In this regard, the recommendations of the Review Group on the SHD process are welcomed. These include Recommendation 4 on ensuring that adequate staffing levels are provided for SHD and that other planning functions are not adversely impacted, and Recommendation 7, which calls for An Bord Pleanála to clarify its guidance for prospective SHD application regarding the appropriate level of design detail required at tripartite consultation meetings.

It is anticipated that the NPF requirement for Local Authorities to develop HNDA to support the preparation of Housing Strategies as part of County Development Plans will support efficiencies in the planning and delivery of housing. Furthermore, National Policy Objectives (NPO) set out in the NPF emphasise the importance of standardising plans and ensure clarity in terms of lands that require investment infrastructure (NPO 72 a-c). NPO's 73a-c and NPO74 relate to the order of priority for development of lands, the use of compulsory purchase powers and the need for coordination between infrastructure delivery agencies, to secure the alignment of the NPF and NDP. Objectives such as these will facilitate efficiencies in land acquisition processes, tendering processes and investment decisions, particularly where

there is a joined up, integrated approach across county boundary lines. This will bring further clarity to developers and contractors on the pipeline for future works, strengthening the confidence of firms to invest in areas such as staff development and new technologies that have positive implications for productivity. Furthermore, it offers scope for more coordinated delivery of essential utility connections that can often cause delays in construction projects.

It is relevant to note the recent work by the DHPLG on progressing a new Planning and Development Bill which deals with revisions to the judicial review (JR) and strategic infrastructure development (SID) provisions e.g. the revision of the "substantial grounds" and "sufficient interest" tests relating to JRs as well as the related legal cost rules. These proposed changes are aimed at further streamlining and improving the planning process and providing greater certainty with regard to planning timelines. This will have positive knock on effects in terms of supporting efficiencies in the delivery of development and will strengthen productivity in the sector.

On the issue of skills within the planning system, the Irish Planning Institute has stated that the single greatest challenge from an operational perspective is a lack of qualified planners to staff Planning Departments at Local Authority level. While this has not been independently verified, anecdotally it is a view that is corroborated by wider planning groups and practitioners in Ireland. Compounding this is the complex and constantly evolving regulatory landscape that extends across the life cycle of development from planning, design through to building standards. This can present serious challenges in the efficient use of resources and to the implementation of standards and the risk of falling foul of standards. Further

Figure 7: International Benchmarking on Infrastructure Projects Tracker



support both in the delivery and uptake of CPD for professional planners is required.

The Office of the Planning Regulator (OPR) has a specific remit to conduct education and training programmes for elected members and staff of local authorities/regional authorities. The OPR's strategy statement further defines the office's role in driving innovation and learning. Additionally, the OPR's work programme in relation to its research remit is currently being prepared and is intended to include a number of projects that will ultimately serve to enhance the planning system, which in turn will improve efficiencies and productivity.

The inconsistent and slow integration of e-planning systems has also been highlighted through this research as both a drain on time and resources with a requirement to print and package planning application documentation, which can run to hundreds of pages and in turn lead to a high volume of paper waste. Furthermore, the variations across the online planning systems of Local Authorities add an unnecessary layer of complexity to planners/designers and developers engaging with the planning system. An ongoing effort to digitise the planning system is welcomed and should continue to be advanced, specifically the ePlanning project, a joint initiative of the Association of Irish Local Government, City and County Management Association, DHPLG, Land Use and Transportation (LUTS) Committee, Board of the Local Government Management Agency (LGMA) and the Public Sector Reform Oversight Group. The ePlanning project is focused on developing a single national planning portal for planning application submission and planning information that is currently being developed/managed by the LGMA. A system is being built/designed to integrate with the current LA planning systems

(APAS, iPlan and Odyssey).

Furthermore, there is widespread support to consider possibilities to explore opportunities to integrate online systems used in planning and building control (BCMS) so that a single, holistic system is available in the reporting/tracking of information throughout the lifecycle of a project.

The UK has implemented a single point of entry for both planning and BCMS matters. These are two different systems which concentrate lodgements and queries in relation to Building Control and Planning information in one place. A similar approach may be appropriate in Ireland. However, this research has indicated that creation of such a centralised 'one stop shop' facility is a longer-term aspiration that could only be considered following the full digitisation of the Planning System.

3.2.4 PROCUREMENT AND CONTRACTING

As set out in the BUILD report, total investment in building and construction in Ireland is projected to increase to €30 billion in 2019, or 14% as a share of GNI*. The overall public capital expenditure allocation for 2019 is €7.3 billion. This is a €1.4 billion (24%) increase on 2018. While private procurement contracts represent a significant proportion of the sector, the majority of procurement and contracting issues highlighted during this research as presenting a challenge to productivity, relate specifically to public sector procurement frameworks.

Issues in relation to the procurement and contracting of public sector works were identified in the online survey as the top policy-related cause of low productivity in the sector (refer to Appendix 3 for survey results). For respondents who work primarily in Connaught and Munster, a concentration of efforts at planning, design and procurement was the most commonly cited cause of low productivity. Procurement and contracting challenges were also raised frequently by stakeholders at interview stage and in submissions by industry bodies. These issues include the bureaucratic and onerous nature of public procurement relative to private sector works, exclusionary qualifying criteria, poorly defined project briefs, unrealistic budgets, a lack of understanding of the complexity of the construction stage on the part of clients, a lack of collaboration with all members of the supply chain and sub-optimal risk transfer mechanisms.

Concerns on the effectiveness of public procurement and contracting processes for the built environment sector in Ireland are well documented with a range of industry reports calling for reform. In its report 'Achieving Quality through Smart Procurement', the RIAI references the results of a September 2018 survey of its members which suggests that while 51% of firms do

compete for publicly procured works, a significant number do not. The reasons cited for this include:

Excessive bureaucracy involved in the procurement process;

Poorly drafted briefs;

Forms of contract which do not encourage collaborative work practices;

Uncertainty about the extent of the commission and timescale of the proposed development;

Excessive risk transfer from the procuring body leading to higher costs.

It has been pointed out that private procurement is not without its faults. While private procurements are not bound by procurement regulations private buyers often apply procurement practices with similar challenges such as poorly designed briefs, uncertainty around timescales and forms of contracts with unreasonable levels of risk transfer. There can often be a significant level of overhead required for private procurement that should not be underestimated.

On an international level, procurement practices are also widely recognised as a factor affecting productivity in the sector with analysis by the McKinsey Global Institute, for example, citing sub-optimal procurement centred on reducing initial price and offloading risk as a key market failure for heavy construction⁴⁹.

The administrative heavy nature of responding to publicly procured works can also disincentivise firms from engaging in the process. In Ireland, the structure of the industry with over 96% of firms classified as 'micro firms' presents other challenges for small firms, such as minimum qualifying

criteria on turnover and previous experience. For firms that do meet qualifying criteria, the time and cost associated with preparing tender responses frequently do not have a sufficient pay-off when the firm is unsuccessful in securing the contract. Pre-qualification criteria for public sector panels and frameworks can be unnecessarily complex with different formats and questioning lines adding to the administrative burden and often leading to disqualification as a result of simple errors or misinterpretation of Suitable Assessment Questionnaires (SAQs) questions.

Poorly defined project briefs are another major issue that presents a myriad of challenges for industry. Costing a project that has been poorly defined at the outset heightens the risk of adversarial action and effectively sets a project up for failure with budget over-runs incurred right across the life cycle of project delivery. Clear, well defined scope of works with design and buildability issues carefully considered, costed and scheduled in, are essential to successful project delivery.

Where the programme for delivery is unrealistic and has not been developed in collaboration with the different actors (including design teams and contractors) along the supply chain, problems inevitably arise. A fragmented industry, with multiple actors along the supply chain who are not afforded sufficient opportunity to communicate with the client or each other, can only ever result in inefficiencies with adverse impacts on productivity. BIM methodology calls for a review of buildability issues at pre-site commencement stage with client, designer and contractor present. An inclusive programme that embeds the timeline for all actors including subcontractors at contract appointment would support efficiencies and a more productive sector both in terms of labour and product output.

⁴⁹ McKinsey & Company, McKinsey Global Institute (2017). *Reinventing Construction: A Route to Higher Productivity*. Available at: <https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights/reinventing-construction-through-a-productivity-revolution>. Accessed 30th August 2019.

The overall impact of a complex, fragmented sector subject to discontinuous demand where participants are encouraged to compete on fixed price contracts, is reflected in the low margins earned across the sector by both large organisations and SMEs.

The long-term nature of many infrastructure projects can mean fixed prices are set in advance for a project that will take place over a number of years. While some element of inflation should be built into tender prices it is not always sufficient to cover unexpected increases in labour or materials or the impact of unforeseen weather events or other events which cause delays in delivery of projects. This leaves contractors exposed to the risk of significant losses on individual projects which can impact on the profitability and sustainability of a company as a whole. This was seen on a large scale with the collapse of Carillion in the UK, but smaller organisations are even more exposed to loss-making projects. It should be noted that it could also be argued that had construction companies invested more in technology and resources during the “boom” times they may have been better placed to manage the recession and generate higher margins.

The types of contracts used in the procurement of public works can also affect productivity. Traditional models used in the construction sector such as Design-Bid-Build (DBB) promote a sequential design and construction process, and typically do not offer much flexibility for participants across a project lifecycle to collaborate, which can lead to poor performance in terms of time, quality, schedule and value for money⁵. Models such as Design Build that have become more commonplace

in recent years offer greater opportunity for collaborative behaviour and processes. In this regard, Willis et. al. (2019) highlight the value of collaborative contracts including Design-Build (DB), which they argue is the fastest growing delivery method promoting highly collaborative environments in the United States. This is followed by Integrated.

Project Delivery (IPD) and the Lean Project Delivery System (LPDS), both of which require the use of Lean tools, high levels of collaboration throughout the construction supply chain, and the use of collaborative tools in multiple processes.

The use of more collaborative delivery methods incentivises integrated approaches to project planning and delivery. The University of Minnesota (in Willis et. al., 2019) note that integrated teams spend months developing and refining not only the design of the project, but also the contractual agreement that will bind team members. This affords time to the project team members to get to know each other, align their goals, and define the best ways to deliver the projects. A similar process occurs on progressive DB projects, where the design and price are progressively defined over time.

"The long-term nature of many infrastructure projects can mean fixed prices are set in advance for a project that will take place over a number of years."

Integrated project delivery arrangements such as Early Contractor Involvement (ECI) commencing at procurement and contract appointment stage has been continually raised by parties to this research as offering an opportunity to improve overall productivity, particularly for private contracts (ECI is widely used by FDI

companies investing in the construction of data centres). IPD is a highly collaborative process that integrates the expertise of all members of a project team at the early stages. This helps to ensure that overall design decisions meet the needs of all parties involved. Gahssemi et al. (2011) describe the key differences between traditional delivery methods and IPD as follows:

- Multi-party contract;
- Early involvement of key participants;
- Collaborative decision making and control;
- Shared risks and rewards;
- Liability waivers among key participants; and
- Jointly developed project goals.

IPD contracts are relational contracts in that they consider the process and not just the end product, encourage transparency, open communication and trust as basic principles for a strong working relationship. Another feature of IPD contracts is the project alliancing model which aims to stimulate efficiency and align interest for the project as a whole with a more equitable approach to risk management.

The input of contractors early in the process may help to alleviate delivery issues later in the project lifecycle but the timing of that involvement needs to be considered closely. Clients, designers and contractors need to come together at the earliest possible opportunity to ensure that scheduling, quality and buildability issues are properly planned for and costed. This requires improvements in the accuracy of cost and scheduling estimates. For this, the more widespread use of metrics to measure cost and track scheduling, are required.

Other welcome initiatives in the space of public procurement and contracting

include the Commercial Skills Academy⁵¹. This initiative of the Office of Government Procurement provides training to public service managers with responsibility for managing significant capital projects under the NDP. The training is intended to enhance participants' awareness and understanding of commercial skills and best practice approaches to apply when managing the delivery of projects throughout the entire project lifecycle - project initiation, planning, design, procurement, contract management and risk management. A pilot programme for the practitioner modules was expected to commence in late 2019. Senior management modules are also available.

"Clients, designers and contractors need to come together at the earliest possible opportunity....."

Traditional cost-based procurement models often hinder the ability to focus on value, outcomes or performance afforded by a whole life value approach. In this regard, a move to procurement and contractual arrangements that embed opportunities to introduce innovative technologies to reduce carbon emissions and to meet commitments set out in climate policy including the national Climate Action Plan 2019, is particularly encouraged.

Flexible contracts would also offer solutions to issues faced by Local Authorities in cases where frameworks of authorised suppliers are established (e.g. for housing or retrofit projects) but where suppliers (e.g. construction contractors) refuse to do the smaller pieces of work. In such cases, this can result in poor completion rates by Local Authorities and frustration in public and political circles.

A potential solution to this could be the batching of similar types of work across multiple Local Authorities to increase

viability for both Local Authorities and construction industry participants.

As part of the development of the next generation of the Capital Works Management Framework (CWMF), a review of the way in which public works are procured and managed is being undertaken by the OGP. The review is expected to deliver significant changes to the CWMF over the coming years. Preliminary engagement and scoping have already been undertaken to inform the development of a medium-term strategy for the development, procurement and administration of projects under the Exchequer Capital Programme. A range of position papers are being prepared throughout 2019 and 2020 on issues that are impacting on project delivery including:

- price variation;
- risk management;
- creating a better quality: price balance in the award of contracts;
- adoption of BIM on public works projects;
- liability, indemnity and insurance requirements;
- performance evaluation; and
- encouraging collaborative working.

A recent Position Paper by the Government Construction Contracts Committee for Construction (GCCC) summarises the approach proposed to improve the procurement and management of Consultant Technical Professions (CTPs). The Position Paper follows on from a period of consultation with representative bodies on current practices and processes. The paper is particularly encouraging in that it sets out a range of proposals to directly address many of the issues referred to

above including new requirements for better project briefs, better scope of services, more realistic pricing by tenderers and better project delivery team definition.

These measures, and others discussed above, will encourage more contractors to compete in procurement competitions, making them less costly to bid on and more commercially viable.

"A review of the way in which public works are procured and managed is being undertaken by the OGP..."

⁵⁰ Willis, D. and Alves, T.C.L. (2019). "Contracting for Collaboration in Construction." In: Proc. 27th Annual Conference of the International Group for Lean Construction (IGLC), Pasquire C. and Hamzeh F.R. (ed.), Dublin, Ireland, pp. 809-818. DOI: <https://doi.org/10.24928/2019/0222>. Available at: www.iglc.net.

⁵¹ Government of Ireland (2018), Office of Government Procurement. Empower People Strategy Statement. Available at: <https://ogp.gov.ie/empower-people-strategy/>. Accessed 07/11/19

New Zealand



Internationally, there is a move towards more integrated and collaborative procurement and contracting arrangements. Recognition of the need for collaboration, trust and understanding of risks arising at different stages of a project has been tackled by New Zealand through the development of the Construction Sector Accord⁵², which was launched in April 2019. The purpose of the Accord is to strengthen the partnership between government and industry and be a catalyst to transform the construction sector for the benefit of all New Zealanders. The Programme is led by the Accord Steering Group, which is made up of approximately 24 construction sector leaders from across government and industry. The members represent a range of interests from across the built environment from property developers, to designers, builders and clients. Also included are the CEOs of government agencies that work closely with the industry as regulators, educators or major clients.

A two-phase approach was adopted for the Accord. Phase 1 involved collaboration between parties to agree a shared set of goals, principles and early initiatives that would signal a new way of working together. Phase 2 is currently underway and involves collaboration on a wider basis and the development of a detailed construction sector transformation plan to meet the challenge and achieve the outcomes agreed as part of Phase 1.

New Zealand updated their construction procurement guidelines in October 2019⁵³. These guidelines consider key requirements of a project including the whole-of-life concept referred to earlier. This considers future operational and maintenance requirements, how will good whole-of-life outcomes be achieved taking into account lifecycle cost, user criteria and environmental considerations and what performance standards are required for achieving whole-of-life public value. Such an approach places less of an emphasis on initial costs but rather provides an opportunity for the construction sector to implement innovative practices and technologies.



⁵² Government of New Zealand (2018). Skills in Construction Action Plan. Available at <https://www.skillsinconstruction.govt.nz> Accessed 14/09/19

⁵³ Government of New Zealand (2018). Construction Procurement Guidelines. Available at <https://www.procurement.govt.nz/procurement/specialised-procurement/construction-procurement/> Accessed 14/09/19



The UK



The UK, through the Construction Leadership Council (“CLC”)⁵⁴, has been working towards a smarter procurement framework which aims to use output-based procurement to drive capital delivery and lifetime performance, increase transparency on the performance of suppliers and assets and improve procurement efficiency and get the basics right. The CLC recommends that in order to capture the maximum benefit from a project the definition of Value must be expanded to include such elements as whole-life value, digital effectiveness, BIM and data capture, and capital and operational carbon emissions. They also recommend a framework to collect and publish cost and performance benchmark data for publicly funded construction and infrastructure projects.



⁵⁴ Construction Leadership Council, UK (2019). Available at: <http://www.constructionleadershipcouncil.co.uk/> Accessed 14/09/19

⁵⁵ Contractors have been selected based on inclusion in the CIF Top 50 Contractor listing for 2019. <https://cif.ie/cif-top-50-contractors-2019/> Turnover and margin information has been accessed from most recently available financial statements. Where not available the turnover figure provided in the CIF list has been used

⁵⁶ Margin data only included for those companies for whom full financial statements were available

3.2.5 PROFIT MARGINS
IN THE SECTOR

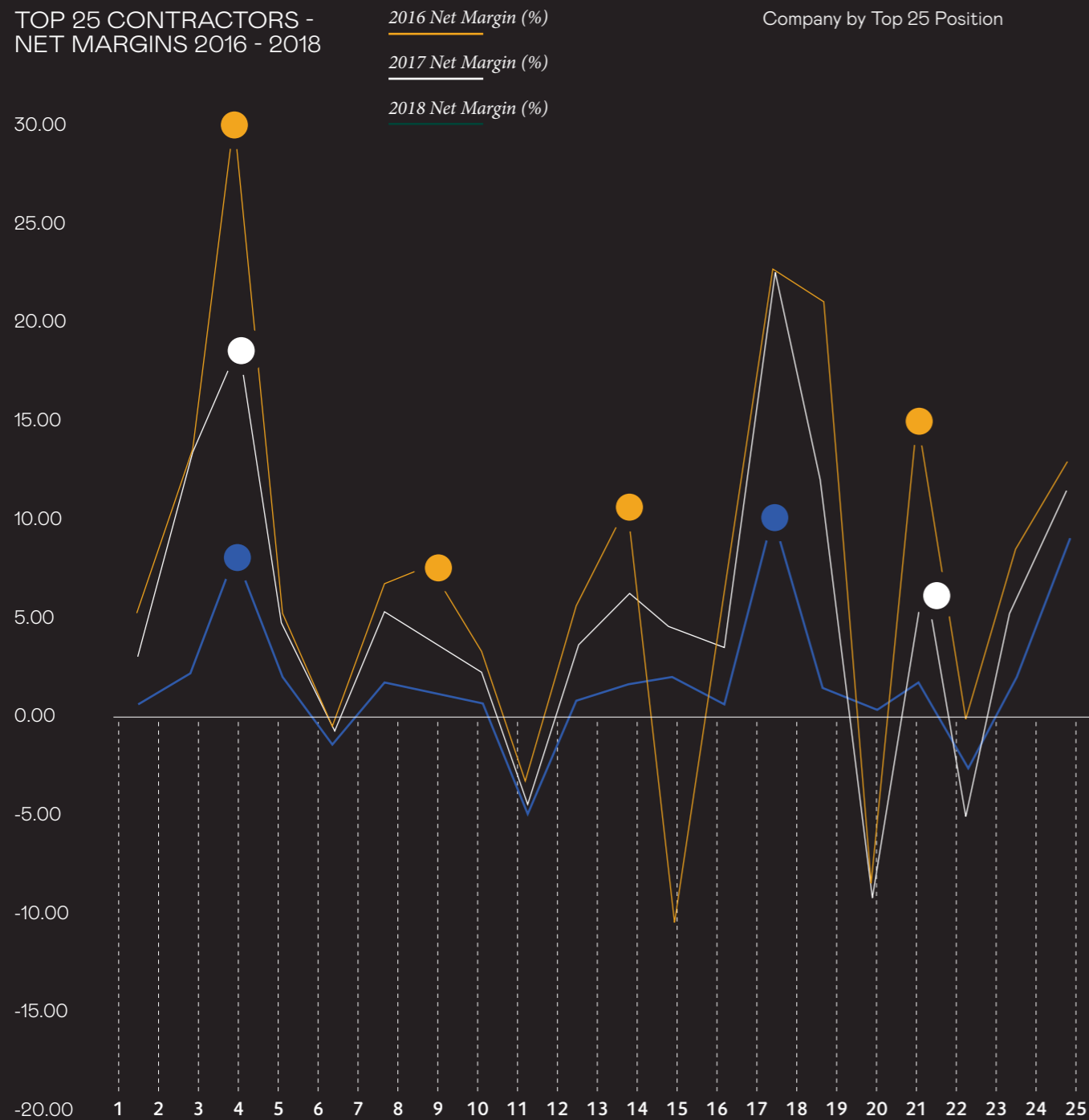
Productivity and profit have a strong correlation. Table 10 below reflects the margins earned by some of the top 25 contractors in Ireland (by turnover).

When margins are reviewed over a three-year cycle, it illustrates a declining performance by some of the top contractors in the country. The chart below illustrates the net margins earned in 2016, 2017 and 2018 for the top 25 contractors⁵⁶.

Table 10: Margins earned by top 25 contractors in Ireland⁵⁵

RANK	COMPANY NAME	TURNOVER (€)	GROSS MARGIN (%)	NET MARGIN (%)
1	John Sisk & Son	1,051,299,968	3.84	1.63
2	Mercury Engineering	770,000,000	n/a	n/a
3	BAM Ireland	465,019,008	3.35	2.99
4	JJ Rhatigan & Company	324,000,000	n/a	n/a
5	Jones Engineering	311,599,008	21.11	8.27
6	John Paul Construction Ltd	300,465,984	5.86	2.71
7	PJ Hegarty & Sons UC	290,000,000	n/a	n/a
8	Bennett (Construction) Ltd	283,577,504	5.17	2.52
9	Dornan Engineering Limited	218,400,912	12.17	1.81
10	Collen Construction Ltd	208,976,608	4.13	1.56
11	Roadbridge Ltd	201,157,504	7.29	-3.69
12	Walls Construction Ltd	190,324,912	6.40	2.01
13	Kirby Group Engineering	166,000,000	n/a	n/a
14	Specialist Technical Engineering Services (STS Group)	157,200,000	n/a	n/a
15	Designer Group Engineering Contractors Ltd	149,935,552	12.89	2.71
16	Suir Engineering Ltd	144,604,480	9.38	2.95
17	Flynn Management & Contractors Ltd	133,634,352	6.44	1.79
18	Mac-Group	133,567,832	21.69	10.32
19	Winthdrop	125,514,432	9.98	2.38
20	Stewart Construction	112,000,000	n/a	n/a
21	Wills Bros Ltd	89,023,024	10.85	1.59
22	Ardmac Limited	67,019,952	2.78	2.71
23	Murphy International	54,909,000	5.71	-1.22
24	Leo Lynch Group	51,758,932	8.48	3.03
25	SIAC Construction Ltd	21,615,000	12.42	9.06

Figure 8: Net margins earned - 2016 - 2018



The average gross margin earned is 8.94% and average net margin 2.9%. This low margin base is both a symptom of low investment and is also a factor in reducing the capacity for industry to invest in resources or technology, leaving them vulnerable to the “boom and bust” cycle associated with construction.

3.2.6 THE FRAGMENTED NATURE OF THE SECTOR

The disjointed nature of the sector and a lack of integration and collaboration are the top causes of low productivity in the sector, according to the results of the online survey conducted as part of this research. Respondents whose work is primarily based in Dublin were most likely to cite fragmentation in the sector as the top cause of low productivity. This issue is not unique to Ireland with international research also pointing to the fragmented nature of the industry as presenting inherent challenges to productivity in the sector⁵⁷.

The complexity of the supply chain with widespread dependency on subcontractors and agency workers can greatly reduce productivity with multiple parties working to different schedules and budgets, fragmented decision-making, often incompatible work processes and ill-defined risk transfer mechanisms in place. With high levels of self-employed labourers characterising the industry, capacity for investment in training and upskilling is also reduced, as discussed later in this section, presenting a further barrier to productivity. Furthermore, a disjointed sector also affects capacity to adopt new technologies.

The disconnect between the design and construction stages of a project has been continually highlighted as a barrier to productivity by participants in this research. From the perspective of the construction contractor, a failure at design stage to fully appreciate the complexities of construction, a lack of detailed design specifications, and/or, the routine revisiting of design decisions at construction stage often driven by the changing demands of a client, are likely to lead to re-work and delays, with implications for overall schedule and budget.

Design specifications that are open to scrutiny and subject to change at the on-site construction phase incur significant cost and time over-runs. Early contractor engagement and IPD contracts, discussed previously, are examples of measures that can help to ensure designs are signed off by all parties and that any potential buildability issues are raised

at an early stage. Another measure is the use of standardised design layouts, where appropriate, that bring clarity and efficiencies to the design and build process. Guidelines on standardised design can allow flexibility in external appearance to avoid uniformity of design and an uninspiring built environment.

While Government and other public bodies have issued technical guidance documents for standardised design in areas such as education, there remains scope to cover a range of subsectors such as social housing and health, where appropriate. However, care must be taken to ensure that design integrity is not comprised in pursuit of standardised layouts and these should only be introduced where it is appropriate to do so. Templates for standardised layouts can also be extended to include off-site production methods, presenting a learning resource for design teams and contractors on the specifications required for modern building methods.

The adoption of international standards such as ISO 19650⁵⁸ also provide a mechanism to support the sharing of information on construction projects and joined up thinking across the supply chain. The ISO 19650 standard sets out a method for managing the production, distribution and quality of construction information across the lifecycle of a project from design, construction, through to operation and even the decommissioning of projects, where relevant. Common methodologies for naming, classifying, layering and exchanging data when setting up projects are defined, facilitating collaborative working and clearly defining roles and responsibilities. This encourages integrated, joined up thinking, improving information transfer across the supply chain, thereby reducing errors and duplication, and ultimately, supporting improvements in productivity.

Examples of initiatives taken by our European peers to unite the sector and support collaboration between the many different actors involved in the lifecycle of a project are set out below.

⁵⁷McKinsey & Company, McKinsey Global Institute (2017). *Reinventing Construction: A Route to Higher Productivity*. Available at: <https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights/reinventing-construction-through-a-productivity-revolution>. Accessed 30th August 2019.

⁵⁸ISO Standards. Available at: <https://www.iso.org/standards.html>. Accessed 30th August 2019.

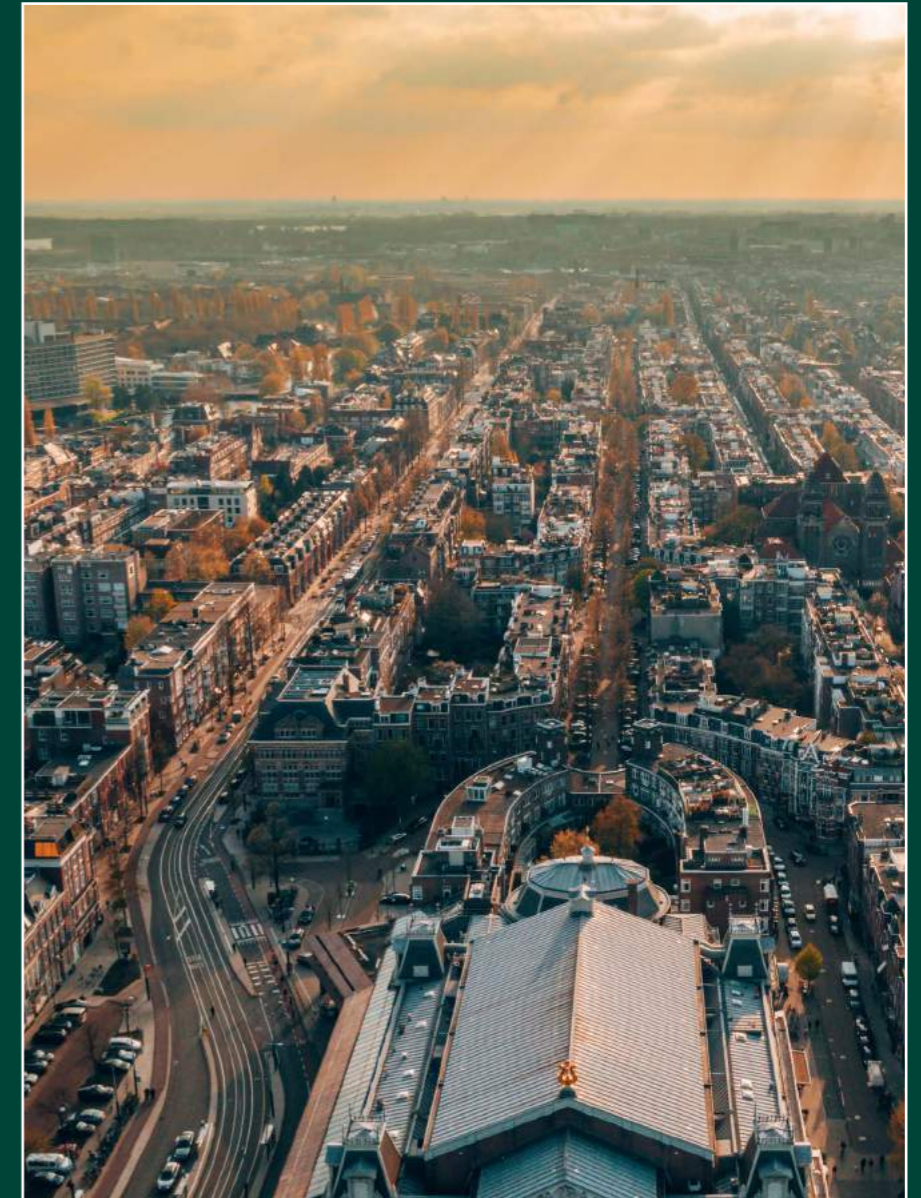
Denmark



Denmark has established a national cross-disciplinary network, Danish Transport Innovation Network⁵⁹, to bring stakeholders together to develop projects in transport and infrastructure with the aim of identifying synergies, the need for new technologies and business opportunities.

⁵⁹European Cluster Collaboration Platform (2019). Available at: <https://www.clustercollaboration.eu/cluster-organisations/danish-transport-innovation-network>. Accessed 09/10/19

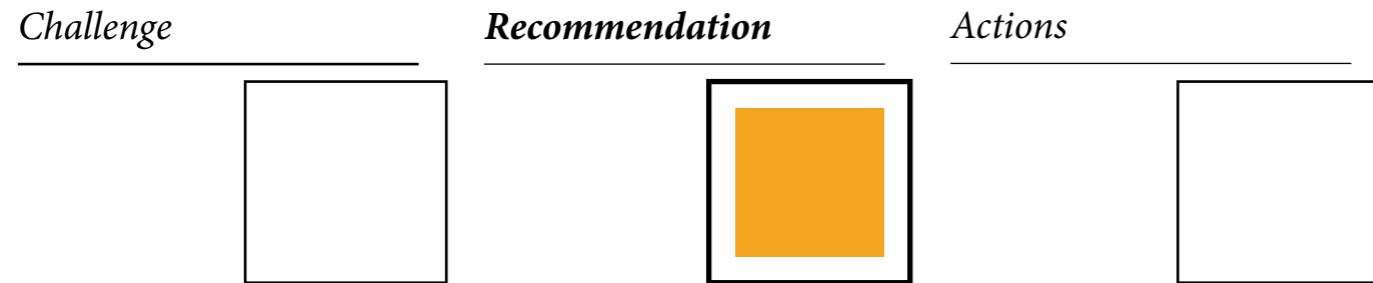
Netherlands



The Netherlands is focusing on encouraging innovation through the use of public-private initiatives. One such initiative is High Tech Campus, Eindhoven⁶⁰, which provides facilities and network opportunities to bring a variety of stakeholders together to address issues in residential construction, infrastructure, commercial buildings and public spaces.

⁶⁰Available at: <https://www.hightechcampus.com/zvvvcvu> Accessed 09/10/19

3.2.7 INITIATION AND PLANNING STAGE RECOMMENDATIONS



There are three main recommendations put forward for the initiation and planning stage of the project lifecycle:

Recommendation 1

The need to introduce efficiencies into the planning system.

This will support efficiencies and strengthen the capacity of public and private sector planners in forward planning and development of management processes. It will also support efficiencies for applicants engaging with the system.

Recommendation 2

Improved transparency of Public Sector Works.

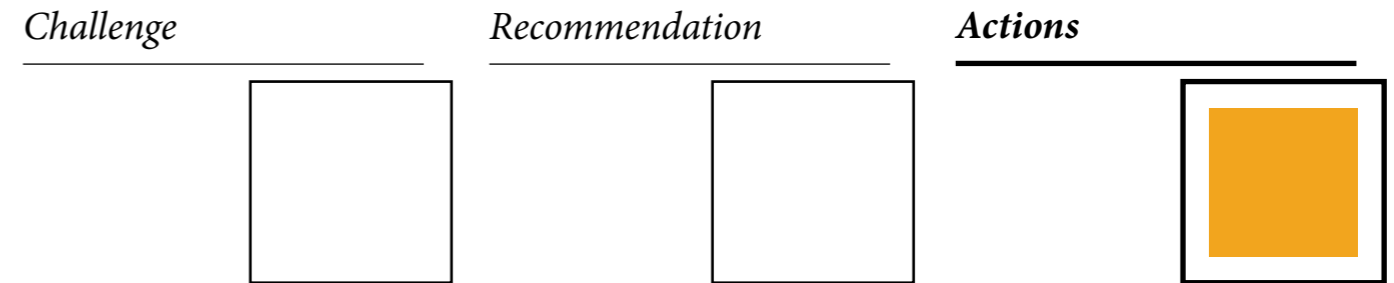
Further clarity on forthcoming public sector work will strengthen firm confidence to invest in resources, technology, training and upskilling, and support the development of specialised areas such as off-site production, all of which are important drivers for productivity.

Recommendation 3

Public procurement and contracting reform.

Procurement and contracting strategies that optimise efficiencies in competing for work and prioritise the timely delivery of quality development will bring improvements to productivity in terms of time savings accrued and by supporting targeted business planning by firms.

3.2.8 INITIATION AND PLANNING STAGE ACTIONS



A significant number of actions have been identified to support the implementation of the three recommendations set out above as part of the planning and initiation stage of the project lifecycle, with the majority of actions being led by government bodies and an implementation timeline of between 1 and 3 years assigned in nearly all cases. Refer to Roadmap to Implementation set out in Section 4 for information on leaders and timeframes.

The actions proposed include:

Recommendation No. 1 - The need to introduce efficiencies into the planning system

Action 1.1

Introduce an integrated approach to the delivery of housing and critical infrastructural projects with coordinated planning and delivery across local authority boundary areas.

This will support an efficient response to housing targets set out in the NPF including the preparation of HNDA.

It will also facilitate efficiencies in land acquisition processes, business planning and tendering processes with benefits arising for all partners across the supply chain.

Action 1.2

Advance efforts in the digitisation of the planning application process to reduce unsustainable, time and cost inefficient paper-based reporting.

Best practice processes should be identified and shared across Local Authorities and consistency in Local Authority online planning systems should be encouraged.



Recommendation No. 1 - The need to introduce efficiencies into the planning system**Action 1.3**

At Local Authority Level, Planning Departments are challenged by lack of resources and a constantly evolving legislative landscape. IPI to partner with Planning Schools and Planning Practitioners to deliver training in the following areas:

- Competence in Environmental Legislation and Directives;
- Project Management;
- Transport Planning;
- Site Activation covering Planning, Legal and Financial Aspects;
- Planning Enforcement;
- Urban Regeneration.

Collaboration with other professional bodies who provide similar training should also be explored. Additional training initiatives to promote innovation and learning in the planning and development area will be overseen by the Office of the Planning Regulator in the light of its statutory research, training and public awareness roles.

Action 1.4

Publication of a template series for planners and designers on standardised layouts for developments such as housing etc., such use to be discretionary rather than mandatory.

These templates could potentially be held in a repository in the proposed Centre of Excellence (Linked to Action 7.1). This lends itself to a more efficient construction phase where design specifications are well established, practiced and support the growth and development of off-site production.

Recommendation No.2 - Improved transparency of Public Sector Works**Action 2.1**

A number of actions are proposed in relation to the Investment Projects and Programme Tracker:

Greater visibility of the public sector pipeline with reform and extension of the tracker in future iterations to lower the threshold for inclusion (not limited to programmes/projects greater than €20 million). Improve the categorisation and searchability of projects e.g. by location, specialist services required, consider the inclusion of interactive features such as dashboards and provide greater clarity on target timelines for each project.

Stronger guidance to all relevant parties on the interactive use and update of the Investment Projects and Programme Tracker. This should include:

- Consistent processing of pipeline updates by public sector bodies; and
- Advice on completion of standard template for uploading information on projects.

Eventual move towards direct uploading of information by individual public bodies/agencies (to reduce administrative burden for central coordinating agency).

Active promotion by Government and industry bodies of Project Ireland 2040, for example through regional roadshows or 'Meet the Buyer' events, social media adverts, newsletters and any other direct marketing opportunities available.

Larger projects to continue to be promoted internationally to ensure sufficient market competition. International firms may require local partners who may not otherwise have qualified for such projects.

Market consultations should be undertaken for large or pilot projects and should involve strong engagement with potential bidders to understand market issues which if not addressed early can result in delivery delays and/or value for money concerns later in the project.

Action 2.2

Maintain a stable and balanced level of public capital investment in the event of an economic slowdown and/or a reduction in Government revenue.

This will give industry, in particular SMEs, greater confidence to invest in human capital, R&D and innovation. This will lead to more time and cost-efficient processes, greater employment stability and will strengthen productivity.

Recommendation No.3 - Public procurement and contracting reform

Action 3.1 Ongoing review and reform of public procurement mechanisms and processes as part of the next generation of the Capital Works Management Framework (CWMF) and the medium-term strategy for the development, procurement and administration of projects under the exchequer funded elements of the National Development Plan. Specifically, continue to improve the mechanisms by which Government agencies procure, engage with and manage public procurement processes. The first phase of the review should address:

- Detailed Project Briefs;
- Detailed Scope of Services including specific timeframes – particularly with respect to design and M&E, and explore opportunities to define a list of core services required for different stages of a project;
- Continued review of risk allocation mechanisms and price variation clauses; and
- Establishment of Project Teams with clear reporting lines.

Action 3.2 The CWMF should support, value and reward innovation and sustainability both at firm level and in respect of improving full lifecycle costs for the asset. While industry must lead innovation in the sector, Government can further stimulate the process with Procurement Frameworks that support, on a proportionate basis, and where appropriate, requirements for ISO 19650 (collaborative workings through BIM), LEAN processes, agile thinking and modern methods of construction including off-site production. An example includes the expansion of Procurement Frameworks such as Rapid Delivery of Housing that incorporate requirements on above.

Action 3.3 Explore opportunities for more integrated project delivery with early engagement of all stakeholders involved in the delivery of a project. This will support clearer communication on all aspects of delivery from design through to build and handover.

This should extend to market consultations undertaken prior to procurement with market views incorporated, where appropriate, to ensure projects tendered are deliverable in the desired structure.

Action 3.4 Improvements to IT systems for tender response such as etenders with the storing of further information such as project experience, references, and editable budget forms in addition to administrative forms such as ESDP.

Introduce a digital “procurement passport” for contractors to allow pre-approval for contractors (in the form of Pre-Qualification Questionnaire (PQQ), or similar) or other professional companies who satisfy minimum qualification criteria – removing an element of the administrative burden associated with tender preparation. In this regard, support and advance the work of the EU Commission on improvements to public procurement procedures.

Recommendation No.3 - Public procurement and contracting reform

Action 3.5 Develop a sustained training programme for public procurers to enhance awareness and understanding of commercial skills and best practice approaches for the delivery of projects throughout the lifecycle - project initiation, planning, design, procurement, contract management and risk management. This should build on and extend the pilot training programmes offered by the Commercial Skills Academy.

Action 3.6 Flexible procurement frameworks that allow the batching of similar types of work across multiple Local Authorities to increase viability for both Local Authorities and construction sector.

Action 3.7 There is an opportunity to reward efforts to reduce the carbon footprint of developments and in embedding circular economy principles as part of the procurement, design and construction process. This could be considered through a focus on whole-of-life costs rather than just initial capital costs, subject to the development of standard metrics for evaluation purposes.

The circular economy presents considerable opportunities to embed resource efficiency, material recycling and reuse within the sector including the use of innovative, low carbon, zero waste materials. With coordinated enhancements in digital technologies, circular economy initiatives for renovation and maintenance, including the traceability of materials for future re-use and recycling, can be facilitated.

Recommendations from the Construction Waste Resource Group with regard to measuring, managing, treating and enforcing construction waste through-out the project lifecycle should be implemented.



3.3

Execution stage

Execution issues are those that tend to manifest at individual firm level and arise as part of the nature of working in the built environment. A summary overview of key challenges, recommendations and high impact actions set out in this section is presented in Table 11 with additional supporting actions referred to in Table 12.



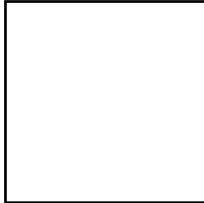
Table 11: Challenges, Recommendations and Actions at Execution Stage

PROJECT STAGE	CHALLENGE AREA	RECOMMENDATIONS AND HIGH IMPACT ACTIONS
Execution Stage	Lack of regulation of construction skills	<p>Recommendation 4: Improvements to policy and regulation</p> <p>4.1 To place the Construction Industry Register of Ireland (CIRI) on a statutory footing</p> <p>4.2 Enhance monitoring, investigations and compliance nationwide, including inspections by DEASP Inspectors and the recently established Employment Status Investigation Unit (ESIU) to detect and tackle the misclassification of workers</p> <p>Recommendation 5: Improvements to Operational Management Processes</p> <p>5.1 Supply Chain Optimisation: Main contractor and sub-contractor to adopt a proactive, mutually supportive and collaborative relationship with upfront liaison on work and payment scheduling and resource capacity</p> <p>Recommendation 6: Technology and Innovation Advancement</p> <p>6.1 Establishment of Joint Working Group to guide the development of the off-site production sector</p> <p>6.2 Renewed focus and commitment to support the widespread use of BIM by the sector in Ireland</p> <p>6.3 Industry to advance efforts with education and training bodies on upskilling the sector on modern construction methods and digital innovations and ensure that education and training programmes are equipped with the best technology and resources to attract fresh talent to the market</p>
	Limited skilled and unskilled resources	
	Need for recruitment and upskilling	
	Managerial capability gaps	
	Conditions of employment including bogus self-employment	
	Limited use of BIM	
	Limited investment in off-site construction	
	Improved management and treatment of construction waste required	

Table 12: Additional Supporting Actions at Execution Stage

PROJECT STAGE	ADDITIONAL SUPPORTING ACTIONS TO ADDRESS CHALLENGE AREAS AND IMPROVE PRODUCTIVITY
Execution Stage	<p>Recommendation 4: Improvements to policy and regulation</p> <p>4.3 Introduce a voluntary skills passport for construction workers to allow for the validation of skills</p> <p>4.4 Greater promotion of the provisions set out in the Construction Contracts Act 2013 on contractual and payment processes</p> <p>4.5 Encourage adoption of relevant international standards (e.g. ISO 19650 - BIM, ISO 9000 - Quality, ISO 5001 – Energy and ISO 18404 - LEAN etc.)</p> <p>Recommendation 6: Technology and Innovation Advancement</p> <p>6.4 Consider the formation of a digital network under the recently established Construction Skillnet, an initiative by Skillnet Ireland to be promoted by the CIF. The digital network will help companies to define and meet their skills needs in the areas of technology and digitalisation and to strengthen innovation by supporting the development of clusters around digital construction challenges and opportunities</p> <p>6.5 Promote funding opportunities arising from external funding sources such as the horizon 2020 programme</p>

Set out below is an analysis of the key challenges identified as arising during the execution stage of projects with discussion of some current strategies already underway. This analysis then allows for the identification of key actions, including some supporting actions, that can be undertaken to expand on work already commenced and to further drive productivity in the construction sector.

Challenge	Recommendation	Actions
		

3.3.1 Labour and Skills

The skills base of the labour force is a key determinant of productivity, essential to the effectiveness, efficiency and sustainability of the sector. Several issues arise in this regard, as follow:

3.3.1.1 Regulating the sector

In 2014, the Construction Industry Register Ireland (CIRI) was introduced on a voluntary basis as an essential component of a suite of measures to increase compliance, competence and oversight in the construction industry. Currently over 850 building and contracting entities are included on the online register. The proposal to place CIRI on a statutory footing with mandatory registration for builders and specialist contractors is an important step forward in ensuring a culture of competence and good practice within the sector and should continue to be advanced.

Another issue that arises in relation to tradespeople is the absence of a formal

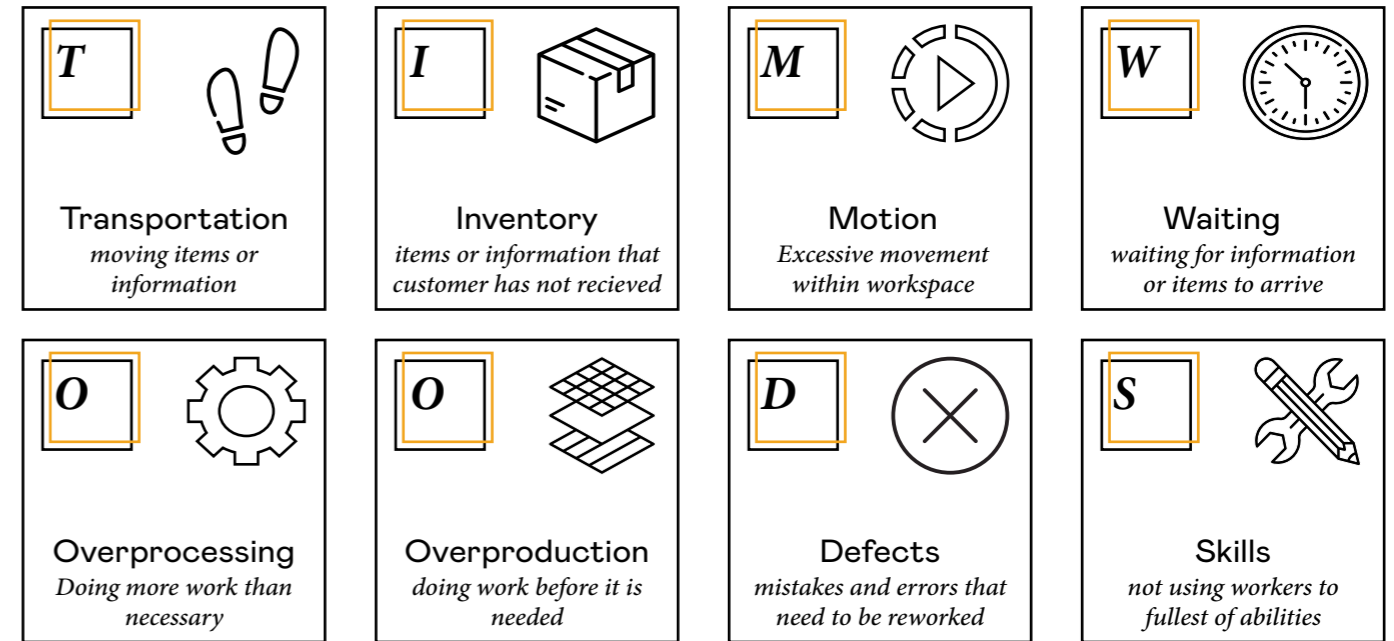
system to require, track and award skills competency or CPD training. This can impact on the quality of output and lead to higher incidents of defective work which is costly to remedy and can lead to delays which cause budget over-runs. Furthermore, the relative ease at which work can be secured by untrained individuals, particularly for trades experiencing skills shortages e.g. plastering and painting, can disincentivise individuals from entering formal training via the apprenticeship route. A mechanism by which the skills competency of tradespeople could be validated would help to ensure high construction standards and working conditions.

3.3.1.2 Skills deficits

The key challenges identified under this heading include:

Skills shortage (wet trades, and trades related to the new deep retrofit agenda, Quantity

Figure 9: TIM WOODS



Surveyors, Engineers)); and Recruitment and upskilling to address issues such as weakness in the apprenticeships system and to enhance managerial capacity across the sector.

Despite the recent return to growth, the severe fall off in human resources suffered as a result of the downturn a decade ago has had lasting consequences with the number of trained construction workers currently staffing the sector unable to meet demand for output across all areas of the economy. Labour and skills are two factors continually highlighted by stakeholders engaged with as part of this research as issues that will continue to undermine productivity. The online survey results indicate that this is a problem across all sub-sectors of the construction industry including residential, commercial, educational, hospitality and leisure and public infrastructure.

While it must be stressed that labour shortage is not a direct productivity issue, the impacts arising for the existing workers as a result of shortages, does incur an impact on productivity. For instance, on a practical level, labour shortages on site can lead to skilled tradespeople being occupied with basic tasks that should be undertaken by unskilled labourers. If a site is poorly managed and organised because of a shortfall in appropriately trained staff, a tradesperson can spend significant portions of their day being negatively impacted by wasteful work practices, such as those referred to in Lean principles such as TIM WOODS, as illustrated in figure 9. This directly affects the level of output from individual workers, the basic measure of labour productivity.

Lean Business Ireland work with companies to help them avail of Lean Construction processes to identify and achieve efficiencies across the organisation. Funding is available from Local Enterprise Offices, Udaras na Gaeltachta, Enterprise Ireland and IDA Ireland for companies who wish to improve their competitiveness using Lean tools and techniques⁶¹. A large number of case studies are also available which highlight project objectives, key challenges, key changes and results achieved from implementing one of the Lean processes by different organisations of all sizes⁶².

⁶¹ Available at: <https://www.leanbusinessireland.ie/funding-supports-overview/66/> - Accessed 09/10/19

⁶² Available at: <https://www.leanbusinessireland.ie/funding-supports-overview/66/> - Accessed 09/10/19



Improvements are required in terms of how industry identifies and articulates specific skills requirements to the relevant agencies in Ireland.

3.3.1.3 Skills identification

This research has indicated that improvements are required in terms of how industry identifies and articulates specific skills requirements to the relevant agencies in Ireland. Current provisions for skills identification include a well-developed network of agencies including Department of Education and Skills (DES), and supporting agencies including the Education and Training Boards Ireland (ETBI), the network of 9 Regional Skills Fora, Higher Education Authority (HEA), SOLAS, Springboard+ provision, Skillnet Ireland training networks and others.

Resources available to support firms to identify skills requirements at present include the Skillnet Network, an initiative of Skillnet Ireland, a group of private-sector businesses that collaborate to address skills needs within the sector or region. As part of this, a range of networks are active within the construction space including the CITA Skillnet, ICBE Advanced Productivity Skillnet and the Lean and Green Skillnet. The network of 9 Regional Skills Fora, each with a Regional Skills Forum Manager provide

a further link between employers and the education and training sector. There may be further opportunity to strengthen the work of these networks by encouraging higher engagement from industry.

Furthermore, while useful Skills Audit Tools are available for example, the Skills Audit tool under the Skills for Growth initiative, which is rolled out via the Regional Skills Fora managers, the more widespread use of performance metrics to identify resource constraints at individual firm level would facilitate more accurate monitoring and identification of skills dimensions.

At present, many of the upskilling funding opportunities are only provided on an annual basis (e.g. Springboard+ and Skillnet require annual applications by education or training providers). This impacts on productivity because companies are not able to develop multi-annual upskilling plans when they do not know which funded programmes will be available each year and when firms are unable to release more than a percentage of staff in any single year.

This annualised application process also significantly reduces the ability of education and training providers to respond rapidly to industry upskilling needs because resources cannot be allocated for delivery until funding has been secured each year and because resources are difficult to re-allocate at short notice when the providers are also experiencing recruitment difficulties. Positive progress is being made to support greater accuracy in the identification of skill requirements and dimensions, most notably the National Training Fund (NTF) funded Human Capital Initiative to be launched in early 2020, which is a ring-fenced funding line to address areas of identified skills needs.

Furthermore, the Expert Group on Future Skills Needs, which advises the Irish Government on the current and future skills needs of the Irish economy, has commissioned a study to determine the nature and the scale of the demand for skills within Ireland's Construction sector to 2030. This study, which will be completed in mid-2020, will inform the work undertaken by Government and industry to plan for the future skills requirements of the industry.



3.3.1.4 Recruitment and upskilling

Tight operating margins and an industry that is primarily comprised of SMEs and micro enterprises is mitigating against the recruitment of trained staff, the upskilling and training of staff and the number of apprenticeships on offer with employers. This is also a legacy issue from the economic downturn with firms still operating within a 'survival mode' mindset, lacking the confidence to invest in recruitment or training for existing staff, particularly apprenticeships for which a four-year commitment is required. This issue is not unique to Ireland. For instance, students enrolled in Vocational Education Training programmes in Denmark encounter difficulties finding apprenticeship places, with the financial burden placed on firms in taking on an apprentice cited as a key negating factor. In this context, it is important to once again note that labour shortage, as an issue considered in isolation, is not a direct contributor to productivity. However, impacts on productivity do arise where shortages exerts pressure on existing labour within the industry, with overly stretched employees forced to take on work for which they may be over or

under-trained, and where the skillsets of the labour pool that is available are insufficient to meet the requirements of a project.

In addition to skills gaps for tradespeople, challenges also pertain to the managerial capacity of the sector. Forfas (2013)⁶³ and Construction 2020 (2014)⁶⁴ highlighted the impact of poor performance in management practice on business productivity. These reports both recommended increased engagement with Skillnet Ireland's Management Development provision and Enterprise Ireland's management development offerings (Management4Growth, Leadership4Growth, Lean). Other supports in this area include the mentoring, business advise clinics and training courses offered by the nation-wide network of Local Enterprise Offices (LEOs). There is also evidence of shortages on the professional side.

Submissions and interviews with members of the industry undertaken as part of this research also highlight the need for targeted actions to enhance managerial skills capacity. Furthermore, upskilling the workforce and developing better management competency was

the second most commonly stated measure cited by respondents to the online survey, as most likely to improve productivity from an operational perspective.

As part of this, there exists an opportunity to address the perceived poor career progression prospects within the industry. In this regard, managerial level positions require a broad knowledge of all trades and so measures that encourage knowledge exchange, core skills training as part of apprenticeship model, and CPD and upskilling opportunities for trained professionals, would be favourably received. Ladders of progression through education need to be promoted to deter talent from leaving the sector and to encourage the participation of new talent.

While there are many initiatives happening in this area, more work is required on the promotional side to ensure optimal visibility and accessibility with blended, online and distance teaching methods. The need to increase managerial level capacity is discussed in more detail from the perspective of education and promotion later in this section.



⁶³ Forfas (2013) Ireland's Construction Sector: Outlook and Strategic Plan to 2015. Available at: <https://dbei.gov.ie/en/Publications/Publication-files/Forf%C3%A1s/Ireland-s-Construction-Sector-Outlook-and-Strategic-Plan-to-2015.pdf> - Accessed 10/10/19

⁶⁴ Forfas (2013) Ireland's Construction Sector: Outlook and Strategic Plan to 2015. Available at: <https://dbei.gov.ie/en/Publications/Publication-files/Forf%C3%A1s/Ireland-s-Construction-Sector-Outlook-and-Strategic-Plan-to-2015.pdf> - Accessed 10/10/19

Australia

New South Wales has introduced a legacy skills program to develop existing and future workforce capability thereby increasing the skillset and productivity of employees. A key tenet of the program⁶⁵ is the use of live large infrastructure projects as demonstration projects where real, on-site training can be implemented. Current projects include the Sydney Metro, Broken Hill pipeline and

Lismore Base Hospital Stage 3B. These demonstration projects have certain targets associated with them including 20% of the labour force to be made up of “learning” workers, 20% of all trades positions to be made up of apprentices, 8% of the workforce to be aged less than 25 years and the number of women in trade-related work is to be doubled.

The Netherlands

The Netherlands has benefited from the Build Up Skills Initiative⁶⁶ set up by Intelligent Energy Europe to upskill employees, from manual labourers to design professionals and senior management to ensure building and renovation projects meet stringent energy efficiency requirements. As part of this a three pillar approach to developing skills capacity has been established which includes: DuBUS, an initial training program to up skill 150,000– 200,000 skilled workers in the construction sector by 2020; BUS_N@W⁶⁷ which aims to develop and implement a qualification structure for post-initial training and fund post-initial training courses; and BUStoB (ongoing) which is to establish and upgrade training schemes in the Netherlands, identify gaps in training, and develop and pilot new trainings materials. As part

of these programs 76 e-learning modules have been launched which have been piloted in 6 regions, study material has been developed in line with European Qualification Framework and nine training institutions from the construction industry in Netherlands have collaborated and launched a joint platform - Bouwopleiders, which offers training and education to people interested in a career in construction. The success of these programs has been seen in the engagement by almost 150 different organisations in DuBUS’s platform with excess of 40 schools and 10 post-training institutes having become permanent members. BUS_N@W has increased demand for training courses with an estimated 10,000 employees receiving upskilling training in 2015.

New Zealand

New Zealand introduced the Construction Skills Action Plan⁶⁸ as a cross-agency plan initiative that aims to increase business investment in training and development. The key ways in which this is being achieved is through changes to Government procurement rules to include training opportunities within tender evaluations, creation of a

Job and Skills Hub in Auckland to facilitate more training placements and new apprenticeships, promoting construction careers, supporting the development of micro-credentials and creation of more flexible immigration settings to provide short term relief for skills shortages while at the same time working with industry to build the domestic workforce.

The UK

The UK⁶⁹ has implemented multiple initiatives to training and development needs of the workforce as part of the Construction Sector Deal under the UK Industrial Strategy policy.

The Construction Industry Training Board (CITB) is working with major contractors and their supply chains to address their skill needs by focusing on encouraging careers, promoting standards and qualifications, and training and development. A new CITB Grants Scheme was launched to provide greater support for apprenticeships and to provide construction-specific training to recognised standards.

In 2018 over 1,400 small and micro employers were provided with access to £6m in training support and this will be extended in 2019 to 1,900 firms as well as medium-sized firms (up to 250 employees). CITB also leads the National Skills Academy for Construction which is a project-based and demand-led training concept, where the client and contractor determine the required skills based on a practical live project. This allows users to provide high-quality training in a live environment.

The Employer Ownership of Skills pilot is a competitive fund open to employers in England to invest in their current and future workforce through funding employers directly for apprenticeships and incentivising greater investment in adult workforce development by providing funding for employer-based investments and loans. It is based on the principle that employers should be given control of training so that it best meets the skills they need rather than the government determining what those needs are.

The Engineering and Physical Sciences Research Council’s Centers for Doctoral Training are developing highly skilled leaders to design and manage future infrastructure projects with an emphasis on green construction in sustainable built environments and end-use energy demand.

⁶⁵ Available at: https://www.industry.nsw.gov.au/___data/assets/pdf_file/0009/91278/Infrastructure-Skills-Legacy-Program.pdf - Accessed 07/11/19

⁶⁶ European Commission (2019) Build Up Skills Initiative. Available at <https://ec.europa.eu/easme/en/section/horizon-2020-energy-efficiency/build-skills> - Accessed 07/11/19

⁶⁷ European Commission (2019) Build Up Skills Initiative, Project Database. Available at <https://ec.europa.eu/energy/intelligent/projects/en/projects/build-skills-nw> - Accessed 07/11/19

⁶⁸ Government of New Zealand (2018). Skills in Construction Action Plan. Available at <https://www.skillsinconstruction.govt.nz> - Accessed 14/09/19

⁶⁹ HM Government (2018) Industrial Strategy, Construction Sector Deal. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/731871/construction-sector-deal-print-single.pdf. Accessed 13th September 2019.

3.3.2 Conditions of Employment

The key challenges identified under this heading focus on workplace rights and include:

Precarious working conditions; and

False self-employment.

The findings of this research indicate that workforce rights, and specifically precarious working conditions is an issue of concern particularly at the trades level. Safe and fair working conditions are baseline requirements for labour productivity which if absent place a limit on everything from quality and timely delivery of work, to health and safety, employee well-being, benefits of employment such as pension entitlements and disability cover, career progression, innovation, and, ultimately, growth and development of the sector.

The incidence of precarious work in the sector and, in particular the misclassification of workers as self-employed (false self-employment), has been continually highlighted by stakeholders to this research as particularly troubling with negative impacts arising for productivity in the sector. The term ‘false self-employment’ refers to situations where an employer engages an individual on a self-employed or ‘independent contractor’ basis but in reality, the individual works in the same role and in the same manner as an employee. In such a situation, the employer pays no PRSI for the individual and the individual is told to register as self-employed and pay class S PRSI.

The precise number of incorrectly classified self-employed workers isn’t known, however, a joint report from the Department of Employment Affairs and Social Protection (DEASP), Revenue and the Department of Finance in January 2018 found no

indication that self-employment was increasingly accounting for a significant share of the labour force⁷⁰. However, DEASP accept that some workers are incorrectly classified as being self-employed when they should be treated as employees for PRSI purposes. Of those who are incorrectly classified, there may be fraudulent intent on the part of the employer or there may simply have been an error.

False or forced self-employment is also a problem in the UK construction industry with as many as 54% of manual construction workers classified as self-employed or two to five times more than in the construction industries of France, Germany and Spain⁷¹.

In this regard, a reliance by firms on non-standard forms of employment as opposed to direct and permanent employment, mitigates against training and upskilling for workers with a knock-on effect on skills capacity. Firms with large shares of non-standard working arrangements are less incentivised to invest in training and productivity-enhancing technologies. International experience has shown that firms that rely on high levels of informal or flexible labour report lower labour productivity growth. Research undertaken in the Netherlands and Italy indicates that labour productivity grows more slowly in firms with higher shares of non-standard employment⁷². The negative impact of temporary workers on productivity is also documented in a range of pan-European research studies^{73,74,75}.

Furthermore, the prevalence of informal labour arrangements can also have the effect of working against companies that do invest in productivity enhancing technology when they are competing with

contractors using cheap informal labour. The uneven playing field that has emerged is well recognised, as highlighted in submissions and survey responses received as part of this research and accords with the findings of international research on productivity challenges including the McKinsey Global Institute (MGI)⁷⁶.

Improvements in the visibility of the public sector pipeline, referred to earlier, and better management training/capability will help to address some of the barriers cited by firms to employing tradespeople, including the issue of discontinuous demand for work. Other initiatives might include training supports specifically targeting “self-employed” individuals. Furthermore, strong initiatives are being progressed by Government to address misclassification of workers across all sectors of the economy. The most notable of these is the recent establishment of an Employment Status Inspection Unit (ESIU) in the Department of Employment Affairs and Social Protection (DEASP). DEASP is seeking to ensure that cases of false self-employment are detected and tackled because of the negative impact on:

the integrity of the Social Insurance Fund,

the protection of the employment rights (e.g. Redundancy, Payment of Wages, Unfair Dismissal etc) of affected workers, and

correct cover for PRSI benefits for the workers involved.

With a view to ensuring that workers are protected, DEASP is undertaking a number of initiatives that focus on targeting and reducing false self-employment nationwide for the purpose of supporting employment rights and the integrity of the Social Insurance Fund, including the following actions:

The ESIU is networking with inspector units across the Department and with the inspectorates of the Workplace Relations Commission and Revenue to ensure its work draws on existing resources to the maximum extent possible, and acts as a focal point for the upskilling of inspectors nationwide in the area of employment status;

Preparations are underway by DEASP for a joint communications strategy to raise awareness of false self-employment in order to try to affect cultural change;

Legislative proposals are also in train to underpin the increased inspections and strategic targeting approach. These include anti-victimisation measures to give workers recourse to the Workplace Relations Commission if they feel they have been victimised by their employer as a result of questioning their employment status. The wilful misclassification of a worker as being self-employed will become a criminal offence under this legislation; and

A Guidance Document, which is a revision of the current Code of Practice on Determining Employment Status, is also expected to be placed on a statutory footing.

⁷⁰Department of Finance and Department of Employment Affairs and Social Protection (2018) *The use of intermediary-type structures and self-employment arrangements: Implications for Social Insurance and Tax Revenues*. Available at <https://assets.gov.ie/10866/71f05854b566428fa2f2678df8e2b81.pdf>. Accessed 07/11/19

⁷¹Behling, F. and Harvey, M. (2015) *The evolution of false self-employment in the British construction industry: a neo-Polanyian account of labour market formation*. *Work, Employment and Society*, vol. 29, 6: pp. 969-988

⁷²Alfred Kleinknecht, Remco M. Oostendorp, Menno P. Pradhan & C.W.M. Naastepad (2006) *Flexible Labour, Firm Performance and the Dutch Job Creation Miracle*, *International Review of Applied Economics*, 20:2, 171-187, DOI: 10.1080/02692170600581102

⁷³Robert Vergeer & Alfred Kleinknecht (2010) *The impact of labor market deregulation on productivity: a panel data analysis of 19 OECD countries (1960-2004)*, *Journal of Post Keynesian Economics*, 33:2, 371-408, DOI: 10.2753/PKE0160-3477330208

⁷⁴Lisi, D. *The impact of temporary employment and employment protection on labour productivity: evidence from an industry-level panel of EU countries*. *J Labour Market Res* 46, 119-144 (2013). <https://doi.org/10.1007/s12651-013-0127-0>

⁷⁵Lisi, Domenico & Malo, Miguel. (2017). *The impact of temporary employment on productivity: The importance of sectors' skill intensity*. *Journal for Labour Market Research*. 50. 10.1007/s12651-017-0222-8.

⁷⁶McKinsey & Company, McKinsey Global Institute (2017). *Reinventing Construction: A Route to Higher Productivity*. Available at: <https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights/reinventing-construction-through-a-productivity-revolution>. Accessed 30/09/19.

3.3.3 Technology and Innovation

The key issues identified under this heading include:

Strong appetite to embrace technology advances but tight operating margins and a perceived lack of support for funding and training is a barrier;

Further support for BIM; and

More training and awareness of the value of off-site production.

The Global Construction Outlook 2018-2022 study⁷⁷ published by the US Construction Intelligence Centre (USCIC) reports that output from the global construction industry is expected to rise to \$12.7 trillion in 2022, up from \$10.6 trillion in 2017. Despite this, the sectors' annual productivity growth has only increased 1% over the last 20 years, with the lack of digitisation cited as a key reason for this. The industry is divided when it comes to the current state of digital transformation. Almost half (46%) of construction companies surveyed by the CIC self-identify as having been on a path towards digital transformation for some time, while 41% see their company as only in the very early stages of digital transformation. According to the CIC, both employers and employees are hesitant about adopting new technologies, due in part to the lack of knowledge surrounding them. More specifically, 29% of companies agree that lack of knowledge is a barrier for adoption, while 38% believe that it is due to lack of budget. A further 38% believe it is the lack of support from employees that inhibits mass adoption.

International research by the OECD⁷⁸ show that digital adoption

in an industry is associated with productivity gains at the firm level. The effective, widespread use of digital technologies can greatly enhance productivity, reduce costs and contribute to more efficient work methods by alleviating burdensome tasks.

However, a recent EU report on the digitalisation of the construction industry⁷⁹ has recognised that the EU construction industry is not digitising at the same speed as major construction markets. Digitalisation of the construction industry goes beyond BIM to include automated fabrication using robots and 3D printing, drones, 3D scanning, sensors and Internet of Things (IoT). A number of recommended actions have been suggested, including three priority actions for the European Commission which include:

Introduction of an interactive handbook and digital maturity scan for the adoption and implementation of digital technologies by construction SMEs;

Support to Digital Innovation Hubs to accelerate the digital transformation; and

Provide lifelong digital skills development for tradespeople through ongoing training.

In Ireland, a strong appetite is apparent at industry level to embrace technology and innovation with submissions, interviews and the results of the online survey highlighting the opportunities to strengthen productivity by using BIM, off-site production and sustainable building methods/practices.

Firm composition in Ireland with a prevalence of SME and micro-enterprises, and a complex supply chain that is heavily reliant on the use of sub-contractors, compounds the issue, with implications for the capacity of firms to embrace new technologies. However, Ireland is tackling these challenges through the development of a roadmap for BIM adoption, early steps in the introduction of a Centre of Excellence to provide practical applications of digital technologies and a recognition that existing and future workers will need training in these modern methods of construction.

An overview of issues facing three key areas within the theme of technology and innovation – BIM, off-site production, sustainable construction/circular economy, as well as current strategies, are set out below.

⁷⁷ US Construction Intelligence Centre (CIC) (2018) *Global Construction Outlook 2018-2022*

⁷⁸ Gal, P., et al. (2019), "Digitalisation and productivity: In search of the holy grail – Firm-level empirical evidence from EU countries", OECD Economics Department Working Papers, No. 1533, OECD Publishing, Paris, <https://doi.org/10.1787/5080f4b6-en>.

⁷⁹ European Commission (2019) *Supporting digitalisation of the construction sector and SMEs*. Available at https://ec.europa.eu/growth/content/report-supporting-digitalisation-construction-sector-and-smes_en
Accessed 07/10/19

BIM =

BIM: Building Information Modelling/ Better Information Management

In an industry that is characterised by fragmented relationships between the many actors along the lifecycle of a development, BIM offers a pragmatic mechanism by which collaboration and a more integrated approach to management and delivery of the built environment can be secured. The adoption of digital technology by stakeholders and clients will facilitate upfront planning and sequencing, and improvements in project performance, data metrics and delivery.

The findings of research conducted by the National BIM Council (NBC) and a range of international research studies⁸⁰, indicates that despite the wide recognition of the benefits of BIM as a tool to improve productivity across the supply chain, there is quite a way to go in establishing its use as a standardised tool in all construction projects. A mandated requirement for BIM in certain public sector capital contracts, as is the case in many other countries, would drive increased rates of adoption across the sector. However, it is critical that the industry is capable of delivering on such a mandate.

In addition, differing levels of BIM maturity amongst stakeholders can also result in information gaps, for example, where an infrastructure company is using 2D drawings, but the construction company is using 3D/4D BIM models. This can lead to a mismatch in design, specifications

etc. and can incur risks of prolonged negotiations due to variation and change orders resulting in delays and cost overruns for both the constructing company and the developer.

The Roadmap to Digital Transition published in 2017 by the National BIM Council established a comprehensive plan to support the digital transformation of the construction sector. It contained four key recommendations:

The formation of a resourced National BIM Centre of Excellence (NBCE);

Support the adoption of a common collaborative framework of OPEN BIM Standards and contribute to international information management standards in construction;

Enhance educational supports for BIM and other innovative technologies; and

A public sector BIM adoption mandate for use in procurement frameworks.

Progress has been made in actioning these recommendations including:

ISO Certification for BIM progressed by the NSAI. Work is well underway in clarifying the public sector's requirements with



BIM offers a pragmatic mechanism by which collaboration and a more integrated approach to management and delivery.....

regards to BIM with an intention to publish this work within the next 6 – 12 months; and

Developments in the educational and training curriculum for BIM supported by the work of the BIM in Ireland Working Group.

Furthermore, the proposed Build Digital project will include a focus on BIM. This presents an opportunity to address, at least in part, the recommendation for a national BIM Centre of Excellence. Additionally, plans are being advanced by Enterprise Ireland to establish a Centre of Excellence for the construction sector. It is envisaged that this would be a centre for product research and development in new technologies with demonstration projects and learning resources on areas such as modern methods of construction, the circular economy and sustainability in construction etc. There may be scope to align the ambitions set out in the 2017 Roadmap with these plans.

Increased awareness of the applicability and benefits of BIM for infrastructure and smaller projects remains a requirement. This can be combined with similar measures for off-site manufacturing and lean construction.

Furthermore, the adoption of BIM at firm level requires a change in process and technology in addition to upskilling

requirements for employees. Support is available in a number of ways via Enterprise Ireland (BIM Programme and Innovation Vouchers), CITA and other Skillnets, and Springboard +.

The expertise and influence of the well-established network of BIM advocates in Ireland should also be leveraged in supporting the widespread use of this technology. This includes the CITA BIM Group, BIM Regions Groups, the Construction Industry Council BIM Group and various other BIM groups forming part of industry bodies such as the RIAI, SCSI, CIF, Engineers Ireland and the Association of Consulting Engineers in Ireland (ACEI), amongst others. Furthermore, a BIM Champion is required to coordinate the national BIM effort in partnership with the BIM Council, for which a renewed mandate is required with formally appointed representatives. Essential to all of this is a secured source of funding – from a combination of both public and private sources as per international best practice.

Parallel to the opportunities presented by BIM adoption, firms can also gain significant productivity improvements through the adoption of Lean construction principles. The World Economic Forum (2016) report⁸¹ that construction companies that have successfully applied lean methods have reduced construction time by up to 30% and reduced costs by up to 15%.

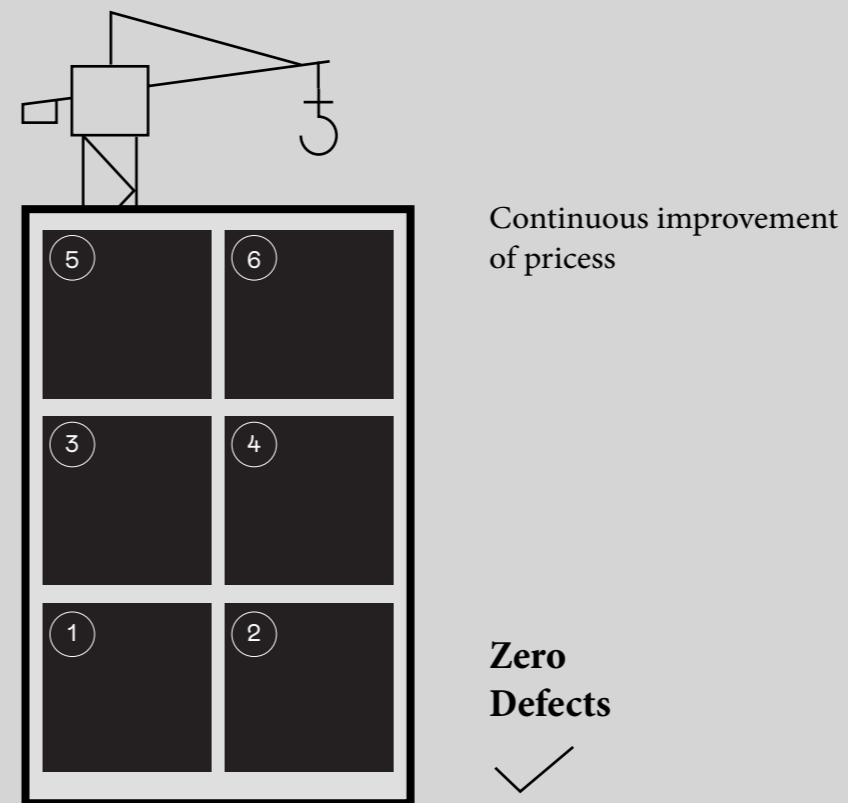
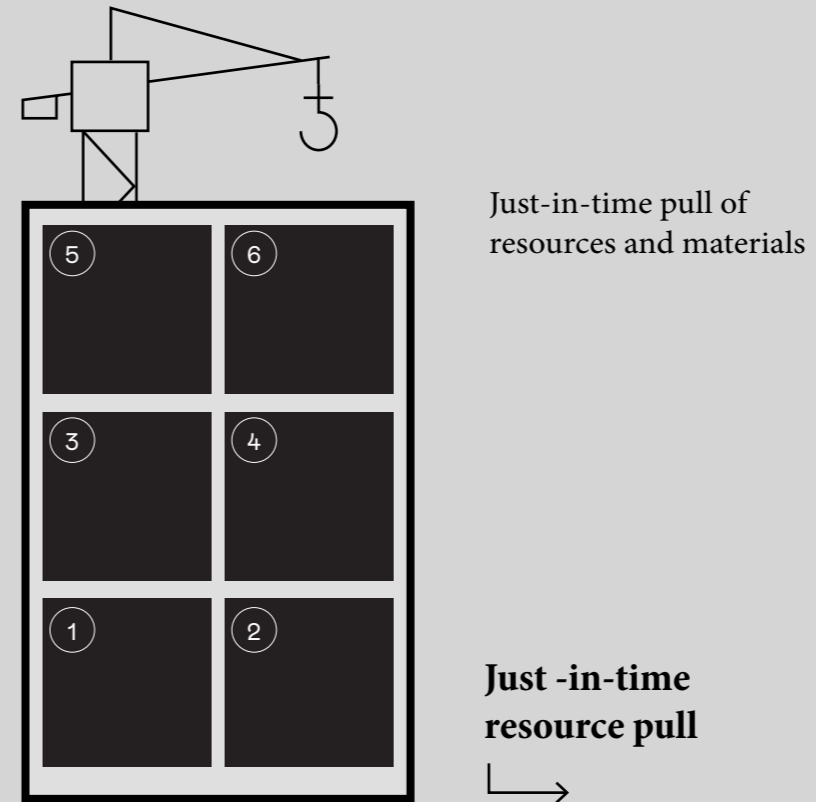
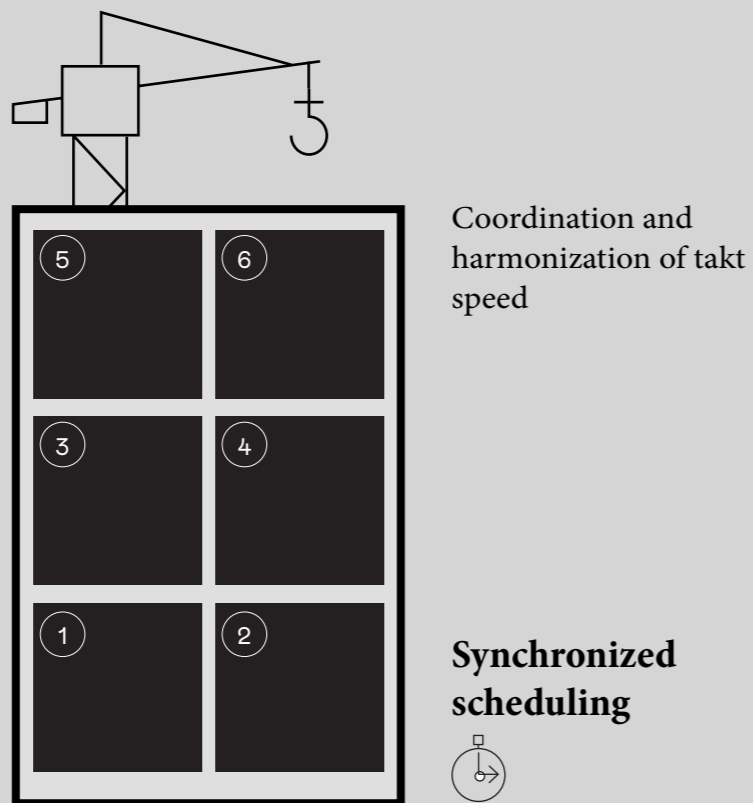
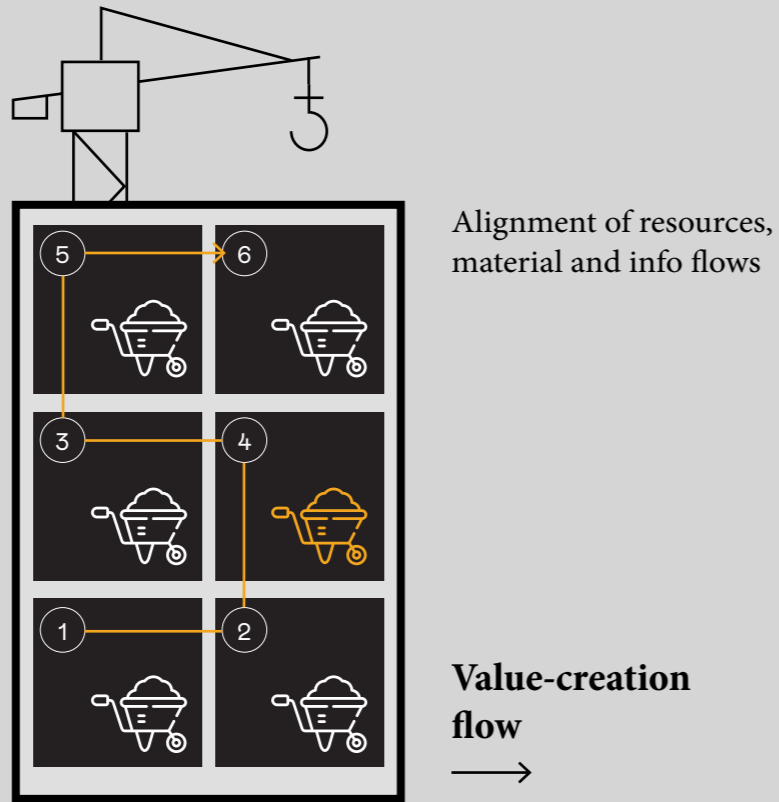
A lean approach achieves efficiencies and more predictable, stable work processes by reducing waste (TIM WOODS – Figure 10) and removing non-value-adding activities. There are four core principles underpinning lean methods in construction projects as illustrated in Figure 10. It should be noted that “Takt” means “pulse” and is the rate at which you need to complete the production process in order to meet customer demand.

Lean Business Ireland work with companies to help them avail of Lean Construction processes to identify and achieve efficiencies across the organisation. Funding is available from Local Enterprise Offices, Udaras na Gaeltachta, Enterprise Ireland and IDA Ireland for companies who wish to improve their competitiveness using Lean tools and techniques . A large number of case studies are also available which highlight project objectives, key challenges, key changes and results achieved from implementing one of the Lean processes by different organisations of all sizes.

⁸⁰ National BIM Council - Global BIM Report (2017) and BIM in Ireland Report (2017). Available at: BIM Innovation Capability Programme for Ireland - <http://www.bicp.ie/>. Accessed 04.11.19.

⁸¹ World Economic Forum (2016), Shaping the Future of Construction, A Breakthrough in Mindset and Technology. Available at: <https://www.weforum.org/reports/shaping-the-future-of-construction-a-breakthrough-in-mindset-and-technology>. Accessed 03/09/19

Figure 10: Core principles underpinning Lean Construction



INTERNATIONAL INITIATIVES

The Australasian BIM Advisory Board⁸² (ABAB) was established by both the government and industry to enhance the adoption and standardisation of BIM in construction projects across Australia and was expected to significantly enhance the efficiency of construction. The main aims of the ABAB are to provide guidance and to promote best practice and consistent approaches to BIM practices, standards and requirements through industry leaders, experts from government and academia.

A strategic framework was established in 2018 to provide a consistent framework on usage of BIM in major building and infrastructure construction projects. In 2019 the focus shifted to maximising benefits across the whole lifecycle of the project including management of assets over the longer term.

Adoption of BIM in Belgium is being driven by both Government and industry. BIM adoption is seen as a key element in reducing construction costs by improving productivity, reducing errors and reduction of reworks. While mandatory use of BIM on public projects has not yet been adopted, the Government is sponsoring many BIM promotion, research and implementation initiatives suggested by the Belgian Construction Federation, Belgian Building Research Institute (BBRI) and private companies. A BIM portal has been established and a BIM cluster has been formed by Flemish construction companies to cooperate on the increased use of BIM. The BBRI issue regular publications on digital issues and provide seminars and training.

Denmark has included mandatory BIM requirements in its public contracts since 2007. This experience over more than a decade has seen it become one of the leaders in Europe in relation to BIM implementation. While public procurement was a key implementation driver, private companies have appreciated the benefits associated with BIM to the extent that 84% of companies believe that BIM can create value on the construction site, 79% believe BIM is about collaboration and cooperation across all parties, and 31% believe BIM is necessary to create a sustainable environment⁸³. The Dansk Byggeri (Danish Construction Association) implements BIM educational programmes to facilitate BIM implementation among construction companies.

The UK is one of the frontrunners in terms of BIM adoption and was ranked second highest adopter in Europe in 2019⁸⁴. The industry and the UK government have made a joint commitment towards the BIM program under its BIM strategy to develop digital techniques in construction and improve its transformative potential, particularly in the areas of recycling and construction waste. Since April 2016, Level 2 collaborative BIM has been made a mandate for all centrally funded public sector construction projects. In 2016, BIM technology reached Level 2 (managed 3D environment with data that is created in separate models) for public projects. The UK Construction industry is working towards implementing BIM Level 3 (a dimension dedicated to the entire life-cycle management of a building) by 2020. A second edition of the UK Construction Industry

Council BIM Protocol for use with a variety of forms of contract was published in 2018. It builds on the mainstream use of BIM and includes updates to reflect current practices and standards regarding the use of BIM. As the 2018 protocol was also closely aligned with PAS 1192-2, a newly named “information protocol” is anticipated shortly.

Another interesting UK led initiative is the recent launch of an online National BIM Strategy Training programme by the Centre for Digital Built Britain at the University of Cambridge. This online training programme is designed to support international governments in creating their national BIM strategies⁸⁵.

⁸² Austrian BIM Advisory Board (2019) <http://www.abab.net.au/>. Accessed 20/10/19

⁸³ European Construction Sector Observatory, State of Play of Implementation of BIM in EU Member States, March 2019⁹⁶ <http://www.abab.net.au/>

⁸⁴ European Architectural Barometer 2017 <https://www.usp-mc.nl/en/insights/usp-shop/shop/european-architectural-barometer/>

⁸⁵ University of Cambridge, Centre for Digital Built Britain (2019). <https://www.cdbb.cam.ac.uk/interactive-content/cdbb-international-national-bim-strategy-training>. Accessed 30.10.19



Off-Site Production

The use of production systems which provide a greater degree of standardisation and modularisation with the bulk of construction work taking place in factories off-site, is a growing sector that offers huge scope for expansion. The results of the online survey conducted as part of this research provide a strong endorsement for greater use of off-site manufacturing, prefabrication and modularisation with this identified as the top operational measure that can be taken to improve modularisation by respondents, irrespective of the region in which they are based. MGI research indicates that off-site production significantly reduces build time because productivity is higher in a controlled environment, such as a factory, than it is on-site.

The compelling benefits of off-site production methods include the opportunities to address regional disparities in the market demand for work, creating a secure employment base for construction workers in rural regions, the delivery of more sustainable buildings and infrastructure, and a reduction in waste (with precision and automated production processes), inefficiency and delays often arising with onsite construction projects.

A recent McKinsey report identifies seven factors that determine the attractiveness of a market for modular construction. The leading factors are labour dynamics, particularly labour shortages and continuously high housing demand. After this, determining factors include local site constraints, supply chain and logistics, quality perception, access to materials and regulations⁸⁶. Favourable regulatory conditions can play a big role in driving the use of off-site production. For example, Singapore mandates its use for

all social housing projects. McKinsey suggest that as modular players gain credibility and scale, this will remove many of the negative connotations of the past and may push construction productivity to new heights.

With challenging targets for housing delivery set out under Rebuilding Ireland and the NDP, there is a clear requirement to expedite the delivery of housing for which off-site production methods offers great potential. Positive advancements have been made in the move toward modern methods of construction, as reflected in the recent development of public procurement frameworks for social housing that have focused on design-build contractors using off-site construction. In 2017, the OGP put in place a framework of rapid delivery contractors, which is available to all local authorities and approved housing bodies (AHBs). Information seminars have also taken place to encourage uptake of these procurement bodies and support growth in the sector. Dublin City Council has also developed a volumetric rapid delivery programme for apartment developments.

Furthermore, Government agencies such as the LDA are actively encouraging the use of off-site production methods with a recognition of the whole life value (including energy efficiencies gained) they can provide.

However, further coordinated efforts are required by both industry and government parties to define and implement a strategic path for growth in the sector. Both public and private sector actors engaged with as part of this research indicated that mandated requirements for off-site production, in appropriate cases, would drive the growth and development of the market. However, care is required to

ensure a graduated move towards a mandated requirement for off-site production methods in order to ensure that industry has developed the skills, knowledge and capacity to respond. In addition, international standards compliance (for example in BIM 19650, Quality 9000, Energy 5001 and Lean 18404) is required to ensure that outputs can be readily supplied to the export market when Irish demand lessens.

From a supply side, expansion of the off-site sector will only occur where industry has confidence in the market to demand modern methods of construction, and so a gradual move with coordinated support in education, training and upskilling, is recommended. Security of demand with greater clarity on both public and private sector pipeline, as discussed earlier, is an essential supporting requirement for development of the off-site sector in Ireland. MGI has found that an automated facility producing sufficient cement slabs and walls for 12,500 housing units could cost about €39m. Investment on this level will only transpire where there is secure and sustainable demand. The Construction Scotland Innovation Centre⁸⁷ have invested in industrialised construction equipment that firms can either hire or be upskilled on. Initiatives such as this are particularly supportive for emerging technologies / materials as they can greatly assist companies as a stepping-stone for considering investment.

There is also an educational element required to reassure designers and clients on the capacity of modern building methods to meet and exceed requirements and standards set out in Building Regulations and other design standards. Specialised suppliers and designers in off-site



COMPELLING BENEFITS OF OFF-SITE PRODUCTION....

production methods need to form part of design teams to ensure all designs are compatible with off-site produced materials. As described later, specialised training and CPD is required to ensure the skillsets of the existing workforce can be readily transferred to optimise productivity in the context of modern construction methods. Necessary advancements in digital technologies referred to earlier should be coordinated with technology requirements for off-site production specifically in digital design modelling, 3D output and BIM. Furthermore, new specialist careers will be required in the area of construction manufacturing, construction quality engineers (a specialism on a par with a pharmaceutical quality engineer, for example) and in construction supply chain management.

A recent UK Government report⁸⁸ on off-site manufacturing emphasises the range of technical planning and

collaborative skills required for the whole-system approach associated with off-site manufacture. In this regard, the UK Chartered Institute of Building (CIOB) has advocated the need for flexibility in the skillsets of off-site construction workers with enhanced abilities in logistics and assembly. There may be requirements for hybrid roles, overlapping managerial and professional levels or commercial and technical skills, and softer collaborative skills in problem solving, team working, and communication to supplement technical competencies.

The clear environmental benefits of modern construction methods offer potential to engage support from organisations such as the Environmental Protection Agency (EPA) or Science Foundation Ireland (SFI). SFI supports industry collaborations by providing researchers with funding, linking researchers and companies that are working on relevant

projects. Relevant funding streams includes the SFI Spokes Programme which facilitates industry partners to align with SFI research centres in new priorities and opportunities. In addition to SFI's funding programmes, new challenge-based funding models are being developed including the SFI Future Innovator Prize. The Future Innovator Prize seeks to support Ireland's best and brightest unconventional thinkers and innovators to develop novel, potentially disruptive, technologies to address significant societal challenges. Recent calls have included themes on AI for Good and Zero Emissions.

⁸⁶ Global Infrastructure Initiative (2019) Scaling Modular Construction, September 2019. Available at <https://www.globalinfrastructureinitiative.com/voices/september-2019> Accessed 30/10/19

⁸⁷ Construction Scotland Innovation Centre. Available at: <https://www.cs-ic.org/innovationcentre/> Accessed 20/10/19

⁸⁸ House of Lords Science and Technology Select Committee (2018) Off-site manufacture for construction: Building for change. Available at: <https://publications.parliament.uk/pa/ld201719/ldselect/ldstech/169/169.pdf> Accessed 12/10/19

International Initiatives

Australia have identified the potential efficiencies to be obtained through off-site manufacture and pre-fabrication, however they recognise that many firms are unfamiliar with the practical applications of such technologies and how they can be utilised to meet technical specifications in regulations and contracts. In order to encourage increased take-up of such opportunities the Government has announced an AUS\$2m investment to undertake a feasibility study for the establishment of a collaborative innovation lab.

prefabAUS⁸⁹, the body for Australia's off-site construction industry has been acting as the hub for building prefabrication technology and design and is actively working to implement prefab buildings across Australia with support from government and industry players. The organisation has predicted that more than 10% of new homes in the country could be prefabs within a decade leading to significant cost savings for developers and homebuyers.

Belgium are applying a similar approach with the rollout of its regional roadshows on Construction 4.0⁹⁰ which demonstrates the advantages associated with embedding technology into construction processes and is particularly useful for implanting new regulations such as the Energy Performance of Buildings Directive.

New Zealand have PrefabNZ⁹¹ which is a non-profit member organisation that educates and advocates for innovative excellence in offsite design and construction. It provides a portal for information, insights and seminars on modular and off-site construction.

The UK, through its Infrastructure and Projects Authority, is examining the case for modern methods of construction and are working with a number of government departments on the development of a presumption in favour of off-site construction. The "Transforming Infrastructure Performance" initiative aims to

improve productivity in delivery through the adoption of digital and manufacturing technologies, better integrated supply chain management practices and creating skilled jobs, promote smart construction by supporting innovation to develop digital and offsite manufacturing technologies, drive faster uptake of digital technologies and support faster uptake of innovation and best practices in the construction sector.

The UK are also exploring the use of off-site construction to help it reach its target of 300,000 new homes a year up to the mid-2020s. To reach this goal would require a 40% increase in the construction workforce and big improvements in productivity using traditional construction approaches. However, Homes England are looking to accelerate housing delivery through improvements to construction productivity, encouraging developers to use modern methods

of construction and increasing the capacity of the off-site manufacturing industry .

Homes England have partnered with the Homes Group (a large UK housing association) on the development of the Gateshead Innovation Village⁹⁴. This is a live research project to build a village from scratch using a mix of traditional and modular homes incorporating energy efficient and smart technologies and test their ongoing performance. This is intended as a starter point to give the industry confidence in new building methods.

Building on this project, Homes England are also planning to launch a modern methods of construction (MMC) pilot site-research project. This will monitor and report on up to 25 sites all of which are using ambitious forms of MMC to build new housing. These sites will then be benchmarked against traditional build approaches to provide the industry

with data to make informed decisions about emerging technologies.

In May 2019, Japan's biggest housebuilder, Sekisui House, announced a deal with Homes England and Urban Splash (a site construction company) to build thousands of new homes across the UK⁹⁸ using the latest modular construction manufacturing methods. Sekisui House have invested £22m in Urban Splash and Homes England have invested £30m equity plus debt funding through its Home Building Fund.

A survey conducted by ProDroneWorx (150 respondents) in 2019, indicates that more than half of the construction firms in the UK are using drone technology (as compared to 33% in 2017), mainly for photography and video. It helps in site assessment and inspections, monitor logistics and deliveries. The significant regulatory requirements associated with the use of drones by SMEs is being mitigated through the provision of drone services by larger companies.

The UK are also at the forefront of drone technology and currently host 34 drone manufacturers. One project that is currently being explored is the use of drone technology in Leeds as part of the self-repairing cities project⁹⁵ which examines how drones could identify and solve issues preventing street closures e.g. identifying and repairing cracks in footpaths.

3D printing (also known as Additive Manufacturing) is also being explored by countries such as Belgium, Denmark and the Netherlands to accelerate construction. Government and industry are working together on research projects to finance and test 3D solutions for the industry to develop prototypes for industry and training. An example of such developments is the building of a 3D printed bicycle lanes and a pedestrian bridge in the Netherlands, which was printed from 800 layers of concrete and could potentially hold the weight of 40 trucks⁹⁶.



⁸⁹ Available at: <https://www.prefabaus.org.au/> - Accessed: 10/10/19

⁹⁰ Available at: <https://www.bbri.be> - Accessed: 10/10/19

⁹¹ Available at: <http://www.prefabnz.com/> Accessed: 10/10/19

⁹² Available at: <https://www.globalinfrastructureinitiative.com/article/working-together-tackle-uk-housing-crisis> - Accessed 10/10/19

⁹³ Available at: <https://www.homegroup.org.uk/Corporate/Development-Partners/Gateshead-Innovation-Village> - Accessed 10/10/19

⁹⁴ Available at: <https://www.gov.uk/government/news/boost-forhousing-market-as-japans-biggest-housebuildersekisui-house-moves-into-uk> - Accessed 11/10/19

⁹⁵ Available at: <https://selfrepairingcities.com/> - Accessed 11/10/19

⁹⁶ Available at: <https://www.welovecycling.com/wide/2017/11/29/worlds-first-3d-printed-bridgescyclists-opened-netherlands/> - Accessed 11/10/19

3.3.4 Sustainable Construction and the Circular Economy

For the sector, the requirements to keep pace with evolving developments in digitisation, promote the circular economy and encourage energy efficiency are both challenges and opportunities, that can bring major benefits in terms of overall productivity.

As referred to above, off-site production methods not only offer potential for productivity gains but also brings many environmental advantages including waste reduction through more efficient use of resources and precision manufacturing, reducing errors, improving the control of materials, lowering the risk of damage, reducing the requirement for travel (both for materials and personnel), bringing efficiencies in the use of energy, and lowering carbon emissions. An overview of issues relating to two major aspects of sustainable construction - construction waste and energy, is set out below. This is followed by a brief selection of best practice initiatives on sustainable construction and the circular economy being undertaken internationally.

Waste

A study by British Precast shows that precast concrete manufacturing reduced carbon emissions from the construction sector by 26%, mains water consumption by 31%, and waste to landfill by 95% over the period 2008 to 2016.

Construction and demolition (C&D) waste accounts for approximately 25-30% of waste produced in the EU. Projected Irish figures for 2019 total 7.4m tonnes with 80% composed of soil and stone. There are 256 facilities for recovery and disposal of this waste (2016). 2027 projections estimate C&D waste will increase to 10.2mt – 11.8mt.

The circular economy presents major opportunities to embed resource efficiency, material recycling and reuse within the sector including the use of innovative, low carbon, zero waste materials. On site execution and productivity of activities can be improved by eliminating and minimising sources of waste.

With coordinated enhancements in digital technologies, circular economy initiatives for renovation and maintenance, including the traceability of materials for future re-use and recycling, can be facilitated.

Government and industry have taken steps to address different elements of C&D waste with the establishment of four sub-groups under the Construction Waste Resource Group in 2018. These groups are examining and making recommendations in relation to the following areas:

Article 27, End of Waste and Waste Permit Thresholds – new regulations have been recently introduced to increase the tonnage of soil and sand that can be sent to a Waste Facility from 100,000 to 200,000 tonnes over the life of the facility. The treatment of waste as a by-product requires approval by the EPA under Article 27 requirements. There have been long delays in receiving this approval previously, but the EPA are now proposing to give a response within 10 weeks or request further information. Currently only individual operators can make applications for certain waste to be considered suitable for recycling. This can take a long time and only applies to that operator. It involves a risk assessment by the EPA with approval typically easier to obtain if the recycled material is to be included within a bound material such as concrete rather than as a standalone product.

Waste prevention on site and best practice for the circular economy – this considers how the minimisation of C&D waste can be built into planning and design of projects. It also includes segregating waste on site efficiently to increase the likelihood of it being suitable for recycling or re-use. 73 recommendations have been suggested which the EPA are working to consolidate into a set of key points with actions, timeframes and lead organisations. It is accepted however, that implementation will take time and require behavioural and cultural changes.

Waste capacity and projections – this group examined current data and sources and made recommendations on mechanisms to ensure the availability of timely and accurate information to enable the Regional Waste Management Offices to monitor and report on current arisings and future capacity requirements. Currently, there is a requirement to report data on a three-year basis to the EU which means data is often out of date and does not give a clear picture of capacity or constraints. Quarterly reporting is now in place for municipal solid waste. Extending this to C&D waste would be beneficial.

Waste flows and enforcement – this considered the identification of waste flows along with source, pathway and receptors for waste flows and identified gaps and weaknesses in enforcement. A number of recommendations have been suggested including the agreement of an approved timeframe for Article 27 notifications (i.e. permit to re-use materials), clear guidance should be provided by the EPA on how soil and stone, crushed concrete and road planings can be re-used as well as the convening by Government of a national coordination group to develop a framework to facilitate end of waste applications.

A recent Government Circular on promoting the use of environmental and social considerations in public procurement has highlighted the need to consider environmental aspects when procuring public projects. The State, as one of the country's biggest developers under Project Ireland 2040, will have significant responsibilities in relation to the management and disposal of construction waste. DHPLG held a symposium late in 2019 to highlight these requirements and to encourage the inclusion of prevention and waste management practices within procurements and designs.

Initiatives such as a project⁹⁷, funded by the EPA, by Limerick City and Council, Clare County Council and Dublin City Council to provide procurement and waste prevention training for architects, engineers, quantity surveyors and others will help awareness and provide practical training in dealing with C&D waste.

While steps are in place to consider the impact of C&D waste and how best to manage it, Ireland appears to be only at the start of the journey with more work to do to embed waste reduction and a circular economy approach into procurement, design, construction and demolition.

⁹⁷ EPA Research Fact Sheets. Available at: <https://www.epa.ie/pubs/reports/research/waste/Design%20Out%20Waste%20Factsheets.pdf> - Accessed 10/10/19

International Initiatives

Energy

Reducing inputs, such as energy or materials, reduces the labour needed to produce a given value of output, which results in a productivity gain. A 2018 study by the European Commission notes a direct positive correlation between the circular economy (and energy efficiency measures) and labour productivity.

The Energy Performance of Buildings Directive (EU) 2018/844 sets ambitious goals for energy efficiency and renewables in buildings by requiring nearly zero-energy buildings, (NZEB) performance for new buildings from 31 December 2020. Furthermore, the Climate Action Plan 2019 establishes a series of actions for the built environment that includes commitments to consolidate data on retrofitting to facilitate greater accuracy in measuring energy efficiency and carbon savings (Action 43), to increase the number of homes and businesses with BERs and DECs, and to maximise potential for BER and DEC data to decarbonise buildings (Actions 44 and 45). The plan also commits to up-skilling of contractors/industry players in deep retrofit, NZEB and new technology installations (Action 50), developing the supply chain for renewables and retrofitting (Action 51) and to working with industry stakeholders to increase the use of low carbon materials. Specific steps set out in this regard include a roadmap to promote greater use of lower-carbon building material alternatives in construction and to consider opportunities to build an exemplar

public building using sustainable materials, in particular, wood.

Embedding circular economy principles can position the industry to respond to the sustainability challenges set out in nZEB, the Climate Action Plan and other policy directions. Similarly, the greater use of modern construction methods can also greatly facilitate progress in how the sector responds to the climate challenge. The more sustainable use of materials and resources is by nature compatible with productivity gains as efficiencies are streamlined into design, daily execution of on site construction activities and the operation of buildings.

The concept of sustainability and the impact on the circular economy is also being addressed internationally.

The **Belgian Government** has introduced a number of initiatives to foster sustainable construction and support the circular economy. These include Greenbizz⁹⁸ – which was launched in Brussels as a business incubator for eco-construction, renewable energy and eco-products by offering up to 8,000 square metres of facilities and services to create or develop environmental projects.

The Renovation Pact 2050⁹⁹ was launched by the Flemish Government and involves collaboration between the Government and 30 stakeholder organisations across regional and local governments and the housing and building sector. Its objective is to develop and implement a plan to significantly increase the renovation rate of the Flemish housing stock and optimise energy performance to nearly zero energy level.

Belgium also launched Werflink¹⁰⁰, a circular construction platform which allows member companies share, rent, sell, loan and exchange equipment, materials, freight space and facilities

with fellow construction companies and sites. A pilot program is being run in 2019 with members of the construction federation being provided with free access.

The Eco-Innovation Programme¹⁰¹ was launched in Denmark in 2015 to subsidise and support Danish construction companies which focus on sustainable construction, the circular economy and recycling of waste. In 2017, around €13.4 million was made available under the scheme. The private sector is also engaging in initiatives including the Danish philanthropic association Realdania¹⁰², which launched an innovation challenge in 2018 to turn the 650MT of construction waste produced every year into a resource for new construction and the Danish Lendager group, which built 20 townhouses in 2019 using recycled material in Denmark. The windows were sourced from old buildings and the concrete used was re-used from the Copenhagen metro project.

The Circle House project¹⁰³ was also launched in Denmark where 60 companies have come together to build 60 social houses using more than 90% recycled materials without losing significant value as a practical initiative to encourage an increased circular economy approach. The units are expected to be completed in 2020. The project is supported by funding from the Danish EPA Eco-Innovation Program.

Circular City Green Deals was launched in the Netherlands to reduce construction costs by reusing and recycling raw materials at various stages of the supply chain. In 2017, the government announced plans to establish a value chain agreement in the concrete sector. The agreement involved collaboration with parties such as raw material suppliers, cement manufacturers, mortar suppliers, contractors, recyclers, state bodies

and private players in order to reduce the use of concrete and other raw materials at every stage of construction and to promote the recycling process at each level of the supply chain to reduce cost and carbon emissions. In the period between 2011 and 2014, 176 Green Deals were closed in the Netherlands, involving a total of 1,090 participants. Green Deals cover nine themes: energy, the bio-based economy, mobility, water, food, biodiversity, resources, construction and the climate. Research living labs have also been commissioned in Amsterdam to help research and execute circular economy methods.

The Netherlands have also developed a concept called “Energiesprong”¹⁰⁴ which is a way to create a mass market for net zero energy homes. It represents a revolutionary whole house refurbishment and new built standard and funding approach. Rather than concentrating on piecemeal refurbishments such as boilers, the approach is to look at energy savings that can be made across the whole house and take into account future energy changes. The program uses the social housing sector as the launch market for net zero energy retrofit solutions with a view to later scaling to private homes. The independent Energiesprong marketing team aggregate mass demand for high quality retrofits (and new built houses) in a market and create the right financing and regulatory conditions in parallel. The refurbishment comes with a 30-year performance warranty and the energy and maintenance savings achieved are used to pay for the upgrade. This concept is now being used in a variety of countries such as a housing association in Nottingham in the UK who are in the middle of their second pilot program.

New Zealand has introduced a sustainable housing programme, “Innovate, Partner, Build



Reducing inputs, such as energy or materials, reduces the labour needed to produce a given value of output, which results in a productivity gain.

Programme¹⁰⁵ which aims to deliver 2,000 new sustainable homes over the next 10 years, as well as a large number of refurbishments. In order to provide security around pipeline, Housing New Zealand (HNZ) is signing capacity partnering agreements with build partners for the delivery of a set volume of state homes each year and over a longer time period, e.g. for up to three years, rather than on a project by project basis. HNZ is also using their scale and forward planning to purchase construction materials and components across the entire build programme and, where possible, direct from the manufacturer to obtain cost reductions.

New Zealand are also prompting the use of timber in construction of mid-rise projects¹⁰⁶ to speed up construction through the use of off-site fabrication, lower building lifecycle costs and improved carbon dioxide emissions. The programme has 3 interrelated projects: Red Stag, a leading forestry, wood processing and property development company is constructing two mid-rise wooden buildings, one residential and one commercial as showcases and the costs relating to the construction of these buildings will be shared with the construction industry; promoting the use of wood amongst the industry through the organisation of site visits to the showcase buildings as well as sharing designs etc. with the industry;

and build a Collective of Excellence – a pool of professionals experienced in mid-rise wood building and construction – to help share and grow knowledge and expertise within the sector.

Red Stag Investments Ltd is contributing NZ\$3 million (60%) and the Ministry for Primary Industries (MPI) is contributing NZ\$2 million (40%) over the four-year term of the Mid-rise Wood Construction Primary Growth Partnership (PGP) programme. If successful, the programme expects to deliver economic benefits of NZ\$155 million by 2023 and NZ\$330 million by 2036, driven by a 10% lift by 2023 in the wood construction industry’s market share across the multi-unit residential and non-residential market.

⁹⁸ Available at: <https://www.greenbizz.brussels/en/> - Accessed: 15/10/19

⁹⁹ Available at: <http://www.go-refurb.eu/renovation-pact-initiated-by-flemish-government/> - Accessed: 15/10/19

¹⁰⁰ Available at: <https://www.werflink.com/en/werflink.html> - Accessed: 15/10/19

¹⁰¹ Available at: <https://eng.ecoinnovation.dk/the-danish-eco-innovation-program/> - Accessed: 15/10/19

¹⁰² Available at: <https://www.realdania.org/> - Accessed: 15/10/19

¹⁰³ Available at: <https://stateofgreen.com/en/partners/orbicon-provides-environmental-impact-assessments/solutions/recycleable-housing/> - Accessed: 15/10/19

¹⁰⁴ Available at: <https://energiesprong.org/country/the-netherlands/> - Accessed: 15/10/19

¹⁰⁵ Available at: <https://www.hnzc.co.nz/working-with-us/innovate-partner-build-programme/> - Accessed: 15/10/19

¹⁰⁶ Available at: <https://www.mpi.govt.nz/funding-and-programmes/sustainable-food-and-fibre-futures/primary-growth-partnership/current-peg-programmes/mid-rise-wood-construction> - Accessed: 15/10/19

3.3.5 EXECUTION STAGE RECOMMENDATIONS



There are three main recommendations put forward to enhance productivity at the execution stage of the project lifecycle.

Recommendation 4

Improvements to policy and regulation.

Policy and regulatory actions which address issues of skills competency, quality, standards and pay, support efficiencies in delivery of development and address the misclassification of workers. Collectively, actions across these areas will support improvements in productivity.

Recommendation 5

Improvements to operational management processes.

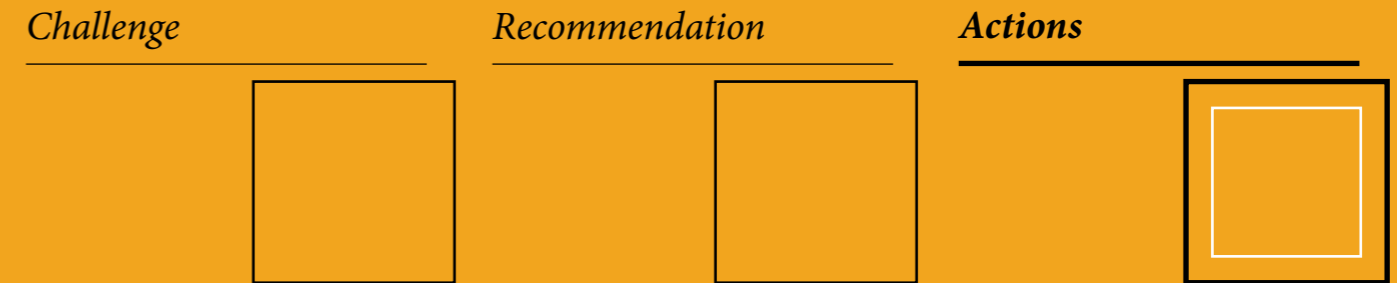
Enhanced collaboration across the supply chain, greater efficiencies in planning, scheduling and delivery of work with the widespread use of Lean and BIM technologies and performance measurement to strengthen productivity at firm level.

Recommendation 6

Recommendation 6: Enable technology and innovation advancement across the sector.

Enhanced technological and innovation capacity in areas such as BIM, modern methods of construction and circular economy construction are directly related to increases in productivity.

3.3.6 EXECUTION STAGE ACTIONS



A broad range of actions are set out to support the implementation of the three recommendations proposed to bring about productivity gains in the execution stage of a project ,as follows:

Recommendation No. 4 - Improvements to policy and regulation

Action 4.1

To place the Construction Industry Register of Ireland (CIRI) on a statutory footing. This will help promote a culture of competence, good practice and a high-quality compliance with Building Regulations within the construction community.

Action 4.2

Central Government and all public bodies have a responsibility to ensure that labour standards are being met by industry. In this regard:

Enhance monitoring, investigations and compliance nationwide, including inspections by DEASP Inspectors and the recently established Employment Status Investigation Unit (ESIU) to detect and tackle the misclassification of workers; and

Advance plans to pursue legislative measures to address the misclassification of workers.

Action 4.3

Introduce a voluntary skills passport for construction workers to allow for the validation of skills. This would help to ensure high construction standards and working conditions. The management of the skills passport initiative to be further discussed by the identified leaders.



Recommendation No. 4 - Improvements to policy and regulation

Action 4.4 Greater promotion of the provisions set out in the Construction Contracts Act 2013 on fair contractual and payment practices that satisfy the concerns of main contractors, sub-contractors, designers and clients. Greater awareness and implementation of the provisions of this Act will enhance quality, efficiency and productivity improvements in construction projects helping to secure better client outcomes and strengthen confidence in delivery (coordinate with supporting actions on performance and cost benchmarks).

Action 4.5 Encourage adoption of relevant international standards (e.g. ISO 19650 - BIM, ISO 9000 - Quality, ISO 5001 – Energy and ISO 18404 - LEAN etc.) to support construction firms in ensuring that their outputs are compliant with requirements and regulations in local and, particularly, export markets (e.g. via European Technical Assessment).

Recommendation No.5 - Improvements to operational management processes

Action 5.1 Supply Chain Optimisation: Main contractor and sub-contractor to adopt a proactive, mutually supportive and collaborative relationship with upfront liaison on work and payment scheduling, resource capacity (including allocation and reallocation of resources) and delivery of work programmes. This should be supported by Lean construction principles and BIM technologies for performance management and measurement to highlight labour capacity issues at individual firm level (supported by firm level KPIs). This action is supported by and linked to Action 7.1 on the Build Digital project and Action 7.2 on the Centre of Excellence. Furthermore, greater promotion of the provisions of the Construction Contracts Act 2013 as set out in Action 4.4 will optimise work relations between contractors and sub-contractors.

Recommendation No.6 - Enable technology and innovation advancement across the sector

Action 6.1 The establishment of a Joint Working Group with industry and Government parties to guide the development of the off-site production sector. Off-site production will bring efficiencies in project delivery and will create a stable and secure employment environment that is less vulnerable to cyclical changes.

First steps to include:

The use of procurement frameworks that encourage off-site production (linked to Recommendation No. 3).

Training and upskilling for design team professionals, construction management professionals, and tradespeople on modular and volumetric building materials, manufacture, and business development;

Workshop or roadshow promotional series to promote the benefits of off-site production;

Develop demonstration projects for rapid delivery and modern methods of construction in collaboration with industry in the medium term;

Provision of business supports/advice with regard to modern methods of construction;

Seek to replicate the success of international best practice initiatives such as the Belgian Werflink Programme, a circular construction platform which allows member companies share, rent, sell, loan and exchange equipment, materials, freight space and facilities with fellow construction companies and sites;

Explore SFI and EPA funding streams to support modular and volumetric construction for start-ups and existing firms looking to move into this area, drawing on opportunities relating to the environmental benefits of modern methods of construction.

Highlight opportunities for skills transfer; and

Reassure professionals on the capacity of off-site materials to meet and exceed all relevant regulatory standards.



Recommendation No.6 - Enable technology and innovation advancement across the sector

Action 6.2 A renewed focus and commitment to support the widespread use of BIM by the sector in Ireland. In doing so, build on established BIM network of actors across the professional bodies, government and educational sector, and prioritise the implementation of the following recommendations:

A reinvigorated National BIM Council with formally appointed representatives freshly mandated to oversee the implementation of the Roadmap recommendations;

A secured source of funding to support the work of the National BIM Council in encouraging the uptake of BIM in Ireland; and

In the longer term, a Public sector BIM adoption mandate in the procurement of public works projects. On this, an incremental and phased approach to the mandatory use of BIM in all public sector work as part of procurement and contracting frameworks. This would also encourage greater use of BIM in private sector projects (linked to recommendation No. 3 Action 3.2). The use of BIM is now mandatory in many other countries including Denmark, Australia, the Netherlands and the UK.

Action 6.3 Industry to work with education and training bodies in advancing efforts to upskill the sector on modern construction methods, BIM and digital innovations and ensure that education and training programmes are equipped with the best technology and resources to attract fresh talent to the market.

Demonstrations of the practical applications of technology are also useful in assisting upskilling, for example the Belgian Constructor 4.0 roadshow that raises awareness of digital technologies and how they can improve productivity in the construction industry (linked to Actions 6.1, 6.2, 7.1 and 7.2).

Action 6.4 To support advancements in the uptake of digitisation across the sector, and to complement ongoing work such as the BUILD Digital proposal (referred to in Action 7.1), consider the formation of a digital network under the recently established Construction Skillnet, an initiative by Skillnet Ireland to be promoted by the CIF. The digital network will help companies to define and meet their skills needs in the areas of technology and digitalisation and to strengthen innovation by supporting the development of clusters around digital construction challenges and opportunities. A longer-term ambition of the Construction Skillnet might be to establish a dedicated manager to oversee the work of the digital network. The network should build on and extend on the work of Local Enterprise Offices (LEOs), Regional Skills Forums, and other education and training providers active in the space.



Recommendation No.6 - Enable technology and innovation advancement across the sector

Action 6.5 Promote opportunities arising from external funding sources such as the European Commission Horizon 2020 programme to SMEs. This supports innovation in the sector through the knowledge sharing and learning opportunities presented. In addition, with projects funded by these programmes typically lasting for a period of 3-4 years, they can provide an important source of funding to underpin the implementation of a company's innovation strategy.

3.4

Performance and monitoring stage

This section describes key performance and monitoring related challenges to productivity including issues relating to measuring productivity, education, training and promotion. A summary overview of key challenges, recommendations and high impact actions set out in this section is presented in Table 13 with additional supporting actions referred to in Table 14.

Table 13: Challenges, Recommendations and Actions at Performance and Monitoring Stage

PROJECT STAGE	CHALLENGE AREA	RECOMMENDATIONS AND HIGH IMPACT ACTIONS
Performance and Monitoring Stage	Measuring productivity Absence of central facility/body to champion the sector Education and training of apprentices Education and training for digital sustainability Low uptake of existing education and training supports Poor perception of career opportunities within the built environment	<p>Recommendation 7: Develop Education and Training Supports and Capacity</p> 7.1 Advance plans for Build Digital 7.2 Establish a Centre of Excellence 7.3 Review content and duration of current Apprenticeship Model
		<p>Recommendation 8: Promote Careers in the Built Environment</p> 8.1 Joined-up approach by all stakeholders to improve the image of the sector 8.2 Industry to work with educational partners to promote built environment options within primary and post-primary curricula

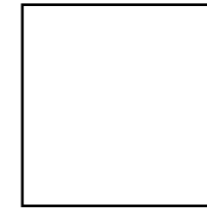
Table 14: Additional Supporting Actions at Performance and Monitoring Stage

PROJECT STAGE	ADDITIONAL SUPPORTING ACTIONS TO ADDRESS CHALLENGE AREAS AND IMPROVE PRODUCTIVITY
Performance and Monitoring Stage	<p>Recommendation 7: Develop Education and Training Supports and Capacity</p> <p>7.4 Consider introduction of minimum levels of apprentices to be used on large infrastructure projects</p> <p>7.5 Industry to develop a plan to engage with the employee skills development initiatives and to promote the availability of education and training resources</p> <p>7.6 Industry bodies to work with education partners to provide opportunities for peer to peer learning and knowledge transfer</p> <p>7.7 Improved articulation of labour and skills needs by industry</p> <p>Recommendation 8: Promote Careers in the Built Environment</p> <p>8.3 Sustain level of apprenticeships and encourage uptake in lagging areas and in growth areas</p> <p>8.4 Encourage diversity within the sector with inclusive promotional campaigns that highlight the full range of opportunities available within the built environment</p> <p>8.5 Develop an anonymised Competitions Programme to encourage innovation in design, construction, technology and MMC</p>

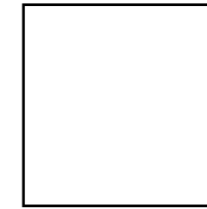
Set out below is an analysis of the key performance and monitoring related challenges including a discussion of how productivity is measured and aspects relating to education, training and promotion of the sector. A discussion of some current strategies already

underway is also included. This analysis then allows for the identification of key actions, including supporting actions, that can be undertaken to expand on work already commenced and to further drive productivity in the construction sector.

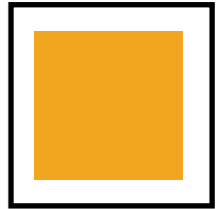
Challenge



Recommendation



Actions



3.4.1 Measuring productivity

As described in Section 1.3, the current measure of productivity of the Irish Construction Sector is based on labour productivity data compiled by the CSO. The CSO measures productivity for the total construction industry but there is no data available on the productivity of the industry’s component sectors (i.e. civil engineering contracting, main contracting, specialist contracting and housebuilding). With the absence of detailed datasets on productivity, the targeting of actions to specific areas is difficult. Furthermore, the use of metrics to track spending on a project can help to inform fair and accurate budgets at the outset of a project. More accurate data collation will also provide an evidence base for current and future skills requirements.

Furthermore, productivity data cannot accurately measure for quality improvements in the built environment. In its 2016 review on construction productivity, the CIOB argued for improved statistics that incorporate the

value of design, materials and components used on site. In addition, off-site production is a growing sector within the industry, which currently forms part of the industry category and is not recognised as a construction activity. The increased use of pre-assembly and off-site fabrication poses a future measurement challenge for the industry that should be addressed to ensure accurate data on productivity of the sector is available.

The results of the online survey indicate mixed views on productivity in the sector. While a majority of respondents (56%) either strongly agreed or agreed that the sector is under-performing from a productivity perspective, a significant proportion (21%) disagreed or strongly disagreed. Respondents whose work is primarily based in Dublin were the least likely to agree that the sector is underperforming from a productivity perspective (39% agreed). Respondents whose work is primarily based in Connaught were most likely to agree with this statement (50%), which is perhaps

suggestive of the regional disparity that exists in the sector. The availability of reliable SMART datasets to provide a more detailed measure of productivity would enhance clarity on the factors affecting productivity across regions and within component sectors allowing for a greater appreciation of why certain views are held by participants active within the sector.

Business supports for measuring productivity include Enterprise Ireland’s Company Health Check (CHC) tool, which supports performance measurement across a range of business functions and metrics including profitability, marketing, operations, innovation, productivity and human resources, and allows firms to benchmark performance against the sector with access to national and international SME norms. This service is provided free of charge to SMEs and includes a 3-day planning session to interpret the benchmarking results and identify areas for specific improvement.

3.4.2 Education and Training

This section describes key issues affecting productivity from an education, training and promotional perspective which underpin performance and identification of future skills and subsequent improved productivity.

Addressing skills capacity challenges, and challenges relating to technology and innovation referred to earlier, necessitates a focus on the availability and effectiveness of education and promotional measures currently in place.

As recognised in Construction 2050¹⁰⁷, by investing in lifelong learning, better working conditions and social protection, and in the better promotion of career opportunities, the sector can address skills gaps and new talent to the industry. A discussion on education and training challenges and potential solutions is set out below.

3.4.2.1 NO CENTRAL FACILITY / BODY WITH RESPONSIBILITY FOR THE SECTOR

The absence of a central facility or agency with overall responsibility for the built environment has been highlighted by industry consulted with as part of this research as a cause for concern. While not all sectors have a central body without a subsequent negative impact on productivity, the establishment of a centre for construction research, development and innovation was the second most popular education and training measure selected by respondents to the online survey.

There is widespread support for the establishment of a Centre of Excellence that could play a role in education and promotion of the sector, and support opportunities to strengthen collaboration and encourage joined-up thinking across the sector.

In this regard, it is encouraging to note the following recent initiatives:

Enterprise Ireland is advancing an early stage proposal to establish a Centre of Excellence for the construction sector. It is envisaged that this would be a centre for product research and development in new technologies with demonstration projects and learning resources on areas such as modern methods of construction, the circular economy and sustainability in construction etc.

To support the digitisation of the sector, the industry and DPER are advancing plans on Build Digital. Build Digital will comprise an online portal which acts as a single source of expertise on BIM, to include advice and guidance, standardised templates and tools, education and training resources. It will also involve national promotion/dissemination/networking events to support the digitisation of the sector.

This report envisages an enhanced leadership role for the CIC, as the main industry representative body, in implementing the broader industry actions and driving further improvements in productivity. This organisation could go some way to representing a more centralised

voice for the construction industry, particularly in the short to medium term.

Both initiatives referred to above could leverage off related work such as the recently established Construction Research Forum by the CIF.

Initiatives such as these are crucial in preparing the sector so that it can embrace innovation, respond effectively to evolving trends in technology and meet the requirements of our future economy, as set out in Future Jobs Ireland¹⁰⁸. In this context it is also relevant to note the announcement in November 2019 of a €1 million donation to TU Dublin by Jones Engineering Group to support the building of Design and Construct, Ireland's first centre of excellence for construction education at TU Dublin. This is a hugely significant milestone in the development of Design and Construct, TU Dublin's response to the critical skills shortages and challenges facing the sector. It will be a national centre of excellence for multidisciplinary and collaborative education, research and industry engagement for the Architecture, Engineering and Construction (AEC) sector in Ireland.



"Enterprise Ireland is advancing an early stage proposal to establish a Centre of Excellence for the construction sector"

¹⁰⁷ Construction 2050, Building Tomorrow's Europe Today, June 2019 <http://www.fiec.eu/en/>

¹⁰⁸ Government of Ireland (2019). Future Jobs Ireland 2019: Preparing Now for Tomorrow's Economy. Available at: <https://dbei.gov.ie/en/Publications/Publication-files/Future-Jobs-Ireland-2019.pdf>. Accessed 7th November 2019

3.4.2.2 EDUCATION AND TRAINING FOR APPRENTICES

There is widespread support for ongoing monitoring of the apprenticeship model in Ireland to ensure it continues to evolve in line with changing requirements particularly in terms of new technology advances but also in response to demand for flexible work and training arrangements. The current model, the Standards Based System (SBS) has been in operation since its inception in 1991 and comprises on-the-job and off-the-job training. Industry calls to reform the apprenticeship model have been echoed in this research with widespread consensus that the current system is no longer fit-for-purpose and is proving ineffective in securing sufficient skills output to serve an increasingly demanding sector.

About 60 per cent of school-leavers in the State currently progress to higher education, one of the highest rates in the EU. By contrast, just 10 per cent of school-leavers are pursuing apprenticeships as a route into work compared with countries such as Germany (a high-performance economy) and the UK where the figure is on par with the EU average of 48%. The record number of students applying for college places a significant strain on the education sector and presents further incentive to transform the public perception of apprenticeships and support an increase in registrations. Figure 11 illustrates the trend in apprentices across the EU in 2017¹⁰⁹.

Options to explore include amalgamating similar trades with a focus on developing core skills across, for instance, the wet trades, in year 1

or 2 with specialisation occurring thereafter. This would strengthen the appeal to potential candidates allowing for a more flexible system so that apprentices are not 'locked in' to any one type of trade. It also supports career progression potential particularly for management positions, for which a shortage has been identified, as tradespeople who have a broad understanding of skills requirements for different trades are better positioned to progress to site manager/foreman positions.

There is also potential to further extend the 'shared apprenticeship' scheme (with a co-operative type arrangement between employers within a region). This would give flexibility to SMEs and micro enterprises, remove the commitment of a 4-year programme and reduce the cost burden of releasing apprentices to off-the-job training. The shared scheme has been championed by the CIF with some regions active in targeting wet trade apprentice recruitment in particular. However, with no formal basis to support this model, uptake numbers remain relatively low and have failed to make an impact on registration figures for the wet trades.

Another opportunity that could be explored in strengthening the appeal of apprenticeships to prospective applicants is an extension of the Erasmus+ programme to facilitate knowledge sharing and learning with European counterparts.

Reform of the apprenticeship model would be further supported by more detailed information on the costs of apprenticeships. The Review of Participation and Costs of Appren-

ticeship report published by DPER notes the inconsistencies that arise in the collation of cost data for apprenticeships. With apprenticeship expenditure dispersed via multiple agencies - SOLAS, ETBs and the Higher Education Authority - there is a need for more consistent datasets that allow a full analysis of the main cost drivers in the sector and indicate whether significant changes in cost of provision arise from year to year, across the apprenticeship system and across funding recipients. This would facilitate targeted, evidence-based deployment of funds.

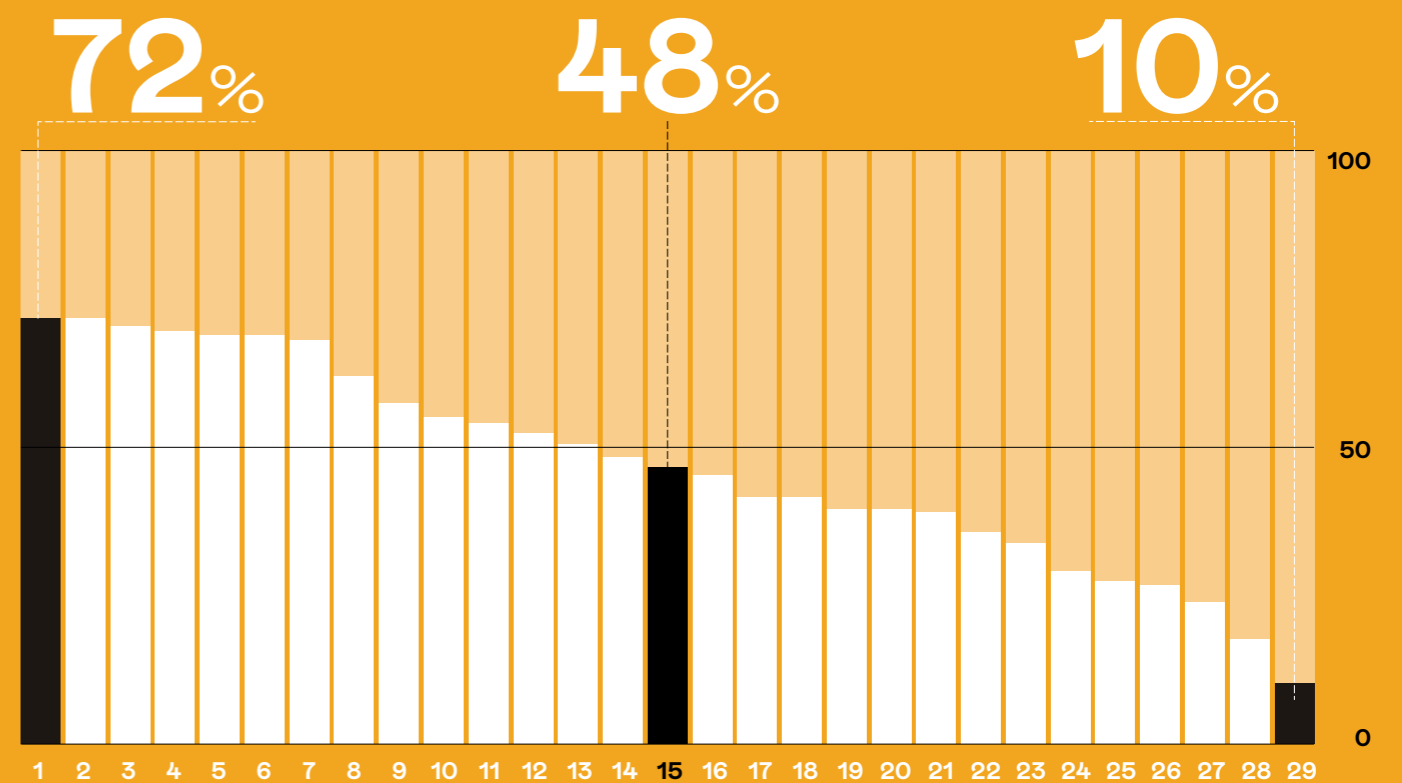
The 2019 allocations from the NTF are intended to facilitate an expansion of apprenticeship registrations by 1,200, increase the number of trainees by 1,100, Springboard+ participants by 1,100, and Skillnet participants by 7,400. The National Training Fund levy has been increased in 2018 from 0.1% to 0.8% and by a further 0.1% in both 2019 and 2020 to support the implementation of planned reforms. There have been calls within the industry to increase the levy for firms who do not engage with the apprenticeship model and to reward firms who do by reducing or removing their contribution to the fund.

¹⁰⁹ Eurostat (2019) Available at <https://ec.europa.eu/eurostat/> - Accessed 08/11/19

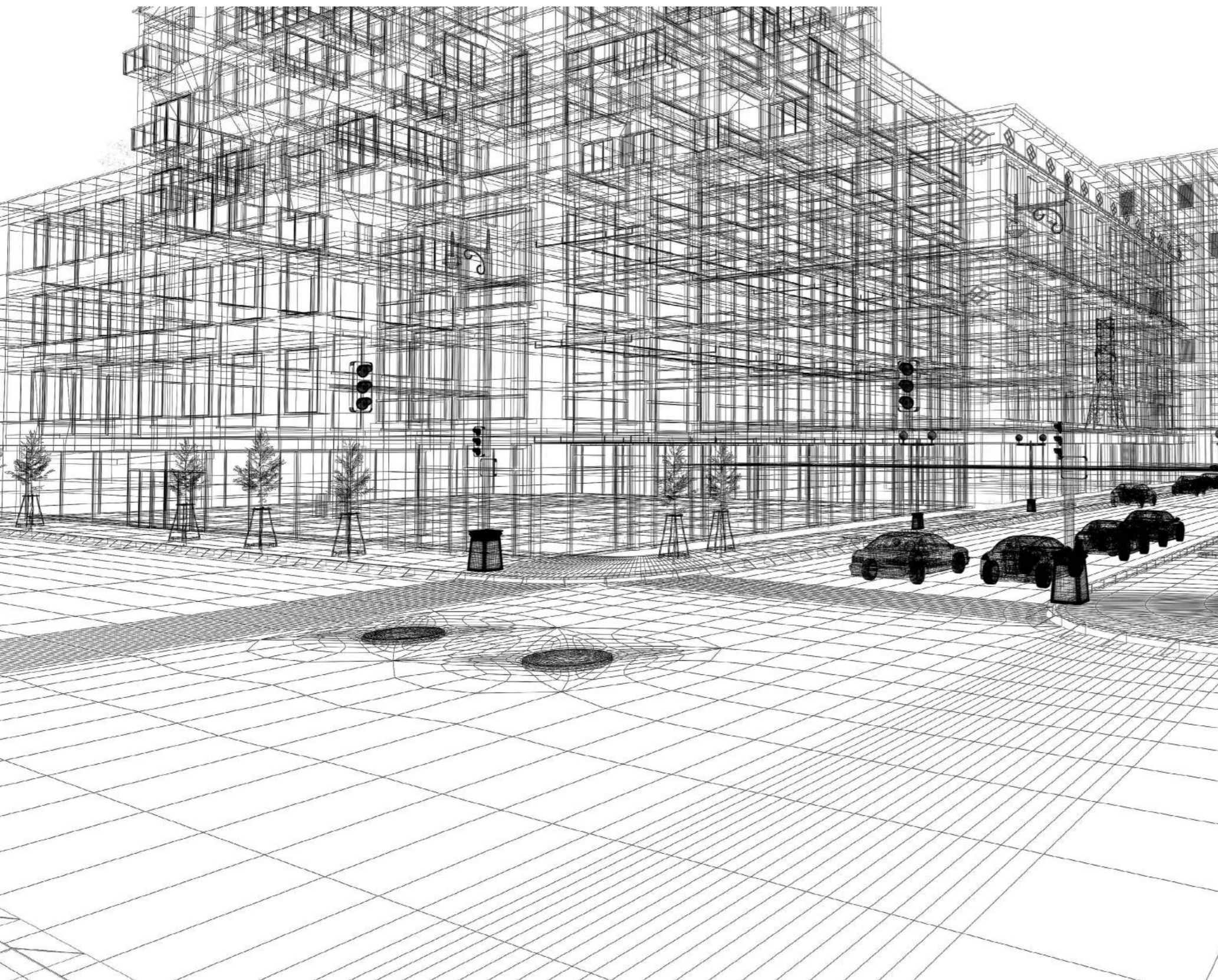


The 2019 allocations from the NTF are intended to facilitate an expansion of apprenticeship registrations.....

VOCATIONAL EDUCATION IN THE EU MEMBER STATES (as % of upper secondary pupils in vocational education programmes in 2017, 2017 data)



- 1. Czechia
- 2. Finland
- 3. Slovenia
- 4. Croatia
- 5. Slovakia
- 6. Austria
- 7. Netherlands
- 8. Luxembourg
- 9. Belgium
- 10. Romania
- 11. Italy
- 12. Poland
- 13. Bulgaria
- 14. EU
- 15. United Kingdom
- 16. Germany
- 17. Estonia
- 18. Portugal
- 19. France
- 20. Denmark
- 21. Latvia
- 22. Spain
- 23. Sweden
- 24. Greece
- 25. Lithuania
- 26. Malta
- 27. Hungary
- 28. Cyprus
- 29. Ireland



3.4.2.3 EDUCATION AND TRAINING FOR DIGITAL TRANSFORMATION AND SUSTAINABILITY

Initiatives to support digital transformation of the sector discussed earlier, must be supported by education and training measures, both for the existing workforce and for those seeking to pursue a career in the industry. CPD and upskilling programmes for existing tradespeople and professionals must offer extensive opportunities to train in the use of new technologies and equipment. This is critically important to the success of developing specialisations including off-site production and deep energy retrofit.

Education and training providers must be at the forefront of technological advancements and the latest best practices in sustainable, low carbon and circular economy measures. Training on these areas must be available to all members of the profession, from existing practitioners at all levels seeking CDP upskilling and reskilling opportunities to third level students training for a career in the sector, to second level students thinking of pursuing a career in the built environment. Significant year-to-year supports exist via Springboard, Enterprise Ireland and Skillnet Ireland.

International practice highlights the opportunity for contractors to ensure that they have a dedicated function for seeking and piloting new construction technology with the appointment of a chief technology officer or chief innovation officer. In the context of the challenges discussed earlier in this report and the subsequent difficulties facing SMEs and micro-enterprises to invest in training and upskilling for staff, a solution might be to consider the establishment of a construction sector digital network under Skillnet Ireland with a dedicated manager to help companies to define and meet their skills needs in the areas of technology and digitalisation. The network could be connected to the proposed Centre of Excellence referred to earlier and should build and extend on the work of Local Enterprise Offices (LEOs), Regional Skills Fora, and other education and training providers active in the space.

An example of a privately led initiative on promoting applied research and innovation to build competitiveness is the **Belgian Building Research Institute (BBRI)**, which is supported by the Belgian equivalent of the CIF. More than 90,000 Belgian construction companies (mostly SMEs) are statutory members of BBRI. It has three main tasks: perform scientific and technical research, supply technical information, assistance and advice to its members and contribute to general innovation and development of the construction sector by performing contractual research on request of the industry and authorities. More than 200 expert staff, from different backgrounds and working on multi-disciplinary teams are involved. Funding is provided by members (approx. 50%) with the balance from subsidies granted by regional, federal and European authorities on research projects as well as research contracts from public and private institutions.

3.4.3 Promotion

"While a broad range of education and training supports are available... there has been a low uptake by industry in recent years".

3.4.3.1 LOW UPTAKE OF EXISTING EDUCATION AND TRAINING SUPPORTS

While a broad range of education and training supports are available, supported by recent increases in funding for construction related training and education via the National Training Fund, there has been a low uptake by industry in recent years. This is across the board from trades level to managerial level. Possible reasons for this include a promotional deficit with what appears to be a lack of recognition by industry on the choice of programmes available and the prevalence of heavily stretched SMEs and micro enterprises who first of all do not have the time to research available programmes and secondly, lack the financial capacity to invest in upskilling their staff or release staff to attend CPD programmes. In particular, existing managerial training programmes, as referred to earlier, need to be more widely promoted to encourage a higher uptake. The nature of existing programmes should also be considered in terms of the commitment required from employees/employers. This research has indicated that flexible, short, module-based programmes are likely to appeal to industry. This is also supported by the EU Commission SME Support Unit (EASME) who provide funding for EU projects, for example

BIMCert, BIMplement, Net-UBIEP and BIMeET which focus on upskilling blue-collar workers via blended and flexible content delivery in energy efficient construction methods.

As referred to earlier, the nine Regional Skills Forum Managers actively engage with employees on future skills requirements and in linking industry to training supports and career progression routes. Support to extend this vital work is required so that a more direct, outreach approach can be taken focusing particularly on small firms and micro-enterprises. The potential establishment of a construction sector digital network under Skillnet Ireland with a dedicated manager to support companies in identifying skills and training requirements, referred to above is relevant here too. Another initiative that could potentially be advanced by the proposed dedicated managers referred to above, could be assisting regional firms to form clusters around digital construction challenges and opportunities. In this regard, there is an opportunity to link in with Enterprise Ireland's Regional Technology Clusters as well as SFI's Technology Centres and Gateways.

3.4.3.2 POOR PUBLIC PERCEPTION OF BUILT ENVIRONMENT CAREERS

"The built environment is a hugely diverse and dynamic sector..."

Construction in particular, but also the wider professions in the built environment such as planning, design, architecture, engineering etc., are perceived as being risky careers prone to redundancies and insecure employment. Joined up, collaborative and fresh approaches are required to improve the image of the built environment as offering exciting and rewarding career opportunities. The built environment is a hugely diverse and dynamic sector and it is vitally important that this message is communicated to the public in order to broaden its appeal.

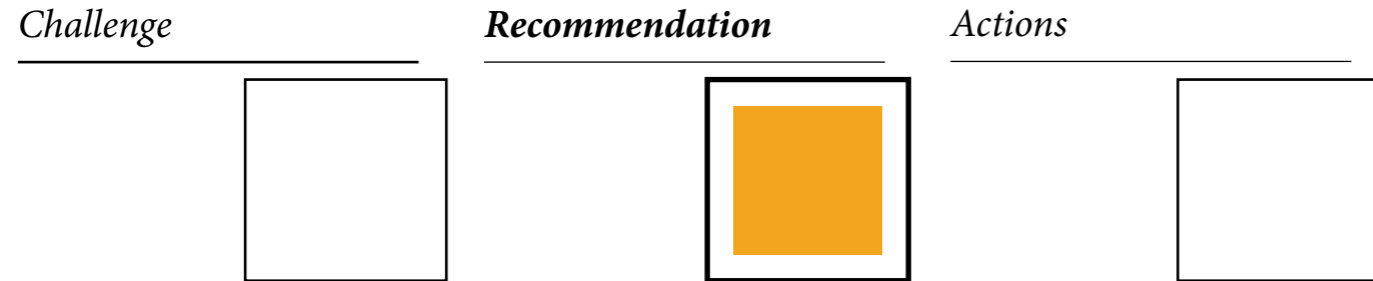
Important strides have been taken in seeking to develop a more gender inclusive sector with recent campaigns by the RIAI, Engineers Ireland and CIF. However, more work is required to attract a diverse, talented future workforce.

In terms of international best practice, **Denmark** has introduced a number of initiatives to promote the construction sector and make it more attractive as a career choice. These include "Build the Future" which is a dedicated website with information on 16 different vocational programmes in construction and provides experiences of current

apprentices to give a "real life" view of what the industry is like when starting out. The "Build a House" programme was launched as a four-year educational project for 9-12 year olds where students build a house to scale in cooperation with a vocational school in order for them to learn about different aspects of building a house. Construction Box was launched for slightly older children which includes a 4-hour visit to a construction site.

A programme in the **UK** called "a Class of their Own" has very good success in generating awareness of the construction sector with children as young as 9 and teaching them about design, construction and engineering as part of the school curriculum. This involves companies adopting schools and providing some real-life training in the classroom along with the teachers so students and teachers alike are exposed to best practice and advancements in technology etc. These students are often well-placed to receive apprenticeship offers or college scholarships from companies looking to find new resources. The programme was recently trialled in Ireland as part of a 11-week program for transition year students in Terenure College, Dublin.

3.4.4 PERFORMANCE AND MONITORING STAGE RECOMMENDATIONS



There are two recommendations proposed for the performance and monitoring stage of the project lifecycle:

Recommendation 7

Develop education and training supports and capacity.

Coordinated strategies for digitisation of the sector supported by wider opportunities for knowledge sharing, training and upskilling of the labour force will strengthen capacity at both firm and sectoral level resulting in productivity gains.

Recommendation 8

Promote careers in the built environment.

Promotion of the sector to strengthen its appeal to new entrants and support career advancement opportunities and a culture of life-long learning. This will bring about improvements in productivity by ensuring the sector is well-positioned to attract the talent and skillsets necessary for sustaining quality, efficiency and for embracing innovation and the adoption of new technologies.

3.4.5 PERFORMANCE AND MONITORING STAGE ACTIONS



A number of actions have been proposed to support the recommendations set out above. These actions will require leadership and support from both Government and industry. The timeline for implementation of these actions is mostly between one and three years.

The actions proposed include:

Recommendation 7 - Develop education and training supports and capacity

Action 7.1

Advance plans for Build Digital. Build Digital will comprise an online portal which acts as a single source of expertise on BIM, to include advice and guidance, standardised templates and tools, education and training resources. It will also involve national promotion/dissemination/networking events to support the digitisation of the sector.

Action 7.2

Advance plans to develop a National Centre of Excellence (NCE) for the construction sector. The NCE will be a centre for product research and development in new technologies with demonstration projects and learning resources on areas such as modern methods of construction, the circular economy and sustainability in construction etc.



Recommendation 7 - Develop education and training supports and capacity

Action 7.3 Ensure apprenticeship curricula and modes of delivery keep pace with technological and process changes in the construction sector. In reviewing curricula, the opportunity should be taken to consider issues of duration and structure in individual apprenticeships to incentivise employer take-up.

Consideration should also be given to including new skills within traditional apprenticeships to enhance their appeal to a broader range of potential applicants, including skills related to growth areas such as deep retrofit and modern methods of construction (MMC).

Action 7.4 Consider feasibility of requiring a minimum number of apprentices to be provided by contractors on all existing infrastructure projects. This would offer training to local communities in construction skills and will support participant's progression onto formal training and education in the sector. This may need to be included in procurement evaluation criteria in order to encourage use.

Action 7.5 Industry to develop a plan to engage with the employee skills development initiatives supported from the NTF to ensure a strategic focus on upskilling, career progression and workplace expansion for professional and trades personnel. In particular, the ETB-led Skills to Advance programme, the Skillnet Ireland programme, the Springboard+ programme and Enterprise Ireland training grants should be targeted. This might include:

Greater promotion on the availability of education and training resources to the industry (with a consistent message disseminated via usual communication channels used by each industry body – spotlight features in newsletters, social media, events etc.)

Short module based CPD courses (either on-line or classroom based) for existing trades people and contractor management teams that:

Facilitate the transfer of skills across multiple sectors and enhance ability to adapt skills to different work environments and standards that pertain to different sectors e.g. pharmaceutical vs. residential requirements.

Enhance management skills for trades people wishing to progress to construction management roles. As part of this encourage higher uptake of existing programmes such as Skillnet Ireland's Management Development provision, Enterprise Ireland's programmes, Management4Growth and Leadership4Growth and mentoring and training supports offered by Local Enterprise Offices (linked to Action 7.6).

Productivity enhancing combined training programmes to public and private sector in areas such as procurement (building on initiatives such as the Commercial Skills Academy) and project management that bring together stakeholders from different stages of the supply chain procurement, design and contracting.

Training supports targeted to the self-employed with blended, online and distance teaching methods to include upskilling into areas of guaranteed opportunities such as retrofitting, green construction, lean construction etc.

Recommendation 7 - Develop education and training supports and capacity

Action 7.6 A broad range of education and training providers are active in serving the built environment sector but further promotion on the role and offer of these providers is required.

Industry bodies to work with training and education providers to encourage increased opportunities for peer-to-peer learning and knowledge transfer to boost productivity.

This should include a regular programme of workshop style events and training sessions across the regions, and the dissemination of good practice, lessons learned, case studies and innovation on projects – this material could be hosted on the proposed BUILD Digital (Linked to Action 7.1).

This could also involve the establishment of mentoring arrangements between SMEs and larger companies.

Action 7.7 Improved articulation of labour and skills needs by industry – an evidence base is required in order for a structured response to be provided. In support of this, implement the following measures:

Greater promotion of existing resources such as the Skills 4 Growth Audit Tool rolled out through the Regional Skills Fora managers and Enterprise Irelands Health Check Tool which includes a benchmarking tool for workplace innovation helping to track training requirements; and

Promote the widespread use of performance metrics to identify resource constraints at individual firm level (proposed development of benchmarks for labour productivity set out in 'Further Supporting Actions' will support this).

Recommendation 8 - Promote careers in the built environment

Action 8.1 A joined-up, collaborative approach by all built environment stakeholders to improve the image of the sector promoting it as an exciting, dynamic environment with a wide variety of opportunities for professional development and career advancement.

This should build on existing initiatives led by industry bodies and should seek to involve industry champions to promote the industry in novel ways and through social media channels appealing to a young demographic.

Action 8.2 Industry to work with educational partners (linked to Action 6.3), including the career guidance community in promoting built environment options and the varied career opportunities available.

Extension of programmes such as Transition Year Programmes run by some professional bodies to develop integrated and novel approaches to promoting the built environment sector at secondary level. This should incorporate the full spectrum of employment opportunities from specialised trades through to emerging careers in technology, and the broad range of opportunities across the management, design, engineering and planning professions.

Action 8.3 In combination with and in addition to the review of the Apprenticeship structure and curriculum identified in Action 7.3, industry to liaise with education and training providers on initiatives to ensure the recent uptake of certain apprenticeships is sustained and to strengthen registrations for areas experiencing shortages i.e. wet trades, and for growth areas such as MMC. Initiatives could include:

Promotional campaign to engage young people in construction related apprenticeships and vocational training, building on the success of the Generation Apprenticeship campaign;

A targeted campaign for employers to increase the number of places on offer. Ideas to be considered include emulating the success of the Danish 'Thank You' campaign which promotes companies who employ apprentices, or the UK '5% Club' which aims to create a shared prosperity across the UK by driving 'earn and learn' skills training opportunities.

Recommendation 8 - Promote careers in the built environment

Action 8.4 Encourage diversity within the sector with inclusive promotional campaigns that highlight the broad range of opportunities available within the built environment and also to other areas not traditionally associated with built environment e.g. ensure that women continue to be a key target audience in the Generation Apprenticeship Campaign.

Action 8.5 Develop an anonymised Competitions Programme that encourages innovation in design and construction, modern technologies and methods of construction, that use new procedures for minimising waste, carbon emissions, and that enhance the circular economy in the planning, design and build of public sector projects. As well as encouraging novel approaches to design, architecture, planning and construction, it will also support the participation of new entrants to the sector and small firms that may find it difficult to compete for large public procurement competitions. This builds on recently launched initiatives to promote innovation and excellence in the sector.



40

ROADMAP FOR IMPLEMENTATION

Roadmap for implementation

4.1

Recommendations, actions, leaders and timelines

Leaders and supporting partners have been assigned to guide the implementation of the actions set out in Section 3 along with an implementation timeline associated with each action point, as follows:

1: Implementation within a year (to be commenced or completed, where appropriate);

1-3: An implementation timeline of 1-3 years;

3+: A long term implementation timeline.

Where possible, one organisation has been assigned responsibility to lead on actions for clarity on ownership and reporting. However, it should be noted that in many cases a collective response is required to ensure successful implementation of each action.

It has not been considered possible to assign costs to these actions at this point in time.

Table 15: Recommendations and Actions – Leadership

ABBREVIATION	ORGANISATION
CIC	The Association of Consulting Engineers of Ireland (ACEI) The Building Materials Federation (BMF) The Construction Industry Federation (CIF) Engineers Ireland (IEI) The Royal Institute of the Architects of Ireland (RIAI) The Society of Chartered Surveyors Ireland (SCSI)
CIF	Construction Industry Federation
CSG	Construction Sector Group – Growth and Productivity Sub-Group comprising: Department of Public Expenditure and Reform (DPER) Office of Government Procurement (OGP) Department of Business, Enterprise and Innovation (DBEI) Department of Education and Skills (DES) Construction Industry Federation (CIF) National Standards Authority of Ireland (NSAI) Irish Congress of Trade Unions (ICTU) Building Materials Federation (BMF) Engineers Ireland (IEI) Association of Consulting Engineers of Ireland (ACEI) Royal Institute of Architects of Ireland (RIAI) Society of Chartered Surveyors Ireland (SCSI)
DBEI	Department of Business, Enterprise and Innovation
DCCAE	Department of Communications, Climate Action and Environment
DES	Department of Education and Skills
DEASP	Department of Employment Affairs and Social Protection
DHPLG	Department of Housing, Planning and Local Government
DPER	Department of Public Expenditure and Reform
EI	Enterprise Ireland
ICTU	Irish Congress of Trade Unions
IPI	Irish Planning Institute
LGMA	Local Government Management Agency
NSAI	National Standards Authority of Ireland
OGP	Office of Government Procurement
OPW	Office of Public Works

4.2 List of Recommendations and Summary Actions

The table below sets out a **summary of the actions**, as detailed more fully in Section 3 as well as the agreed leaders and a proposed timeline for implementation.

Table 16: Leaders of actions with an implementation timeline for delivery

RECOMMENDATION	ACTION NO.	ACTION	LEADER	TIMELINE
1. Efficiencies in the planning system	1.1	Integrated approach to delivery of housing & critical infrastructure projects through coordinated planning and delivery across Local Authorities	DHPLG	1
	1.2	Digitisation of planning application process	LGMA	1
	1.3	IPI to partner with Planning Schools and Planning Practitioners to provide targeted training in a number of areas	IPI	1
	1.4	Template series to be published for planners and designers for development of standardised layouts	DHPLG	1-3
2. Improved transparency and evaluation of public sector works	2.1	Reform, extension, promotion of Public Project Tracker	DPER	3+
	2.2	Maintain a stable and balanced level of public capital investment	DPER	1-3
3. Public Procurement and Contracting Reform	3.1	Ongoing review and reform of public procurement mechanisms and processes as part of the next generation of the Capital Works Management Framework (CWMF) and the medium-term strategy for the development, procurement and administration of projects under the exchequer funded elements of the National Development Plan.	OGP	1
	3.2	Proportional requirements for use of PAS 1192 Standard, BIM, Lean processes, modern methods of construction and circular economy initiatives in public procurement contracts.	OGP	1-3
	3.3	Integrated project delivery to be explored through early engagement with all stakeholders.	OGP	1
	3.4	Development of a "procurement passport" to be included with eTenders to reduce administrative burden on companies.	OGP	1
	3.5	A sustained training programme for public procurers to enhance awareness and understanding of commercial skills and best practice approaches for the delivery of projects throughout the lifecycle. This should build on and extend pilot training programmes offered by the Commercial Skills Academy.	OGP	1
	3.6	Develop flexible procurement frameworks that allow the batching of similar work across Local Authorities.	LGMA	1-3
	3.7	Reward efforts to reduce the carbon footprint of developments and in embedding circular economy principles as part of the procurement, design and construction process	DCCAE	1

RECOMMENDATION	ACTION NO.	ACTION	LEADER	TIMELINE
4. Improvements to Policy and Regulation	4.1	Construction Industry Register Ireland to be placed on a statutory footing	DHPLG	1
	4.2	Enhance monitoring, investigations and compliance nationwide, including inspections by DEASP Inspectors and the recently established Employment Status Investigation Unit (ESIU) to detect and tackle the misclassification of workers	DEASP	1
	4.3	Introduction of voluntary skills passport for construction workers	CIF ICTU	1-3
	4.4	Greater promotion of the provisions set out in the Construction Contracts Act 2013 on fair contractual and payment practices that satisfy the concerns of main contractors, sub-contractors, designers and clients	CIF	1
	4.5	Encourage adoption of relevant international standards (e.g. ISO 19650 - BIM, ISO 9000 - Quality, ISO 5001 - Energy and ISO 18404 - LEAN etc.) to support construction firms in ensuring that their outputs are compliant with requirements and regulations in local and, particularly, export markets (e.g. via European Technical Assessment).	NSAI	1
5. Improvements to Operational Management Processes	5.1	Supply chain optimisation to be leveraged through early engagement with subcontractors by main contractor to optimise scheduling, resource and material requirements	CIF (representing CIC)	1-3
6. Enable Technology & Innovation Advancement across the Sector	6.1	Joint Working Group to be established to guide the development of off-site construction and other modern methods of construction	CIF (representing CIC) ICTU	1
	6.2	Renewed focus and commitment to support the widespread use of BIM by the sector in Ireland.	CSG	1
	6.3	Industry to work with education and training bodies on upskilling the sector on modern construction methods and digital innovations and ensuring that education and training programmes are equipped with the best technology and resources to attract fresh talent to the market (linked to Action 6.1).	RIAI (representing CIC)	1
	6.4	Consider the establishment of a construction sector digital network under Skillnet Ireland with a dedicated manager assist firms accessing supports and making the move to digital processes and to support innovation in the sector such as the development of clusters around digital construction challenges and opportunities	CIF Skillnet Ireland	1-3
	6.5	Promote opportunities arising from external funding sources such as Horizon 2020 (linked to Action 6.3)	ACEI (representing CIC) EI	1

RECOMMENDATION	ACTION NO.	ACTION	LEADER	TIMELINE
	7.1	Advance plans for Build Digital - a destination for training and peer-to-peer knowledge transfer on areas such as BIM, supported with industry funding,	DPER CSG	1-3
7. Develop Education and Training Supports & Capacity	7.2	Advance plans to develop a National Centre of Excellence (NCE) for the construction sector.	EI	+3
	7.3	Ensure apprenticeship curricula and modes of delivery keep pace with technological and process changes in the construction sector. In reviewing curricula, the opportunity should be taken to consider issues of duration and structure in individual apprenticeships to incentivise employer take-up. Consideration of new skills within traditional apprenticeships e.g. deep retrofit and modern methods of construction (MMC).	DES CIF ICTU	1
	7.4	Consider introduction of minimum levels of apprentices to be used on large infrastructure projects	CIF (representing CIC)	1-3
	7.5	Industry to develop a plan to engage with the employee skills development initiatives supported from the NTF to ensure a strategic focus on upskilling, career progression and workplace expansion for professional and trades personnel.	CIF (representing CIC) ICTU	1-3
	7.6	Industry bodies to work with training and education providers to encourage opportunities for peer to peer learning and knowledge transfer to boost productivity	SCSI (representing CIC)	1
	7.8	Improved articulation of future labour and skills needs by industry	CIF (representing CIC)	1
8. Promote Careers in the Built Environment	8.1	Joined-up approach by all stakeholders to improve the image of the sector	IEI (representing CIC)	1
	8.2	Industry to work with educational partners to promote built environment options within primary and post-primary curricula	RIAI (representing CIC)	1
	8.3	Promotional initiatives to sustain level of apprenticeships and encourage registration in areas for which shortages have been identified and in growth areas such as deep retrofit and MMC	CIF (representing CIC)	1
	8.4	Encourage diversity within the sector with inclusive promotional campaigns that highlight the broad range of opportunities available within the built environment	IEI (representing CIC)	1
	8.5	Develop an anonymised Competitions Programme that encourages innovation in design, construction, technology and MMC	OPW	1

4.3

Government policy objectives and alignment opportunities

In compiling the list of proposed recommendations and actions discussed above due attention was paid to the objectives of recent Government strategies to ensure alignment and consistency.

Our review identified a number of recent Government strategies from which the following were identified as the most relevant for alignment purposes:

*Project Ireland 2040 (National Planning Framework);
Future Jobs Ireland;
Rebuilding Ireland;
Build Report 2019; and
GCCC Position Paper on Public Sector BIM Adoption Strategy.*



Appendix 1

Stakeholder Consultation – List of Consultees

Table 17 below sets out the different government and industry bodies engaged with as part of the consultation process, through survey responses, submissions or direct meetings.

Table 17: Stakeholders consulted

STAKEHOLDER
Association of Consulting Engineers of Ireland
Building Materials Federation
Construction Industry Federation
Department Business, Enterprise and Innovation
Department of Education and Skills
Department of Employment Affairs and Social Protection
Department of Housing, Planning and Local Government
Department of Policy Expenditure and Reform
Dublin Regional Skills Fora
Dún Laoghaire Further Education Institute (Construction Industry Education Representative)
Engineers Ireland
Enterprise Ireland
Government Construction Contracts Committee
Irish Congress of Trade Unions
Irish Planning Institute
Land Development Agency
Local Government Management Agency
National BIM Council
National Standards Authority of Ireland
Office of Government Procurement
Office of the Planning Regulator
Private Industry
Royal Institute of the Architects of Ireland
Society of Chartered Surveyors in Ireland
SOLAS

Appendix 2

Stakeholder Consultation – Submissions

Submissions were received from the following parties:

Construction Industry Federation

Department of Employment Affairs and Social Protection

Irish Congress of Trade Unions

Irish Planning Institute

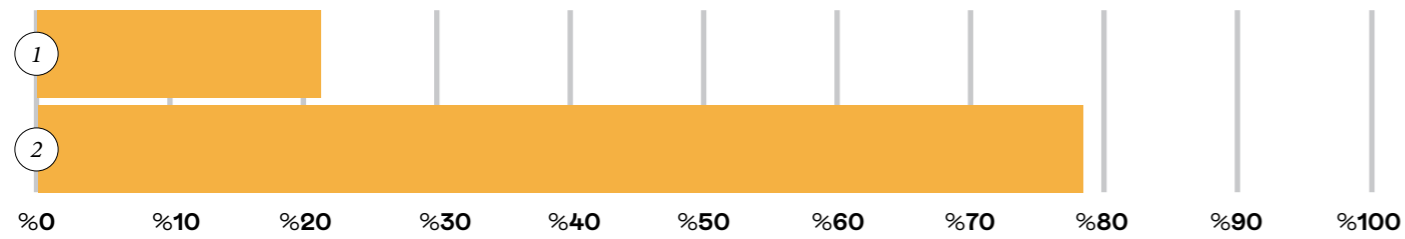
Kirby Group

Appendix 3

Stakeholder Consultation – Survey Results

Q1

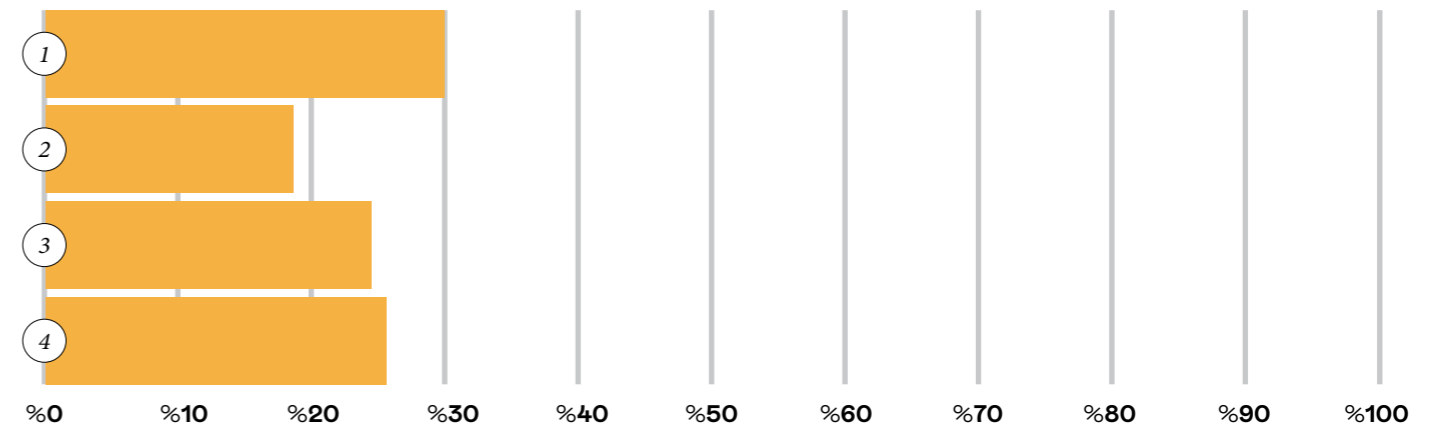
ARE YOU EMPLOYED IN THE PUBLIC OR PRIVATE SECTOR?



- 1. Public Sector
- 2. Private Sector

Q2

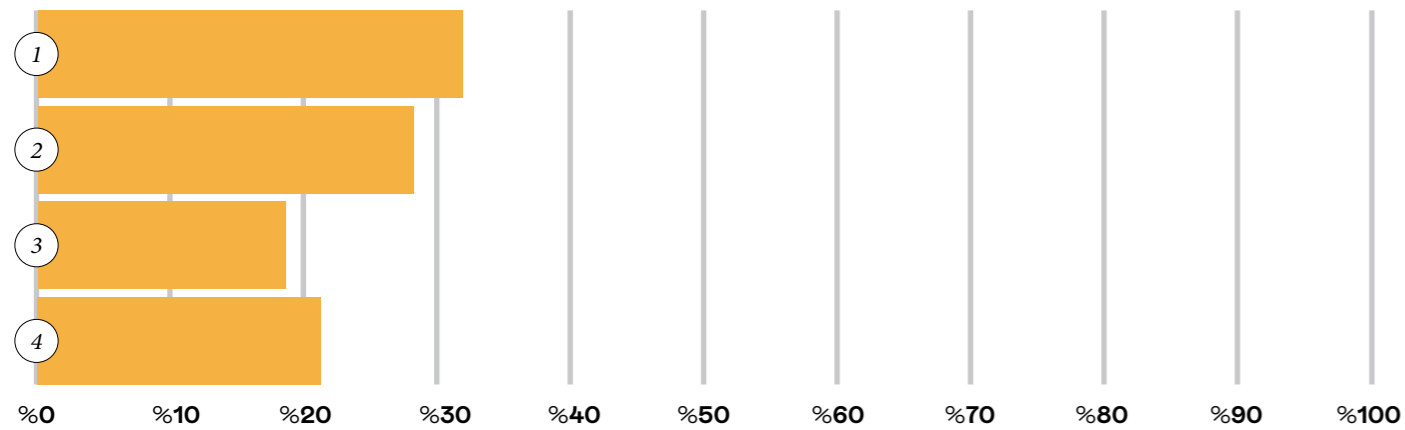
IF YOU WORK IN THE PUBLIC SECTOR, PLEASE SELECT THE LEVEL OF YOUR ORGANISATION.



- 1. Central
- 2. Regional
- 3. Local

Q3

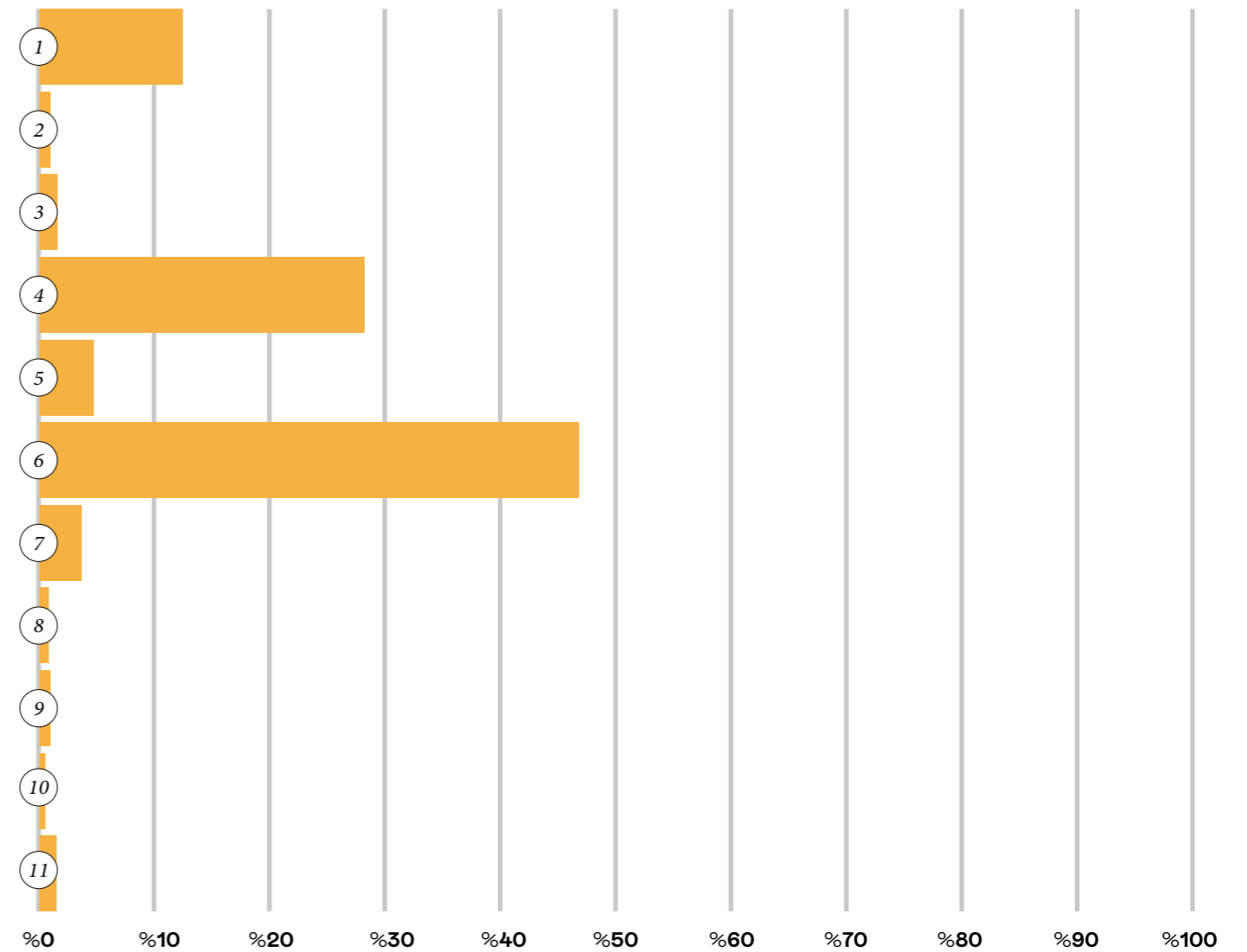
IF YOU ARE EMPLOYED IN THE PRIVATE SECTOR, PLEASE SELECT THE SIZE OF YOUR ORGANISATION.



- 1. 1-9 Employees (Macro)
- 2. 10-49 (Small)
- 3. 50-249 (Medium)
- 4. +250 (Large)

Q4

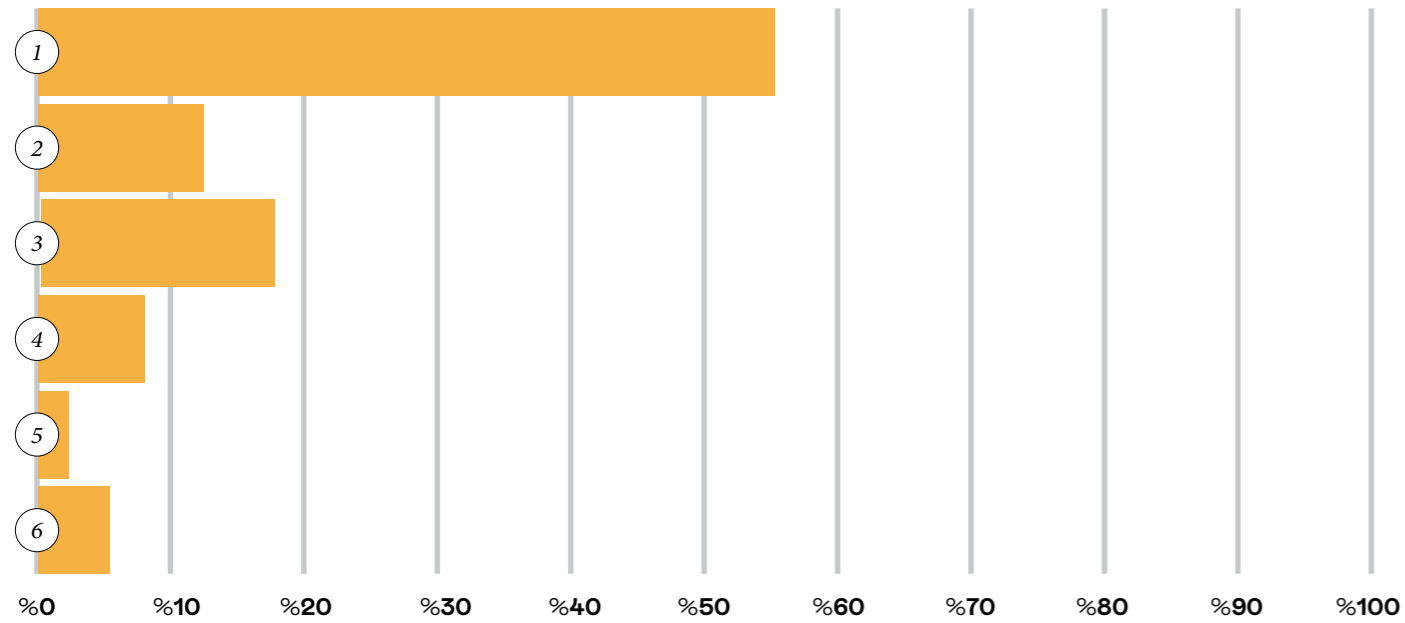
TO WHICH PROFESSIONAL BODY/ORGANISATION ARE YOU AFFILIATED?
(PLEASE SELECT THE MOST RELEVANT BODY IF MORE THAN ONE)



- 1. Construction Industry Federation
- 2. Irish Congress of Trade Unions
- 3. The Building Materials Federation
- 4. Engineers Ireland
- 5. Society of Chartered Surveyors Ireland
- 6. Royal Institute of Architects of Ireland
- 7. Association of Consulting Engineers of Ireland
- 8. Irish Planning Institute
- 9. Chartered Institute of Architectural Technologists
- 10. National Standards Authority of Ireland
- 11. Chartered Institute of Building

Q5

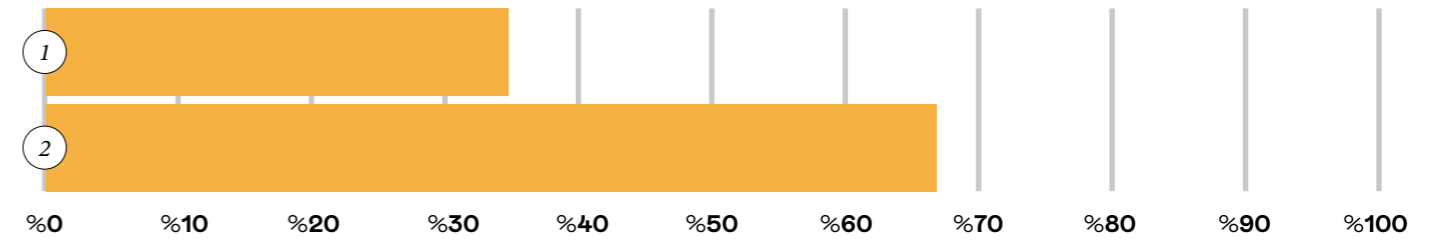
WHERE IS THE MAJORITY OF YOUR BUSINESS BASED?



- 1. Dublin
- 2. Rest of Leinster
- 3. Munster
- 4. Connaught
- 5. Ulster
- 6. Overseas

Q6

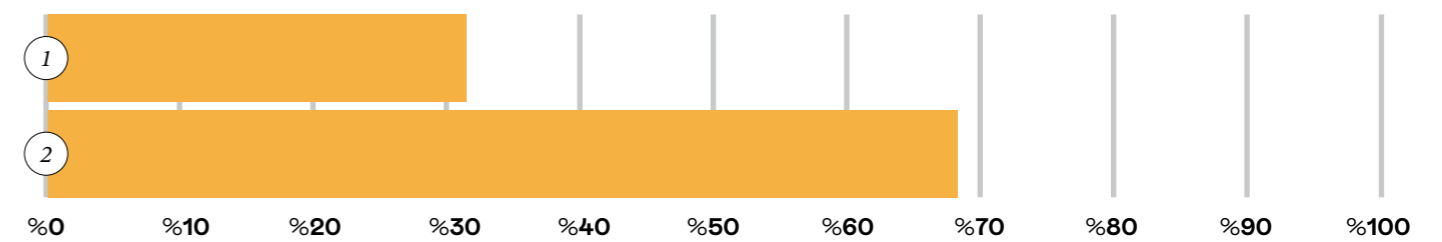
DO YOU PROVIDE SERVICES TO FDI COMPANIES BASED IN IRELAND



Q7

ARE YOU ENGAGED IN INTERNATIONAL CONSTRUCTION ACTIVITY?

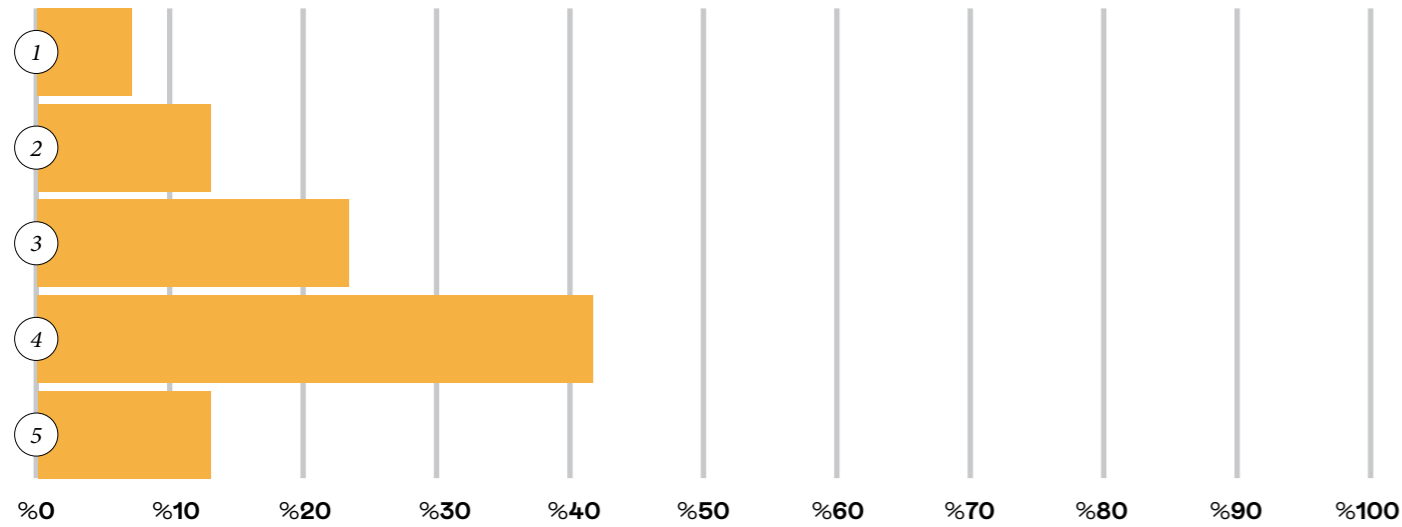
Answered: 525 Skipped: 15



- 1. YES
- 2. NO

Q8

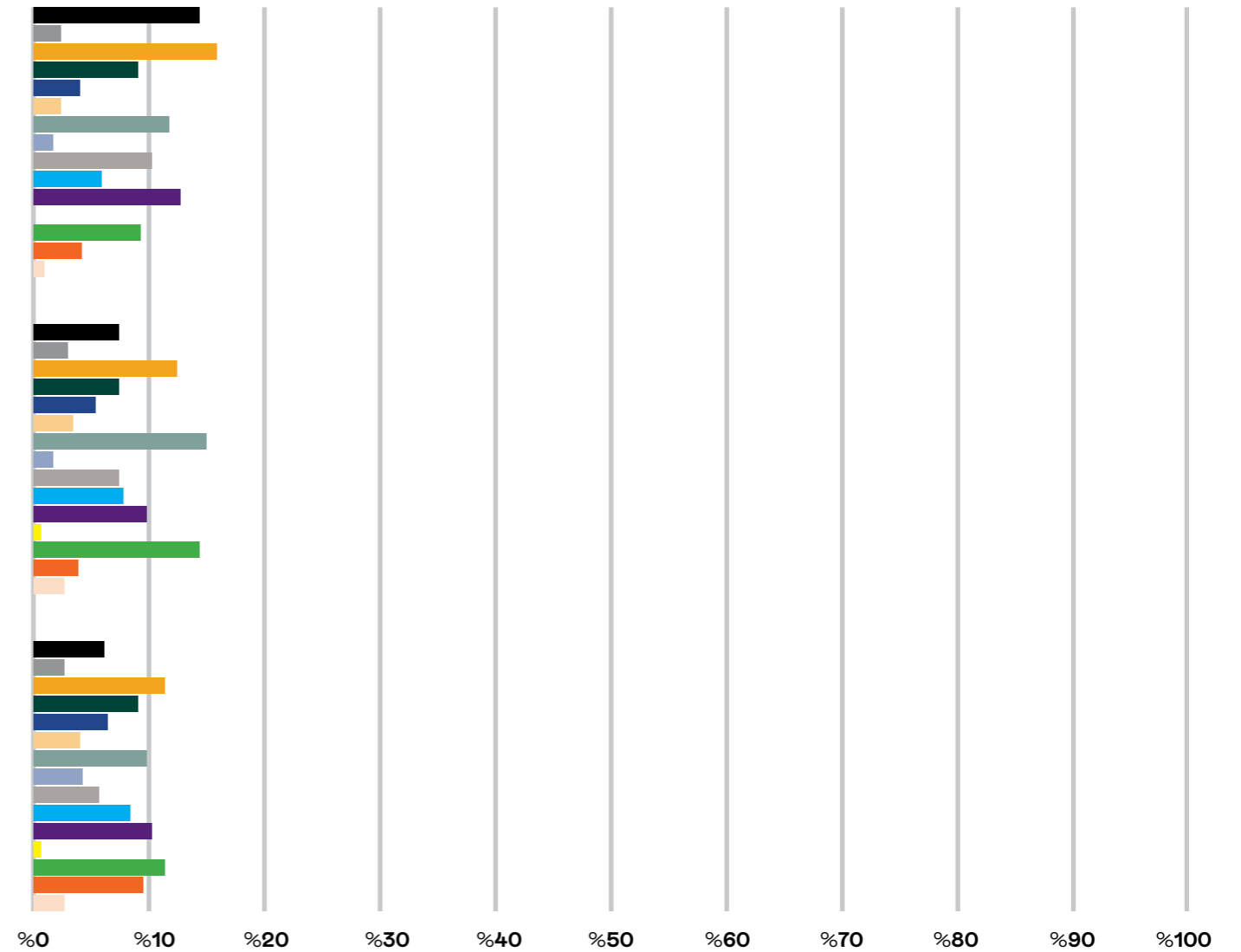
TO WHAT EXTENT DO YOU AGREE THAT THE CONSTRUCTION SECTOR IS UNDER PERFORMING FROM A PRODUCTIVITY PERSPECTIVE?



1. Strongly Disagree
2. Disagree
3. Neutral
4. Agree
5. Strongly Agree

Q9

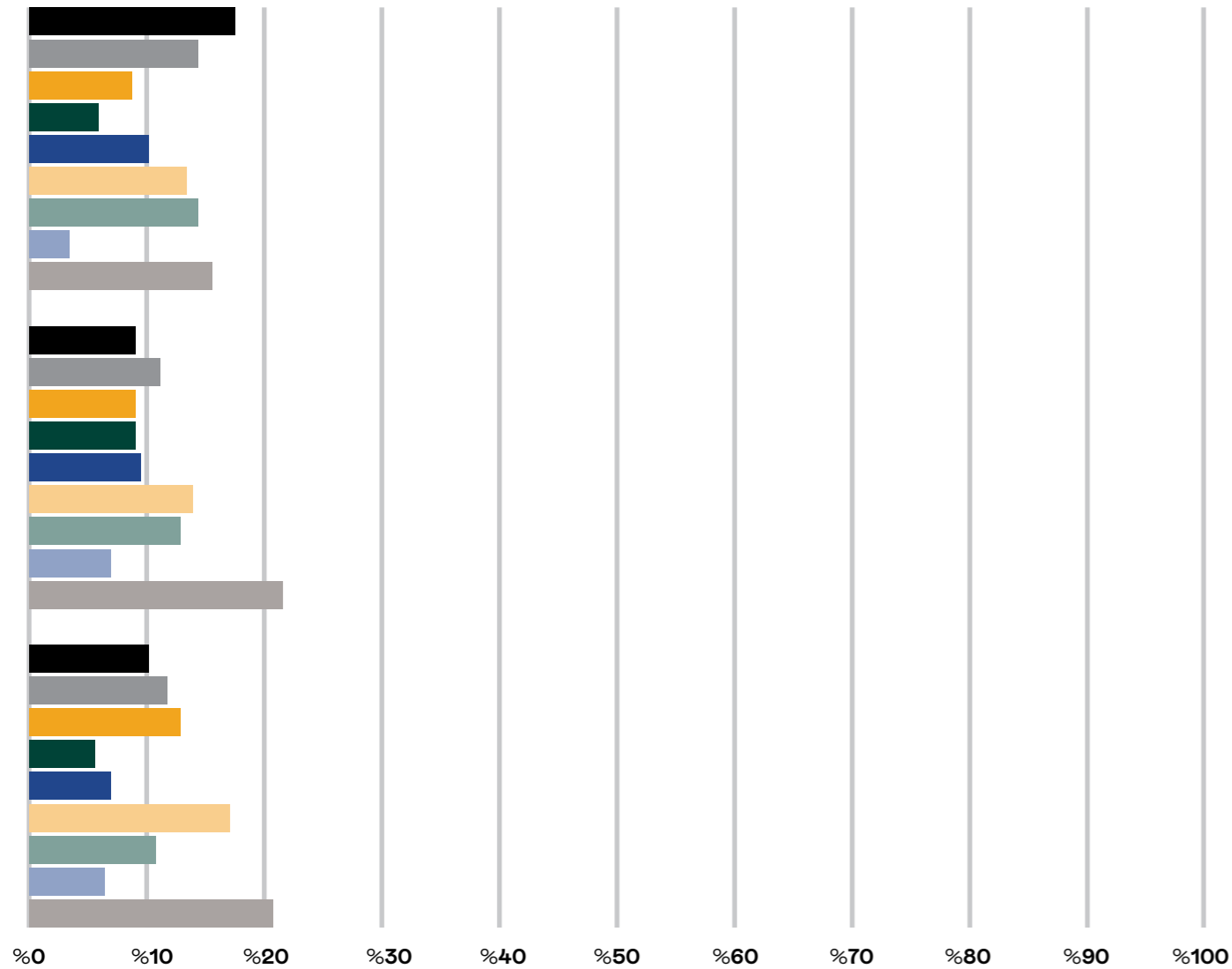
WHAT DO YOU PERCEIVE TO BE THE TOP 3 CAUSES OF LOW PRODUCTIVITY IN THE SECTOR?



- Concentration of efforts at planning, design and procurement stage
- Labour shortage
- Conditions of employment
- Low levels of profitability
- Fragmented nature of sector - lack of integration and collaboration
- Planning and regulatory obstacles
- Funding and financial constraints
- Restrictive employment permits
- High cost of labour
- Skills shortage
- High cost of material
- Slow uptake of new technologies
- Issues relating to procurement and contracting
- Slow industry response to R&D
- Job security

Q10

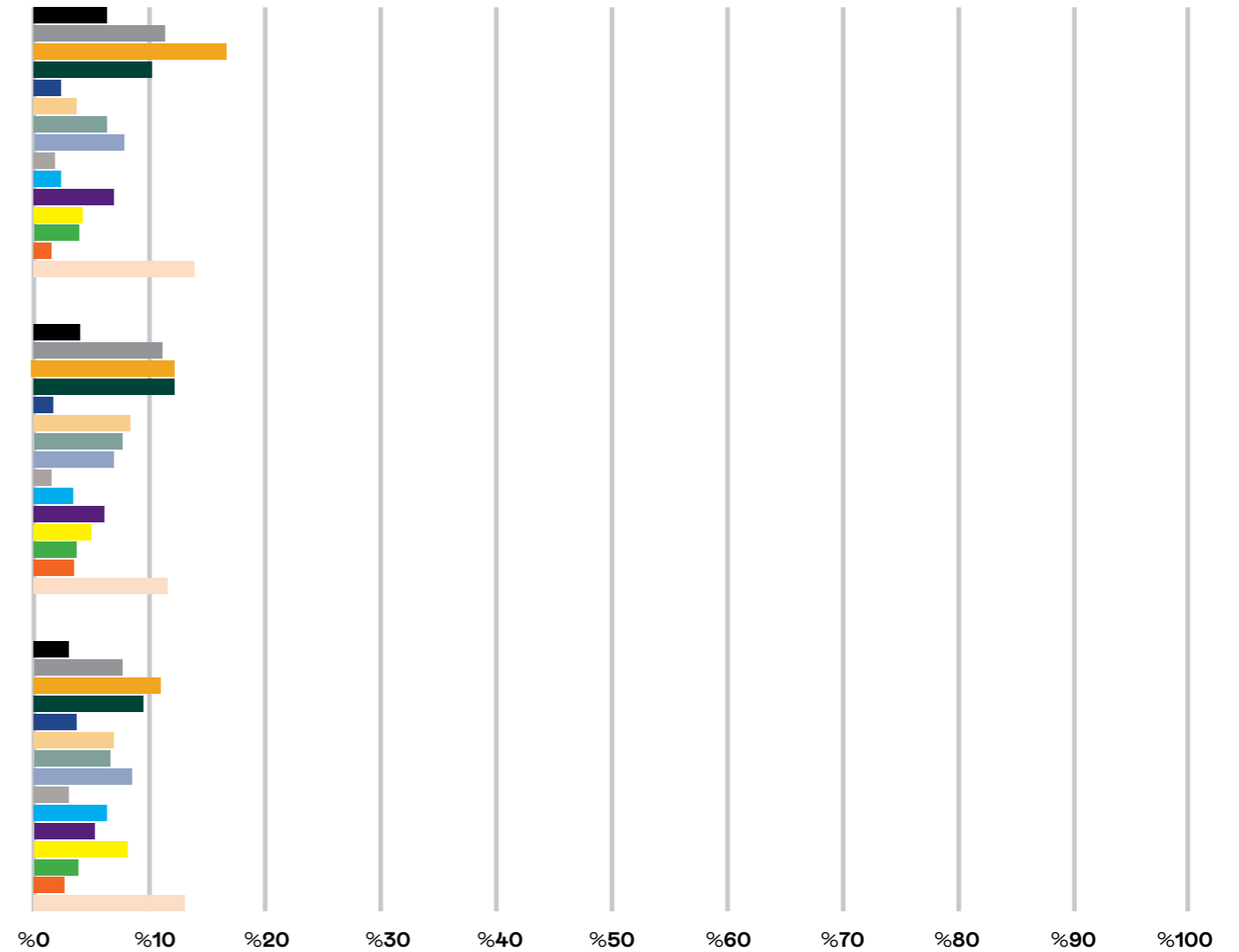
SELECT THE TOP 3 LEGAL AND POLICY-LED MEASURES THAT COULD BE TAKEN TO ADDRESS LOW PRODUCTIVITY IN THE SECTOR?



- Alternative contracting approaches
- A well planned and transparent public sector pipeline
- Clear and effective building regulations
- Financial mechanisms - loan schemes/subsidy support schemes
- Incentivise property/building owners to renovate
- Incentivise training and upskilling
- Measures to improve efficiency of planning process
- New technology in the procurement process
- Simplified, transparent and consistent procurement practices

Q11

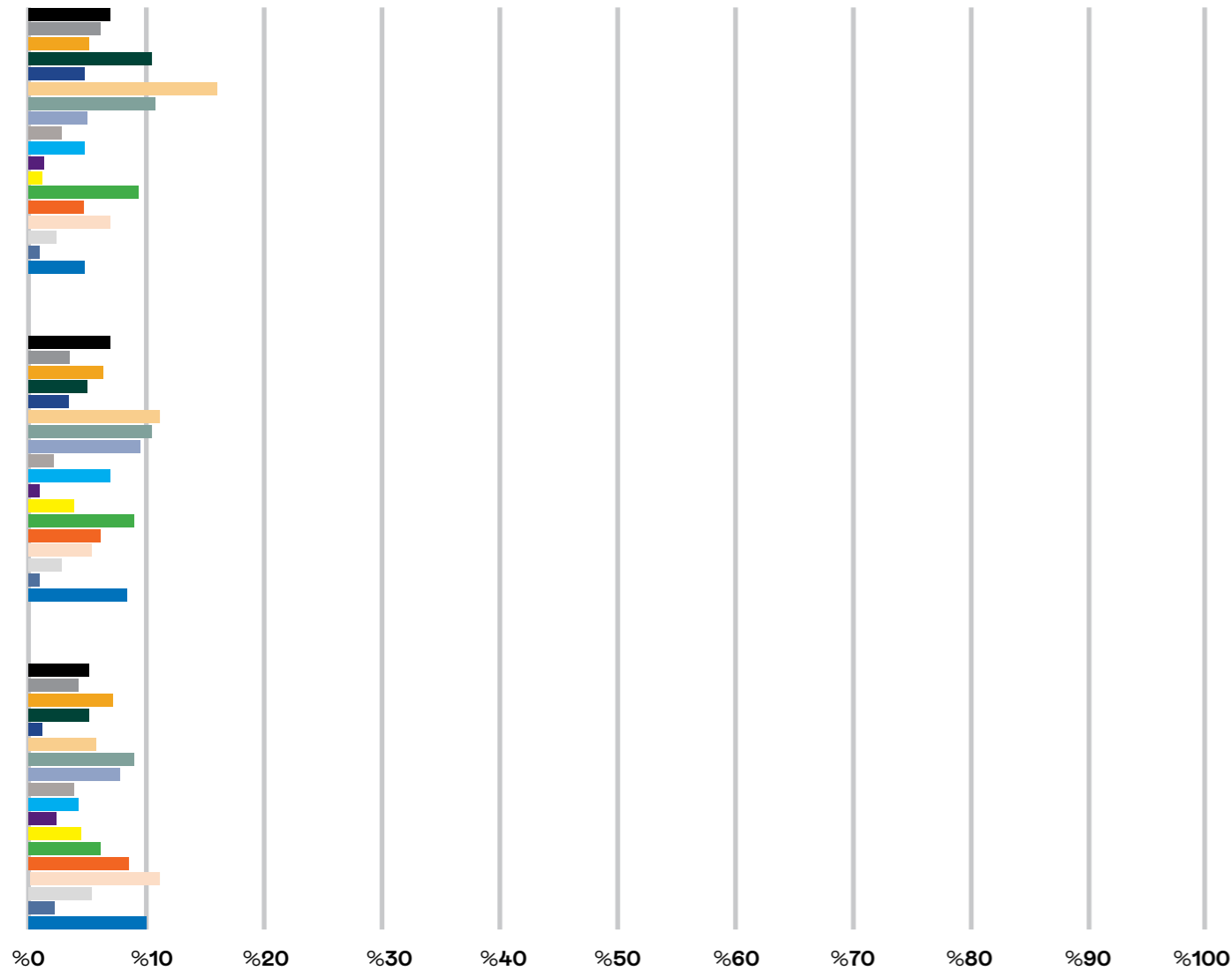
SELECT THE TOP 3 OPERATIONAL-LED MEASURES THAT COULD BE TAKEN TO ADDRESS LOW PRODUCTIVITY IN THE SECTOR?



- Adoption of lean principle of people first
- Develop collaboration capability
- Greater use of off-site manufacturing, prefabrication
- Grow workforce capability and capacity
- Improved labour utilisation
- Improved on-site execution and delivery
- Improving technological penetration in the industry
- Positive workplace culture - recognise and reward effort
- Prioritising health, safety and wellbeing
- Prioritising environmental sustainability
- Security of employment
- Stronger industry leadership
- Stronger leadership and adoption of standards
- Supply chain optimisation
- Upskilling the workforce and developing better management

Q12

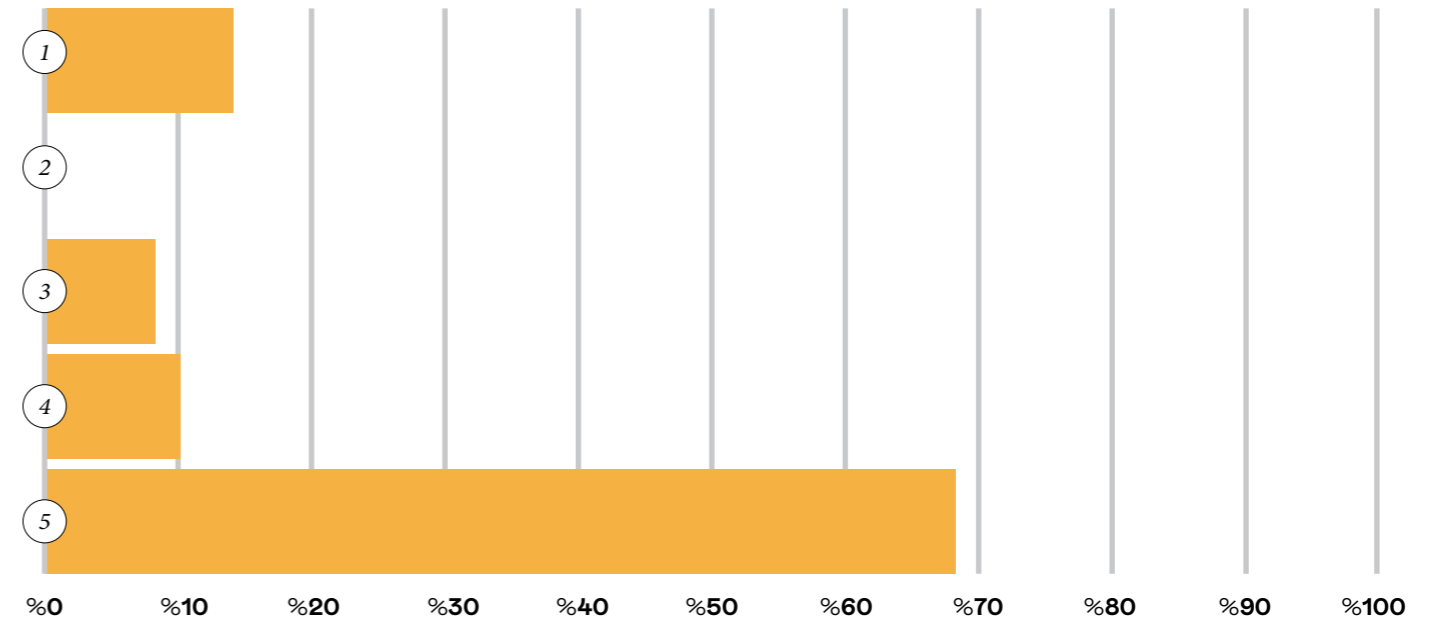
SELECT THE TOP 3 EDUCATION AND PROMOTIONAL-LED MEASURES THAT COULD BE TAKEN TO LOW PRODUCTIVITY IN THE SECTOR?



- Align education & training provision to prequalification
- Campaing promoting employment in the sector
- Create and implement initiatives to develop business management
- Create more apprenticeship positions on the public sector
- Develop construction-related primary and post-primary teacher training
- Encourage higher uptake in apprentice registrations
- Establishment of a designated centre for construction research
- Grow workforce capacity and capability through a skills action plan
- Increase technology and business improvement adoption supports
- Increase the number of apprenticeships offered by private employers
- Increase the number of places offered by higher education providers
- Industry training and knowledge sharing on risk management
- Innovate in the 2nd level curriculum to develop student interest
- More knowledge sharing opportunities
- Promote career progression opportunities and pathways
- Recruitment drive appealing to encourage greater diversity in sector
- Roadshow series promoting digital transformation
- Support mentoring programmes for students on construction

Q13

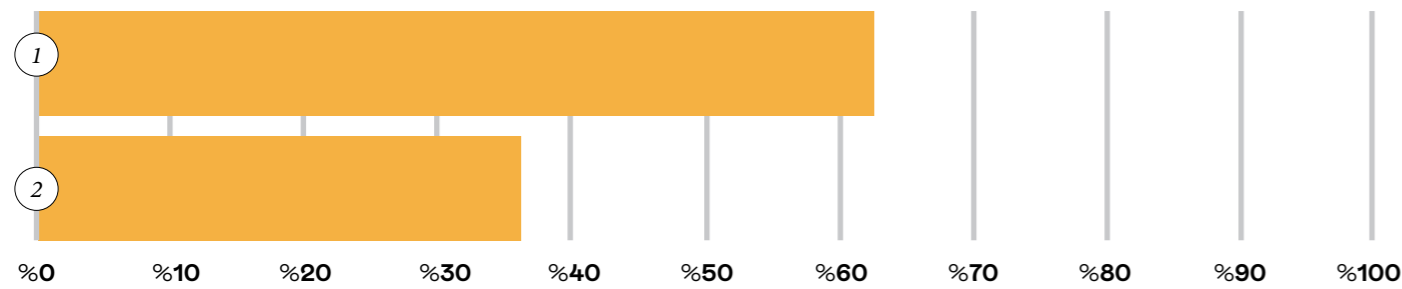
WHAT TYPE OF MEASURES ARE MOST LIKELY TO DRIVE INNOVATION AND PRODUCTIVITY IN THE SECTOR



1. Legal and Policy Led-Mechanisms
2. Policy-Led Mechanisms
3. Operational Mechanisms
4. Educational and Promotional Mechanisms
5. A Combination of the above

Q14

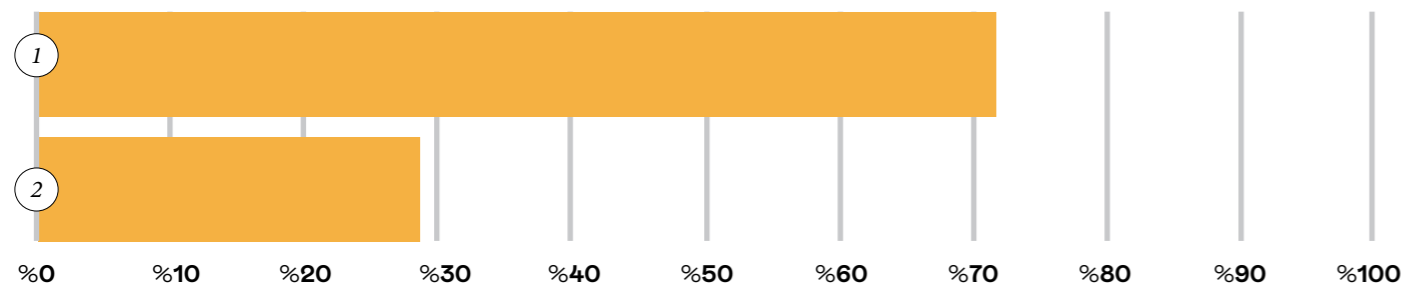
DO THE CHALLENGES FACING THE CONSTRUCTION SECTOR IN THE MAJOR CITIES DIFFER GREATLY FROM THOSE IN SMALLER/RURAL AREAS



Q15

DO THE PRODUCTIVITY CHALLENGES VARY ACROSS THE SUBSETS OF THE SECTOR: residential, commercial, retail, educational, hospitality and leisure, and public infrastructure?

Answered: 303 Skipped: 237



- 1. Yes
- 2. No

Questions 16-22 of the Online Survey, as set out below, were open-ended. It is not possible to transcribe the responses received.

Q16

Please list the top productivity opportunity and challenge facing the residential sector.

Q17

Please list the top productivity opportunity and challenge facing the commercial sector.

Q18

Please list the top productivity opportunity and challenge facing the retail sector.

Q19

Please list the top productivity opportunity and challenge facing the educational sector.

Q20

Please list the top productivity opportunity and challenge facing the hospitality and leisure sector.

Q21

Please list the top productivity opportunity and challenge facing the public infrastructure sector (Transport, Utilities, Health and Community Infrastructure).

Q22

Please use this text box to highlight any other information that you believe is relevant to this survey and to this work on the economic analysis of productivity in the construction sector and/or to providing advice on future policy and industry strategy.

Appendix 4

International Construction Initiatives

Those attributes considered most relevant in an Irish context are set out in the table below along with a consideration of the cause of the relative differences in productivity between Ireland and the reference countries.

Table 18: Attributes encouraging construction productivity in reference countries

REFERENCE COUNTRY	ATTRIBUTE/ INITIATIVES	KEY SUCCESS FACTORS	CAUSES OF DIFFERENCES IN PRODUCTIVITY IN IRELAND
Australia Belgium Denmark Netherlands New Zealand UK	BIM	<ul style="list-style-type: none"> Adoption of BIM encouraged through mandatory use in public contracts or through introduction of strategic frameworks to support training and standardisation Use of BIM portals to support knowledge exchange and open BIM standards Client led focus on BIM encourages take-up e.g. 78% of Danish design companies now use BIM Success driven by public sector promotion and encouragement Adoption of lean construction principles in tandem with BIM 	<ul style="list-style-type: none"> Early stage work on rollout of BIM underway Government currently reviewing how BIM can be incorporated into public procurement Digital Build aims to support all participants in the take-up and use of BIM Not yet mandatory on public projects It is likely to take a number of years before the full benefits of BIM across public expenditure are seen as adoption won't happen immediately Lean construction practices not prevalent in Ireland and is a key recommendation from the CIF Productivity Report that these methods should be adopted across all departments
Australia UK	Off-site construction Pre-fabrication	<ul style="list-style-type: none"> Off-site construction and pre-fabrication techniques encouraged by both government and industry Government departments working together to develop a presumption in favour of off-site construction. For example, the Infrastructure & Projects Authority team in the UK have established a benchmarking team to deliver on four key objectives – cost and schedule benchmarking, benefits realisation, performance measurement and international benchmarking 	<ul style="list-style-type: none"> Growing number of companies investing in off-site construction and pre-fabrication however expansion will most likely be client led Some companies more proactive, for example Sisk recently announced the use of a robotic brick lifting material on a UK project which enabled the pre-construction of concrete bricks that are twice as large as those typically used in the sector which has increased productivity on the site

REFERENCE COUNTRY	ATTRIBUTE/ INITIATIVES	KEY SUCCESS FACTORS	CAUSES OF DIFFERENCES IN PRODUCTIVITY IN IRELAND
Australia Denmark New Zealand	Speed of planning approvals	<ul style="list-style-type: none"> Streamlined approval process for construction permits encourages innovation and entrepreneurship, speeds delivery and encourages firm expansion 	<ul style="list-style-type: none"> Planning process in Ireland highlighted in consultation as one of the key inhibitors to productivity Some recent improvements to the planning system have been welcomed by stakeholders e.g. National Planning Framework and Strategic Housing Development Regulations 2017, however regular changes to the regulatory landscape have made it more difficult for companies to plan and design efficient specifications High costs and delays experienced in Ireland, for example takes 149.5 days and 10 procedures to obtain a permit to build a warehouse with an associated cost of 5.4% of value of the warehouse compared to the OECD average of 1.6%. The UK system requires only 9 procedures and 86 days
Australia Denmark Netherlands UK	Upskilling	<ul style="list-style-type: none"> Focus on skill development funded by industry e.g. through use of levies on construction projects above a certain value to fund training and apprentices Public sector contracts require a minimum % workforce to be apprentices/trainees to improve skills and staff retention Introduction of programmes to engage young people in construction-related apprenticeships and vocational training, for example "Thank You" campaign in Denmark that promotes companies that employ apprentices Access to EU programs such as Build Up Skills Initiative set up by Intelligent Energy Europe to access funding for training and upskilling. Ireland produced a status quo report in 2012 on the current status in relation to energy training and which included an initial analysis of the skills requirement and a roadmap for implementation, but further action does not appear to have been undertaken 	<ul style="list-style-type: none"> The economic crisis had a significant impact on the construction labour force with large numbers either leaving the sector or emigrating to countries such as Australia and New Zealand Demand for construction related third level courses dropped significantly as did requirements for apprentices/trainees Ageing workforce suggests more experienced workers will be leaving the sector and may not be replaced by similar numbers The National Skills Bulletin has identified a shortage of civil engineers, quantity surveyors and construction project managers

REFERENCE COUNTRY	ATTRIBUTE/ INITIATIVES	KEY SUCCESS FACTORS	CAUSES OF DIFFERENCES IN PRODUCTIVITY IN IRELAND
Belgium Denmark	Research Institutes	<ul style="list-style-type: none"> Belgian Building Research Institute, with the support of the Belgian equivalent of CIF, work to boost research and innovation in the sector and have also introduced voluntary sustainable and quality construction certificate systems to encourage R&D and innovation National cross-disciplinary networks can bring stakeholders together to develop projects in transport and infrastructure. For example, a network in Denmark works to gather the different players across the transport sector with the aim of identifying synergies, the need for new technologies and business opportunities 	<ul style="list-style-type: none"> There is a lack of an overall construction body to support and encourage research and innovation, act as a "one voice" for the sector and lobby effectively on behalf of all participants in the built environment – key common theme from consultation
Belgium UK	Digital Technology	<ul style="list-style-type: none"> Practical demonstrations of applications of technology by government bodies designed to raise awareness of digital technology and how it can improve productivity, e.g. Construction Demonstrator 4.0 roadshow in Belgium which involves digitalisation of the construction sector incorporating BIM and can be used successfully for implementing new regulations such as the Energy Performance Buildings Directive Adoption of latest technologies, e.g. use of drones and laser scanning, UK currently hosting 34 drone manufacturers and is involved in a number of innovative projects e.g. self-repairing footpaths 	<ul style="list-style-type: none"> Ireland has been slower than some other countries to adopt new technologies – this may be due to the fragmented nature of the sector, low profit margins leaving little spare capacity for investment and lack of training and education

REFERENCE COUNTRY	ATTRIBUTE/ INITIATIVES	KEY SUCCESS FACTORS	CAUSES OF DIFFERENCES IN PRODUCTIVITY IN IRELAND
Belgium Denmark Netherlands	Circular Economy	<ul style="list-style-type: none"> Government and industry working together to develop innovative solutions. For example, a circular construction platform, Werflink, was set up in Belgium to share unused materials and storage space Government programmes to encourage a greater focus on the circular economy and a reduction in use of primary raw materials, for example the Danish Eco-Innovation Programme launched in 2015 to subsidise and support construction companies focusing on sustainable construction, the circular economy and recycling of waste Priority given to companies practicing circular economy methods and tools in public procurements Practical initiatives to encourage circular economy approach such as the Circle House project in Denmark where 60 companies across the sector are building 60 housing units using more than 90% recycled materials Establishment of value chain agreements in the concrete sector. This involves collaboration with all parties in order to reduce the use of concrete and other raw materials in the construction process 	<ul style="list-style-type: none"> The Irish Green Building Council is working with companies to encourage more sustainable construction practices However no single system/standard for use in Ireland for measuring sustainability in construction Potential changes to the waste-charging regime by the EPA may also impact on construction companies which proposes removing the exemption that allows companies dispose of non-contaminated soil for free. Proposed charges are €12 per tonne which could rise to €140 per tonne if the soil is contaminated Lack of adequate waste treatment capabilities will also impact the ability to sustainably treat waste
Belgium Netherlands	Access to Finance	<ul style="list-style-type: none"> Support provided to SME's through government backed schemes which provide loan guarantees as well as EIF supports Ban on payment terms exceeding 60 days Access to EU funds such as EIF to support innovative and fast-growing companies, for example the Dutch Growth Co-Investment Programme 	<ul style="list-style-type: none"> Access to finance has been difficult with outstanding credit to the sector showing a decrease of 78.2% since 2010, from EUR3.5 billion to EUR755 million in 2016. In particular, outstanding credit extended to Irish firms involved in construction of buildings fell by 86.4% over 2010 - 2016, to EUR 1.6 billion from EUR 223 million According to a survey by the CIF, 63% of construction companies surveyed that sought to borrow from financial institutions in 2016 - 2017 experienced difficulties in securing finance and 70% of companies with a turnover of less than EUR9 million, reported difficulties in obtaining access to finance Home Building Finance Ireland and the Strategic Banking Corporation of Ireland have been introduced to help SMEs and house builders access finance

REFERENCE COUNTRY	ATTRIBUTE/ INITIATIVES	KEY SUCCESS FACTORS	CAUSES OF DIFFERENCES IN PRODUCTIVITY IN IRELAND
Belgium Denmark Netherlands	3D Printing	<ul style="list-style-type: none"> 3D printing initiatives supported by government and industry to accelerate integration of 3D printing technologies in construction Development of partnership amongst sector participants to finance and test 3D solutions for the industry to develop prototypes for testing and training Government and industry investment in research projects, for example creation of 3D bicycle lanes and pedestrian bridges in the Netherlands 	<ul style="list-style-type: none"> 3D printing is being used but is very expensive so outside financial reach of many companies Concrete printing not yet being used as sector adopting a “wait and see approach” Market led demand will drive sector acceptance and adoption
Netherlands	Innovation	<ul style="list-style-type: none"> Strong focus on innovation through public-private initiatives Building campus, the high-tech campus in Eindhoven, Netherlands, is a public – private initiative which provides a space and network that brings together a variety of stakeholders and actors to address issues in residential construction, infrastructure, commercial buildings and public spaces. Start-up Delta, an independent public-private partnership helps start-ups to grow in the Dutch economy and is funded by sponsors and investors 	<ul style="list-style-type: none"> Innovation currently encouraged through use of specific funds, e.g. Rural Development Fund, but specific initiatives aimed at encouraging companies/universities to develop new processes, approaches or techniques could help

REFERENCE COUNTRY	ATTRIBUTE/ INITIATIVES	KEY SUCCESS FACTORS	CAUSES OF DIFFERENCES IN PRODUCTIVITY IN IRELAND
New Zealand UK	Collaborative Approach	<ul style="list-style-type: none"> Collaborative approach with all stakeholders across government and industry to tackle issues and develop sustainable solutions through Construction Sector Accord Support of housing delivery by partnering with construction companies, for example Innovate, Partner, Build Programme in New Zealand which aims to build 2,000 houses over next ten years by partnering with companies over a longer time period and using their scale to forward purchase construction materials at lower prices Promotion of alternative construction materials such as timber through partnerships with industry to demonstrate timber capability for office and residential developments Programmes launched to boost productivity and increase earning power. For example, the UK Construction Sector Deal introduced a number of initiatives including development of new apprenticeship standards, providing additional apprenticeship spaces and working on improving contractual and payment practices 	<ul style="list-style-type: none"> Industry, supported by Government, is considering the Build Digital project to provide support and access to training in digital technologies which could have the potential for further expansion in future years to provide more of a voice and central knowledge support for the sector The Construction Sector Group has been set up to ensure regular and open dialogue between government and industry on how best to achieve and maintain a sustainable and innovative construction sector positioned to successfully deliver on the commitments in Project Ireland 2040.
Australia New Zealand UK	Project Pipeline	<ul style="list-style-type: none"> Improved pipeline management for companies to increase transparency of projects, better planning for government departments and provide a roadmap for market participants improving information availability and investment decisions Examples include Infrastructure Australia, New Zealand Infrastructure Commission (now incorporated under Construction Accord) and Infrastructure and Projects Authority in the UK 	<ul style="list-style-type: none"> Ireland’s current project tracker has over 500 projects, programmes and funds which make it difficult for users to identify relevant projects Only projects > €20m included Work is ongoing on improving the tracker to promote greater transparency and monitor progress of implementation of Project 2040

Set out below are a number of tables and charts which illustrate the economic position of Ireland relative to the six other countries analysed as part of this report. Data used is based on most recently available figures as at November 2019.

Table 19: GDP values and growth rates

	IRELAND	AUSTRALIA	BELGIUM	DENMARK	NETHERLANDS	NEW ZEALAND	UK
Real GDP	312 million	1.13 trillion	403 billion	€27.03 billion	€33.16 billion	€37.60 billion	€45.51 billion
GDP growth rate	6.8%	-2.9%	1.4%	1.2%	2.6%	1.8%	0.4%
CAGR growth rate 2013 – 2018	8.5%	1.5%	1.5%	2%	2.2%	3%	n/a
Forecast growth rate 2020	3.4%	2.3%	1.3%	2%	1.7%	2.1%	1.3%

Table 20: Population and growth rates

	IRELAND	AUSTRALIA	BELGIUM	DENMARK	NETHERLANDS	NEW ZEALAND	UK
Population	4.8m	25m	11.4m	5.8m	17.2m	4.89m	66.49m
Growth rate	1.35%	1.59%	0.4%	0.57%	0.59%	1.92%	0.65%
Average forecast rates	0.25%	1.21%	0.4%	0.38%	0.29%	0.55%	0.53%
Projected 2030 population	5.2m	28.4m	11.9m	6.1m	17.7m	5.3m	70.3m

Table 21: CPI Index

	IRELAND	AUSTRALIA	BELGIUM	DENMARK	NETHERLANDS	NEW ZEALAND	UK
CPI Index	101.2	114.1	107.24	102.1	103.44	102.5	106.0

Table 22: Employment in construction industry

	IRELAND	AUSTRALIA	BELGIUM	DENMARK	NETHERLANDS	NEW ZEALAND	UK
Employment in construction industry ('000)	146	1,174	332	178	449.5	245.2	1,518

Table 23: Construction production values

	IRELAND	AUSTRALIA	BELGIUM	DENMARK	NETHERLANDS	NEW ZEALAND	UK
Production value (€m)	22,800	135,800	69,100	34,600	91,600	21,900	300,800

Table 24: GVA from construction

	IRELAND	AUSTRALIA	BELGIUM	DENMARK	NETHERLANDS	NEW ZEALAND	UK
GVA from construction	€6.94 million	€93.1 billion	€20.5 billion	€13.4 billion	€33.4 billion	€10.1 billion	€125.9 billion
GVA as a % of GDP	2.51%	8.0%	5.17%	4.9%	4.5%	7.1%	5.58%
Hours worked index	99.7 (2016)	100	110	102.7	112	140	155

Table 25: Loans to construction sector

	IRELAND	AUSTRALIA	BELGIUM	DENMARK	NETHERLANDS	NEW ZEALAND	UK
CPI Index	101.2	114.1	107.24	102.1	103.44	102.5	106.0

Table 26: Business Enterprise R&D Expenditure

	IRELAND	AUSTRALIA	BELGIUM	DENMARK	NETHERLANDS	NEW ZEALAND	UK
BERD (€m)	2.2	339.6	52.5	5	102.9	131.8	120.8

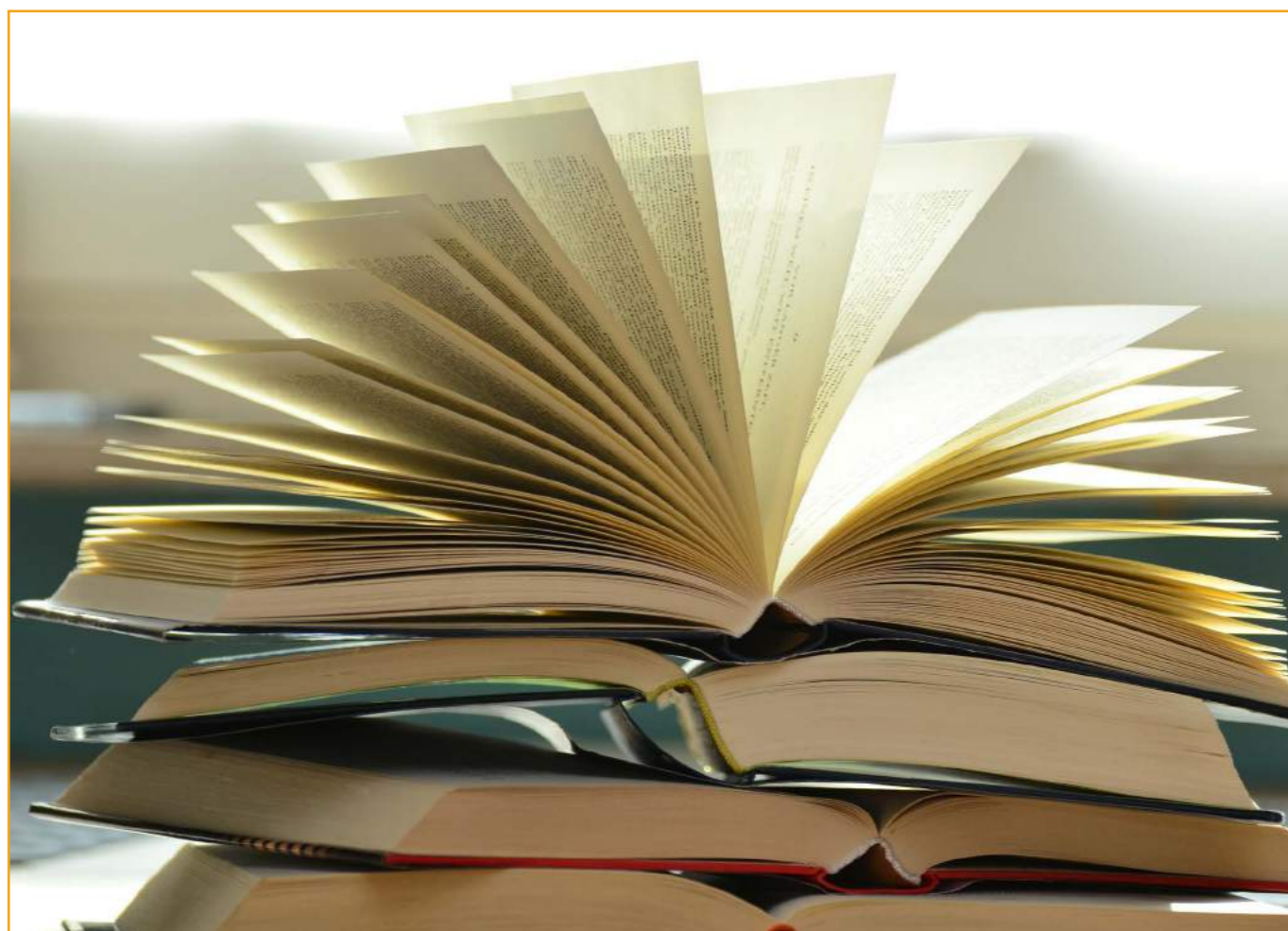
Table 27: Time and number of procedures required to complete warehouse construction approvals

	OECD AVG.	IRELAND	AUSTRALIA	BELGIUM	DENMARK	NETHERLANDS	NEW ZEALAND	UK
Time to complete (days)	153.1	149.5	121	212	64	161	93	86
No. of procedures	12.7	10	11	10	7	13	11	9

Appendix 5

Literature Review

Set out below is a sample of the recent reports and articles reviewed as part of this report:



Economic & Social Research Institute. Quarterly Economic Commentary, Autumn 2019. Available at: <https://www.esri.ie/publications/quarterly-economic-commentary-autumn-2019>. Accessed 15th October 2019

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European Construction Sector Observatory. Company profiles for Ireland, Belgium, Denmark and the UK. Available at: https://ec.europa.eu/growth/sectors/construction/observatory_en. Accessed 02nd October 2019

Expert Group on Future Skills Needs (2019). Skills for the Construction Sector: Assessment of 2008-2018 strategies, September 2019. Available at: <http://www.skillsireland.ie/all-publications/2019/construction-studies-assessment-of-2008-2018-strategies.pdf> Accessed 7th November 2019.

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McKinsey & Company (2019). Modular Construction: From projects to products. Available at: <https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights/modular-construction-from-projects-to-products>. Accessed 14th September 2019.

McKinsey & Company, McKinsey Global Institute (2017). Reinventing Construction: A Route to Higher Productivity. Available at: <https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights/reinventing-construction-through-a-productivity-revolution>. Accessed 30th August 2019.

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Economic analysis of productivity in the Irish construction sector



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