



Building for the Future

A synthesis of international research on the future of the construction industry, to support the next generation of the Construction Sector Accord.



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Acknowledgement

The information in this document has been sourced from a number of external publications:

KPMG

No turning back: An industry ready to transcend (2021 Global Construction Survey)

[2021 Global Construction Survey – KPMG Global \(home.kpmg\)](#)

MCKINSEY & COMPANY

The next normal in construction: How disruption is reshaping the world's largest ecosystem (2020)

[The-next-normal-in-construction.pdf \(mckinsey.com\)](#)

WORLD ECONOMIC FORUM

Shaping the Future of Construction: A Breakthrough in Mindset and Technology (2016)

[Shaping the Future of Construction: A Breakthrough in Mindset and Technology | World Economic Forum \(weforum.org\)](#)

The Accord wishes to thank these organisations for allowing reproduction of the charts and figures included below.

1 Introduction

The Construction Sector Accord – helping to shape the future of construction in New Zealand

A partnership between industry and government, towards a high performing construction sector for a better New Zealand.

The Construction Sector Transformation Plan is the toolkit used by the Construction Sector Accord to bring industry and government together to transform the sector. It has made much progress in a number of areas, despite the disruption that the Covid-19 pandemic has caused the industry.

But the Accord will need a new toolkit after June 2022 when the current plan comes to an end.

Ministers and industry have indicated the need to keep going, as there is still much to do. So, as we plan the next iteration of the Transformation Plan – what we are calling the ‘Accord Gen 2’ – it is a good opportunity to look elsewhere to understand trends in construction, and learn how the pathway towards the future has been laid by transformational initiatives in other jurisdictions.

Purpose of this document

This document highlights key themes for the future of construction, as identified from a review of external literature discussing practices in other countries. It does not seek to provide an exhaustive overview of all relevant research, but it does provide the Accord with valuable external perspectives on the issues and opportunities that the construction sector in Aotearoa needs to address now and into the future.

Who is it for?

This document gives professionals across the construction sector an overview of the most relevant trends in construction globally, and should provide business leaders with ideas and suggestions about how their business can overcome the challenges to adopting bold and innovative new practices.



2 Executive summary

This global literature review has identified the most significant developments in construction internationally and the barriers to be overcome when implementing them.

Construction is an industry beset by challenges, including labour scarcity, low productivity growth, low profitability, high risk and – most starkly – the need to reduce carbon emissions. Yet populations are increasing, especially in urban areas. New homes and infrastructure must go up, and ageing infrastructure must be replaced.

There is a way forward, and it requires new approaches by individual businesses, by businesses working together, and by governments working with them:

- use of transformative approaches in construction, including advanced materials, technology such as automation and applying innovative contracting arrangements
- collaboration across the industry on standards, and sharing best practice and data
- facilitation by governments to put in place effective regulation and to promote and fund research and development.

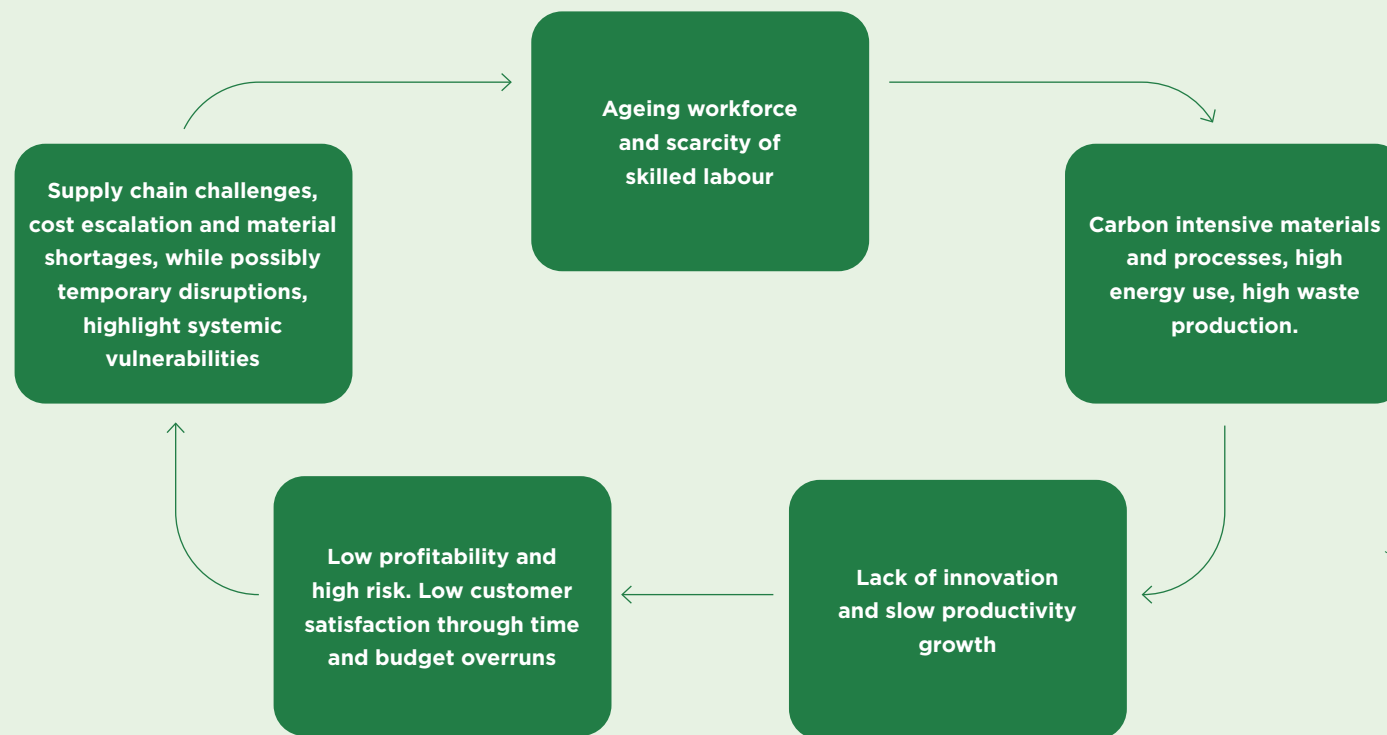
Examples of effective innovation are highlighted throughout this report, from “flying factories” to co-operative development of industry standards.

The Construction Sector Accord has championed innovative approaches through its Beacons programme, and many are also highlighted below.



3 An industry beset by challenges...

Over time, the construction industry has developed characteristics that make it a challenging environment for businesses, employees and customers.



...while trying to meet high delivery expectations

The demands on infrastructure have increased, as global demographic shifts and the need to respond to climate change increase expectations on construction to modernise and adapt. From now into the future, the global construction industry will be required to:

➤ **Help cities to grow to support increasing population, while making them more liveable and easier to traverse.**



1.5 million people are added to the global urban population every week and need affordable and healthy housing.

[UN DESA](#)

➤ **Protect the environment by reducing reliance on carbon-intensive materials and processes and making buildings more energy efficient and durable.**



The construction industry is the no. 1 consumer of raw materials globally.

[World Economic Forum](#)

➤ **Replace ageing infrastructure that is resilient to shocks and disasters, and support healthy and productive lives in urban and rural areas.**



The world needs to invest \$5.3 trillion a year until 2035 to close the global infrastructure gap and keep pace with projected growth.

[McKinsey](#)

➤ **Reduce the cost of construction to make living more affordable.**



Construction projects typically run 20% longer than planned and 80% over budget.

[McKinsey](#)

➤ **Create healthy and safe living and working environments, during and after the construction project.**



In 2020, the UK experienced 40 fatal injuries to construction workers, while 81,000 reported some form of work-related ill health and there were 61,000 non-fatal injuries.

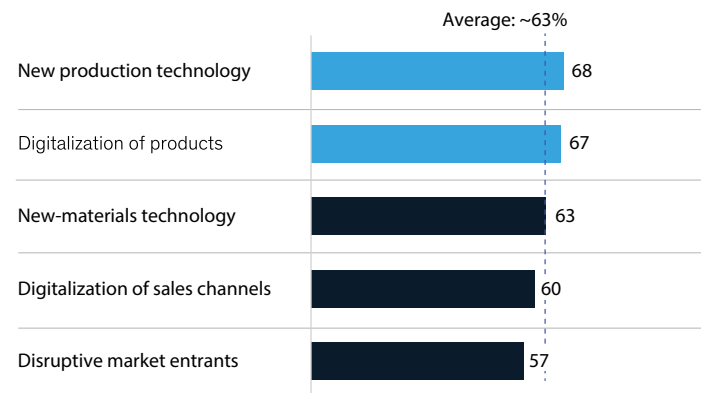
[UK Health & Safety Executive](#)

4 The Way Forward

Leading organisations around the world are beginning to identify and implement innovative approaches that signal a dramatic change from the traditional methods of construction. Most construction industry executives responding to a McKinsey survey agreed that these disruptive new practices will impact the industry in the coming 5 years.

Industry leaders expect disruption to occur

Which [of these emerging disruptions] do you think will have highest impact on the construction industry? Share of respondents rating that emerging disruptions will have "high impact,"%

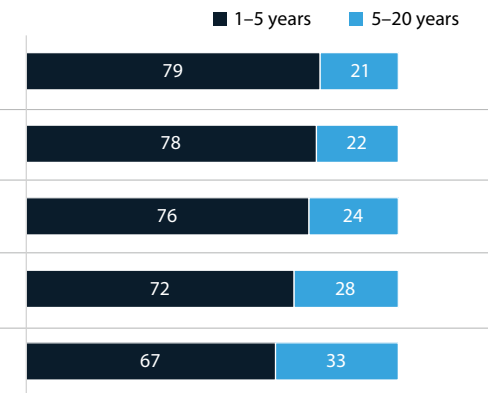


More than two-thirds of respondents think that industrialization and digitalization will have the highest impact of the emerging disruptions

¹ High impact equals a 7 or higher, where 10 is highest impact.

Source: McKinsey survey of 400 construction-industry CxOs; expert interviews; McKinsey analysis

When do you think the emerging disruptions will impact construction at scale? Share of respondents, %



More than two-thirds of respondents expect disruptions to impact construction in the near term

5 Barriers that firms must overcome to deliver change

Achieving successful change in construction can be an uphill battle. Successful transformation will require organisations to overcome some significant barriers, including:

- **R&D investment has delayed pay-offs**, which makes it difficult to justify in a project-driven business;
- Informal and inconsistent processes mean that companies often seem to put **greater emphasis** on defining the final product than on **planning the actual construction process**;
- **Insufficient knowledge transfer** from project to project results in a lack of institutionalised knowledge, meaning each project becomes dependent on the experience of a **project manager**;
- **Weak project monitoring** differentiates construction from industries such as manufacturing, where vast amounts of **data** are **collected to identify root causes** and implement remedies;
- **Little** cross-functional cooperation with different technical disciplines (**project owners, designers, constructors**) leads to steps in the process happening sequentially rather than collaboratively; and
- Challenges with **company culture** make construction companies **challenging environments** for engagement and **change**, stemming from high levels of conservatism, **transactional relationships** with product suppliers and **poor HR practices** (lack of diversity and inability to attract and retain talent from outside the industry).



6 Collaboration and new approaches required

Achieving industry-wide transformation will require businesses to seek out and adopt innovative practices and technologies. However, to overcome the most significant barriers to adoption, the industry will need to collaborate - both with other parts of the industry and with government - while government must ensure its interventions are effective.

This section profiles global developments in construction, and provides examples of successful implementation from other jurisdictions.



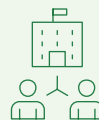
INDIVIDUAL BUSINESSES - TRANSFORMATIONAL DEVELOPMENTS IN CONSTRUCTION

- Advanced building materials
- Prefabrication
- Technology & Automation
- Business model innovation
- Process improvement
- Workforce planning



MULTIPLE BUSINESSES

- Redesigning the value chain
- Identifying cross-industry collaboration opportunities



BUSINESSES AND GOVERNMENT

- Government's role in paving the way



Individual businesses – Transformational developments in construction

Advanced building materials

ADVANCED BUILDING MATERIALS

PREFABRICATION

TECHNOLOGY & AUTOMATION

BUSINESS MODEL INNOVATION

PROCESS IMPROVEMENT

WORKFORCE PLANNING

What is it?

Innovation in building materials can come in many forms, from incremental improvements to traditional materials, to the generation of new material combinations with additional functional characteristics, to radically innovative materials with entirely new functionalities.

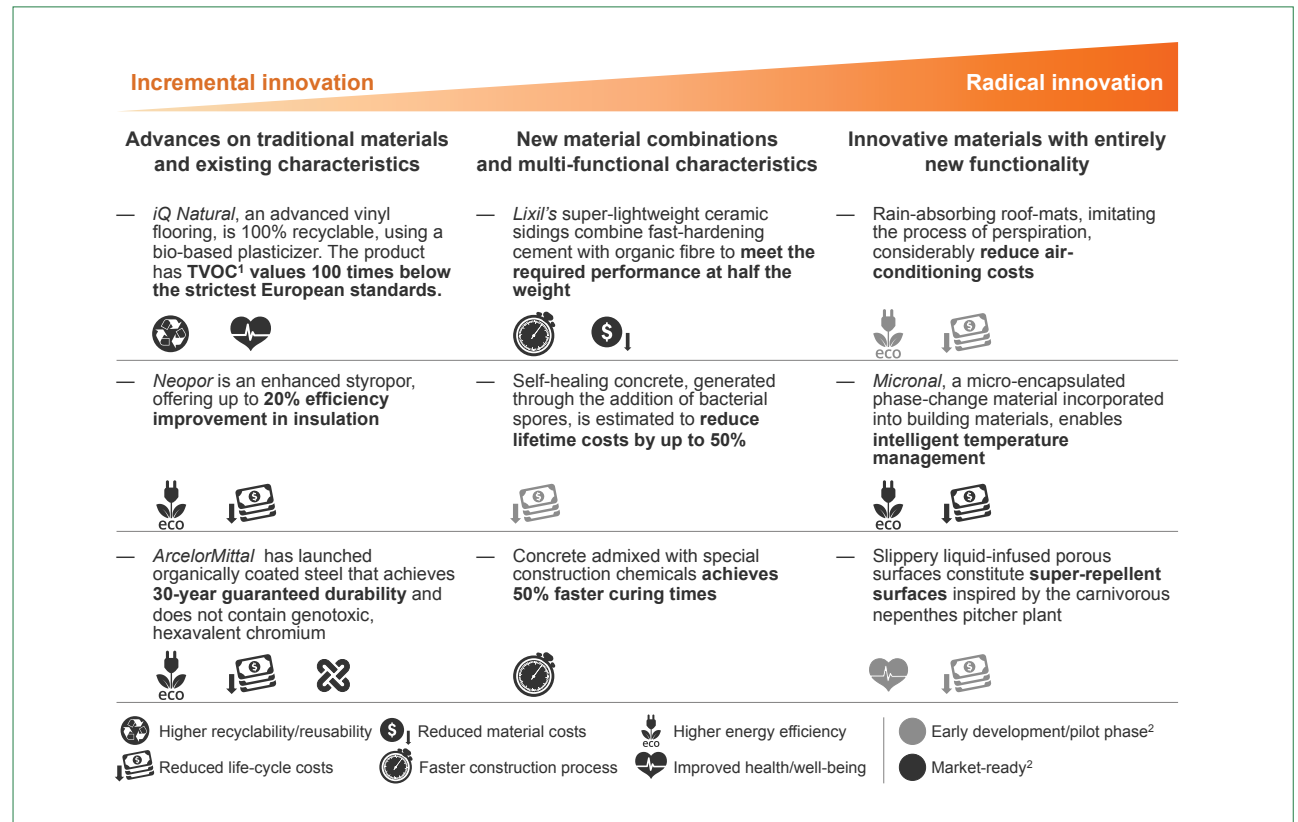
Enablers for success

- Contractors need to develop a knowledge base of the applicability and benefits of new building materials
- Informed architects, engineers and clients will be able to take advantage of new materials, for instance, by showing how, despite their price premium, they have an improved total-cost-of-ownership
- Considering product lifecycle value and whole-of-life costs when assessing project costs will change the way components are selected. Considering not only design and construction costs but also long-term costs, such as utilities, operations & maintenance, will improve performance over the asset's whole lifecycle

What does it look like?

The following graphic gives an overview of the spectrum of innovation in building materials, and how they can be applied to construction projects.

Examples of Advanced Building and Finishing Materials



World Economic Forum



Building a centre of material expertise at Fluor

Fluor has built up an internal team of experts on concrete to advise the client at an early planning stage, to develop a foundation of data based on experience and to create a convincing business case for greater use of innovations (such as 50%-faster-curing concrete) in the market.



Accord tip

When considering innovation in the use and selection of building materials, don't restrict thinking to 'new' materials. An important aspect is the incorporation of circular economy principles such as effective maintenance, re-use, and refurbishment of existing or used materials. A recent [Beacon case study on Piritahi](#) showed how residential homes could be kept and re-purposed, avoiding waste to landfill and fulfilling housing needs.



Individual businesses – Transformational developments in construction

Prefabrication

ADVANCED BUILDING MATERIALS

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What is it?

Prefabrication, also called offsite construction/ manufacturing, is a method of construction where a building or some of its components are manufactured away from its final location. Once ready, all the components are delivered and assembled on a building site. Due to recent advances in technology and market awareness, there is a growing acceptance of the environmental and productivity benefits of offsite, prefabricated, and modular building systems. However, businesses must first overcome the barriers described below.

Enablers for success

Businesses can take various steps themselves, as well as through cross-industry collaboration, to overcome barriers and create more fertile ground for the adoption of prefabricated construction.

BARRIERS TO PREFABRICATION

A poor reputation, due to misconceptions about quality, price and the limited potential for individualisation/customisation

Client demand for individual solutions, which discourages the use of standardised processes and components

Under-utilisation of factory space due to inconsistency of demand profile

High cost of transportation, especially where the distance between factory and site is large, exacerbated by community opposition to transportation of large components

ENABLERS FOR PREFABRICATION

Introduce an economic and logistical assessment of these technologies in the planning process and tailor on-site construction processes to the use of prefabrication components or modular systems

Develop industry-wide standards on component dimensions or connections

Explore new manufacturing concepts and methods, e.g. temporary factories set up close to construction sites

Ensure clients understand the various advantages of prefabrication, such as the opportunities for repurposing or post-installation adjustments including temporary housing or hotel accommodation to meet seasonal demand



Using ‘Flying Factories’ to bring regional economic benefits at Skanska

Skanska has developed a new construction concept known as “Flying Factories”, which are temporary factories set up close to construction sites. They apply “lean” manufacturing techniques and employ local semi-skilled labour. The advantages include a reduction in construction time of up to 65%, a halving of labour costs and a 44% improvement in productivity relative to on-site assembly, while still upholding the construction industry’s importance as a local employer.



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Individual businesses – Transformational developments in construction

Technology & Automation

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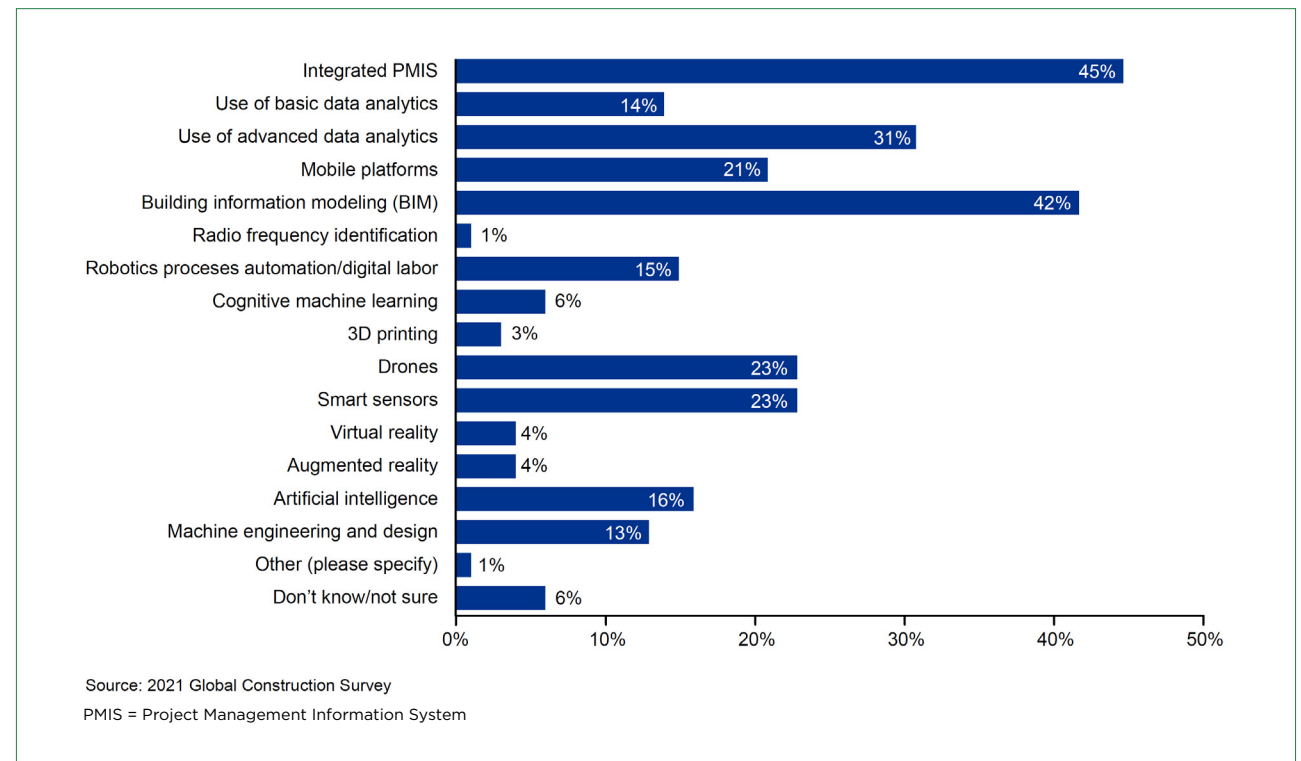
What is it?

The technological opportunities in front of the industry at the moment are significant and varied, and require organisations to make informed investment decisions on the technologies that will deliver the most value. Respondents to a global KPMG survey demonstrate that of those technology options, there are no clear winners. And the leading response (Integrated Project Management Information Systems) does not represent a technology that would materially impact the way organisations construct, and therefore would not deliver the productivity gains required to transform the industry.

What are the benefits?

Some businesses that have embraced digital technology have found that by successfully integrating physical works with systems and data, they can deliver productivity and health and safety benefits. For example, earth-moving and excavation machinery can be automated, design clashes can be greatly reduced, and asset information improved to support future maintenance activities.

Technologies with the potential to deliver the greatest overall return on investment to your organisation



KPMG



Individual businesses – Transformational developments in construction

Technology & Automation

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Enablers for success

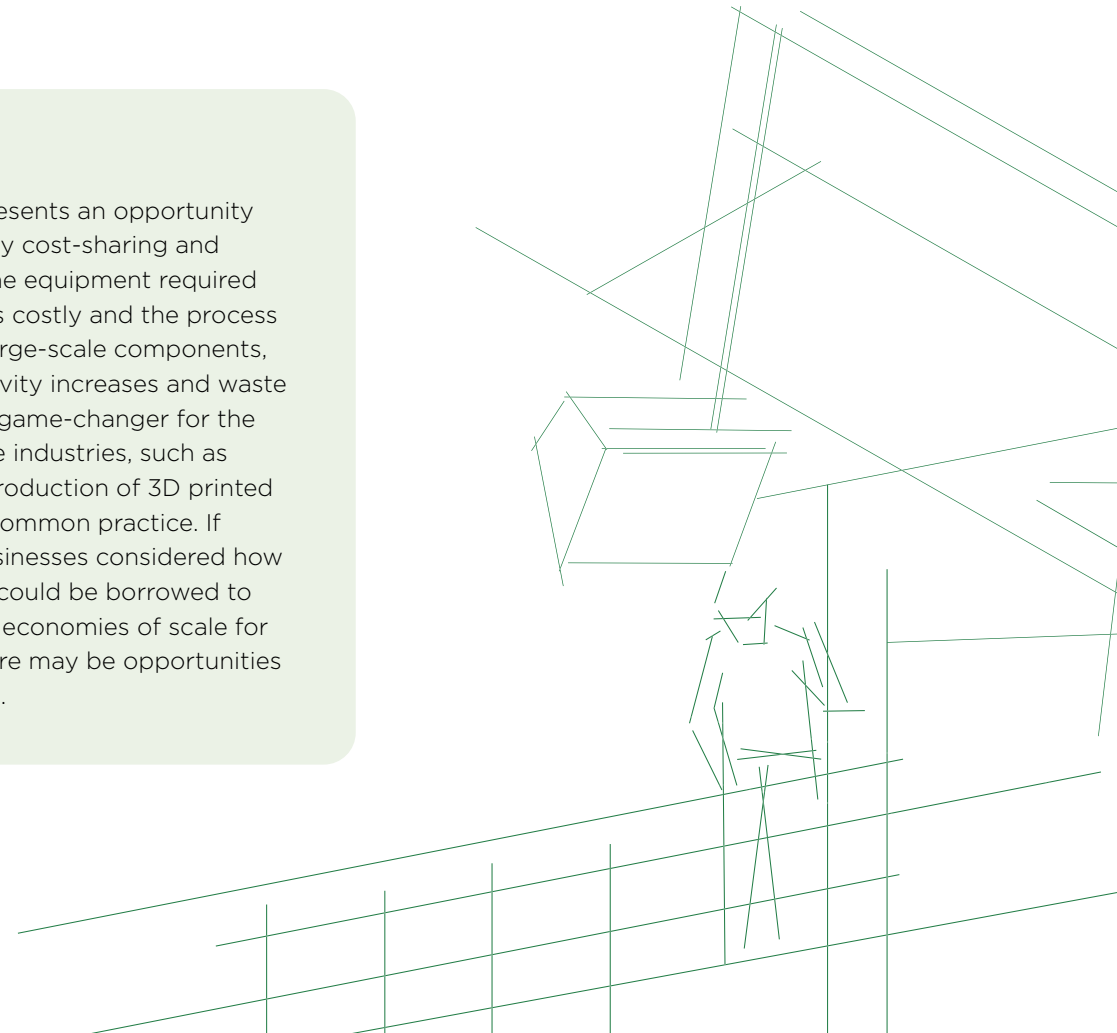
In other jurisdictions, successful implementation of new construction technologies has been enabled by the following measures:

- Create conditions for automation by improving upfront planning, given that automation is most effective where there are standardised systems and processes in place
- Establish industry standards for communication protocols, so that automated and interoperable equipment can be applied widely
- Create opportunities for sharing of equipment across the industry through machinery leasing and sharing models to achieve economies of scale
- Installing smart and life-cycle optimising equipment in buildings, such as sensors to get early detection of assets needing replacement or maintenance, can greatly reduce building lifecycle cost, but is reliant on Building Information Modelling (BIM) to ensure the recording of structured asset data down to the level of individual components.



Accord tip

3D printing represents an opportunity for cross-industry cost-sharing and collaboration. The equipment required for 3D printing is costly and the process is still slow for large-scale components, but the productivity increases and waste decreases are a game-changer for the industry. In some industries, such as aviation, mass production of 3D printed components is common practice. If construction businesses considered how these examples could be borrowed to create sufficient economies of scale for our industry, there may be opportunities for collaboration.





Individual businesses – Transformational developments in construction

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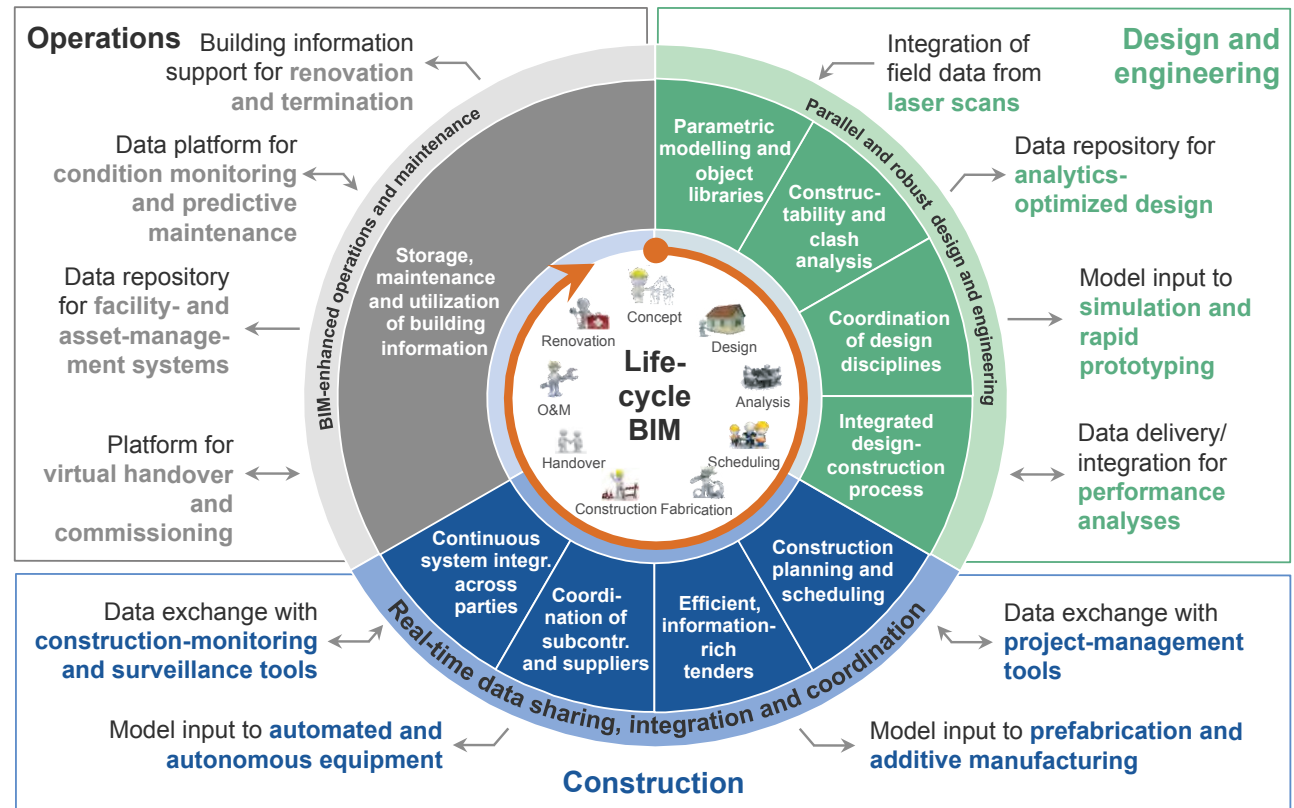
WORKFORCE PLANNING

Building Information Modelling (BIM) as a foundational component of technology adoption

Traditional building design is largely reliant upon two-dimensional technical drawings (plans, elevations, sections, etc.). Building information modelling extends this beyond 3D, augmenting the three primary spatial dimensions (width, height and depth) with time as the fourth dimension and cost as the fifth. BIM therefore covers more than just geometry. It also covers spatial relationships, light analysis, geographic information, and quantities and properties of building components (for example, manufacturers' details).

BIM enables structured information to be handed from the design team (architects, landscape architects, surveyors, civil, structural and building services engineers, etc.) to the main contractor and subcontractors and then on to the owner/operator, bringing a host of benefits along the way. The diagram to the right shows applications of BIM throughout the building lifecycle:

Applications of BIM along the engineering and construction value chain



The Boston Consulting Group / World Economic Forum



Individual businesses – Transformational developments in construction **Technology & Automation**

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Collating data sources to automate bulldozers at Komatsu

Komatsu, a Japanese manufacturer of construction equipment, is developing automated bulldozers incorporating various digital systems. Drones, 3D scanners and stereo cameras gather terrain data, which is then transmitted to the bulldozers; these are equipped with intelligent machine-control systems that enable them to carry out their work autonomously and thereby speed up the pre-foundation work on construction sites, while human operators monitor the process. On mining sites, autonomous haul trucks are already in common use.



KiwiRail Beacon showing the way on BIM

The Accord profiled KiwiRail's work with supply chain partners to launch BIM within a pilot project. Find out more [here](#).



Accord tip

As opposed to just a tool for the design process, BIM and the collection of asset information should be seen as a tool for ongoing asset management. 'As designed' information needs to be turned into 'as built' (i.e. up-to-date post construction) to enable the smart use of data for planning maintenance and replacement activities.



Individual businesses – Transformational developments in construction

Business model innovation

ADVANCED BUILDING MATERIALS

PREFABRICATION

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BUSINESS MODEL INNOVATION

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WORKFORCE PLANNING

What is it?

As in other industries, the emergence of new business models (such as Uber or video streaming services) can be a disruptive influence on traditional economic or market structures. They often integrate different services through the value chain.

What do current construction businesses need to do differently?

It can be hard for a business to find the right balance between specialising in a specific discipline and developing customised solutions on the one hand, and becoming more general and thereby achieving economies of scale and diversifying risk on the other. They also need to decide on their value-chain coverage – that is, their scope of services from design and engineering, to construction, to operations and maintenance. Already, some construction firms have identified that they can deliver capital certainty to clients by expanding their in-house capability across all functions or domains (e.g. design, engineering, procurement, supply chain management and construction).



Legal & General acting as a disruptive new entrant to the market

The British insurer Legal & General set out to invest nearly \$100m in a “flat pack” housing factory to prefabricate complete homes, with white goods and interiors included. As part of this disruptive move, the insurance giant has teamed up with the Dutch pension-fund manager PGM. The objective was to construct 3,000 apartments across the United Kingdom, under a more than \$1bn “build-to-rent” plan, to help tackle the housing crisis.



Accord tip

Rather than businesses needing to expand to take on additional capabilities that might be outside of their ‘sweet spot’, a business’ skillset can be expanded at a project level through partnerships and collaboration. For example, contractors can consider partnering with smaller, more agile firms adept at technology use and development to improve their digital capability and offer clients a more rounded value proposal.



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Individual businesses – Transformational developments in construction

Process improvement

ADVANCED BUILDING MATERIALS

PREFABRICATION

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PROCESS IMPROVEMENT

WORKFORCE PLANNING

What is it?

Beyond technology and innovations to construction methods, businesses have found other ways of improving practices to streamline delivery, improve communication and establish better commercial arrangements. These developments have helped many businesses to withstand disruption caused by COVID-19.

What does this look like in practice?

Some tangible examples of the types of process improvements adopted by businesses are provided below:

- Investing more time and money in planning and design, for example by integrating a multi-discipline project team early on (incorporating designers, engineers, contractors, operations and maintenance representatives, and the client) so that the implications of decisions can be fully understood and analysed from a number of important perspectives
- Rigorous monitoring of project time, scope and cost, allowing better insight into live issues and more robust lessons learned and trend analysis
- Applying innovative contracting models with balanced risk sharing, such as alliances and Early Contractor Involvement (ECI), ensures that contractors and others in the supply chain are not saddled with risks that they cannot mitigate. It also tends to create a project environment that is more conducive to innovation.



Partnering on display in NZ

The Accord has championed the use of collaborative contracting and partnering principles across New Zealand. The Accord's [Partnering Agreement](#) was launched to assist parties to embed these principles in their project.



'Bet the farm' projects carry a significant risk imbalance weighted heavily in favour of owners, placing existential pressure on contractors. All it takes is for one contractor to accept such a burden, and others follow suit in a vicious cycle. Recently, however, for complex, multi-year, mega-projects, contractors have been shifting to hybrid or cost-plus arrangements with lower liability for cost and schedule overruns. The pandemic accelerated the risk transfer away from contractors and also saw an unusually high level of cooperation, to cope with the increased impacts on cost and schedule.'

KPMG report, 'No Turning Back'



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What is lean construction and why do it?

Lean thinking has been applied with much success in many industries, particularly manufacturing. Broadly speaking, it can be characterised as techniques aimed at maximising value and minimising waste. Requiring a mindset of continuous improvement, lean construction can be defined in many different ways as it includes a range of different approaches, tools and techniques. According to the World Economic Forum, construction companies that have successfully implemented ‘lean’ principles and methods managed to cut project time by 30% and costs by 15%.

Four core principles underlie the use of lean methods in construction projects:



Case study shows SME adoption of lean principles

A small concrete foundation company, [TidySlabs](#), was able to implement lean principles by providing leadership training for employees at all levels of their organisation, which empowered employees to identify and implement improvement opportunities.



ALIGNMENT OF RESOURCES, MATERIAL AND INFORMATION FLOWS

Optimising the construction process by, for instance, identifying repeatable elements and sequencing the various work shifts accordingly. For example, the building could be divided into several sections to allow a value-creation flow based on the orchestrated movement of subcontractors and craftspeople through each section



COORDINATION AND HARMONISATION OF TAKT SPEED

Takt speed is, roughly, the work pace or rhythm; typically, work cycles vary from one day to one week. Synchronise the steps, identify and ease bottlenecks, and smooth the flow of construction work to avoid idle times by, for instance, sizing teams appropriately and moving re-work to night shifts or weekends.



JUST-IN-TIME PULL OF RESOURCES AND MATERIALS

Plan work at the “request” of a downstream “customer”. Ensure that the availability of materials is in sync with the progress of construction by, for instance, transporting materials “just in time” and to precise locations on the site. This approach also promotes flexibility, by allowing contractors to accommodate their clients’ last-minute decisions.



CONTINUOUS IMPROVEMENT OF PROCESSES

To minimise delays and defects, implement continuous monitoring and make use of regular feedback loops via, for instance, daily and weekly meetings and project steering routines.



Individual businesses – Transformational developments in construction

Workforce planning

ADVANCED BUILDING MATERIALS

PREFABRICATION

TECHNOLOGY & AUTOMATION

BUSINESS MODEL INNOVATION

PROCESS IMPROVEMENT

WORKFORCE PLANNING

What is it?

The construction industry is suffering from a well-known shortage of talent, particularly in key disciplines and outside of metro centres. External factors will also change the shape and nature of the workforce. The current scarcity of talent in the industry is only going to increase with anticipated demographic changes, and the skillsets required of workers in the industry will change dramatically with the introduction of technology.

So what does successful strategic workforce planning look like?

Planning for skills requirements is extremely difficult given the nature of the industry (i.e. resource requirements become evident at short notice following the award of a tender, and the execution of contracts typically requires the short-term integration of a transient workforce from multiple subcontractors).

Unsurprisingly, businesses are focusing on strategies to improve the retention and engagement of talent already within the industry, as well as recruiting newcomers:

- Strategic workforce planning requires contractors to take a long-term view of workforce demand based on the forward pipeline. To be useful, it needs to be granular enough to look at skills clusters and the impact that demographic changes and technology advancements will have, which should help to identify gaps and risks that need addressing

- On top of retaining and developing existing staff, recruitment activity needs to be smarter and reach beyond the industry by partnering with education institutions, focussing on improving the industry's image
- Smaller players lack capability and capacity to do this, and are reliant on other institutions to identify and close skills gaps. Governments can support this work by bringing together tertiary and training institutions to align the workforce development pipeline with long-term skills requirements.
- As the requirement on construction firms to embrace technology and new ways of working increases, it will be important to attract and retain talent into the industry that has the skillset to embrace innovation.





Individual businesses – Transformational developments in construction

Workforce planning

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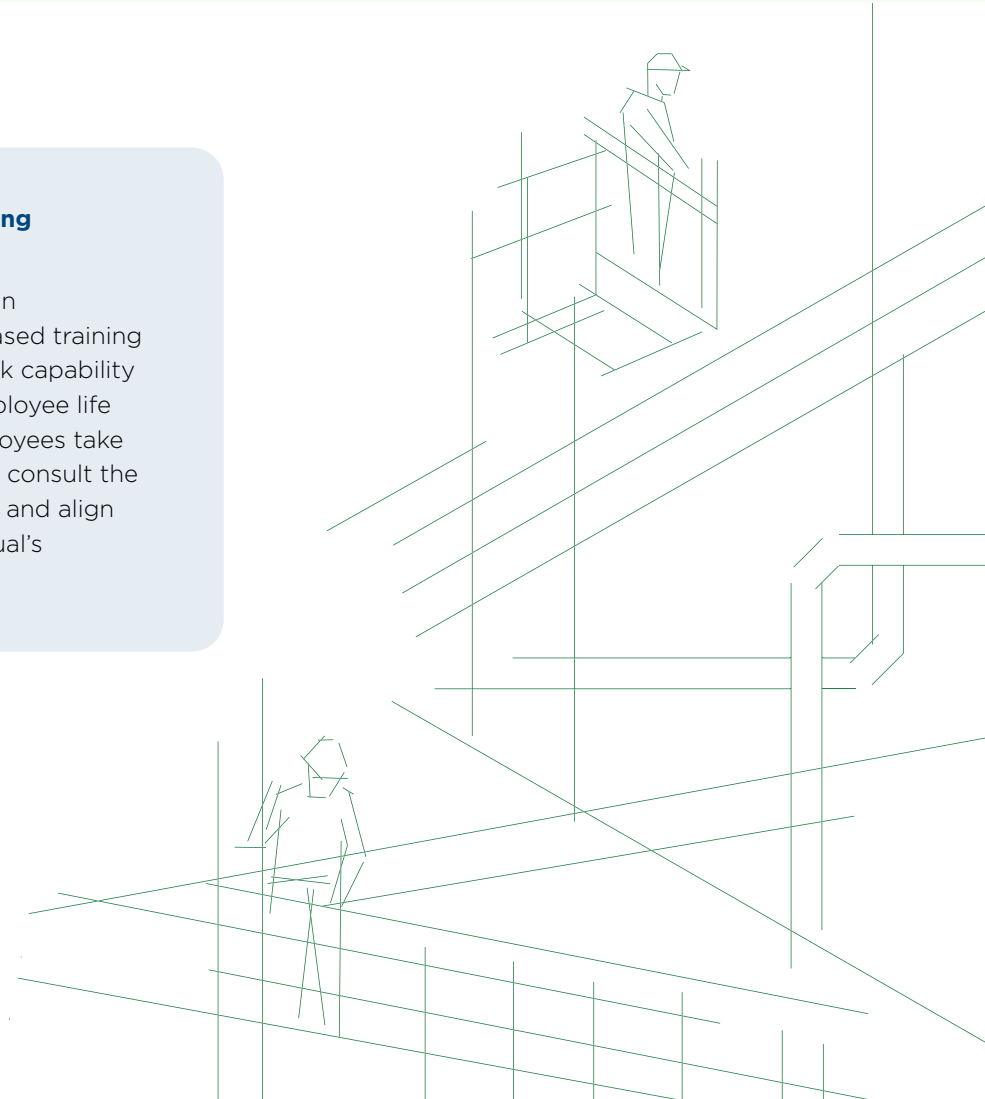
DPR Construction becoming an employer of choice

For several years in a row, DPR Construction has been ranked among Fortune's "100 Best Companies to Work For". Notable elements of the company's human resources strategy are a strong mission statement ("we exist to build great things") and progressive values (integrity, enjoyment, uniqueness and ever forward); title-less business cards to allow individuals to take on multiple roles and levels of responsibility; an open-office environment, including wine bars; and free use of company-owned vacation property.



Structured employee training programmes at Skanska

Skanska has implemented an organisation-wide, cloud-based training system to continuously track capability development along the employee life cycle. For example, as employees take classes, the supervisors can consult the system to monitor progress and align the content to each individual's development plan.



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Why is it important to diversify the construction workforce?

Internationally the construction industry has a relatively poor reputation as an employer, with inadequate diversity and little job security.

At a time of labour scarcity, one obvious path is to tap new talent pools by increasing diversity. Research indicates this would bring benefits beyond addressing labour shortages.

In KPMG's 2019 Global Construction Survey – Future-Ready Index, the organisations defined as 'innovative leaders' in the sector demonstrated significantly greater commitment to diversity. A number of studies have shown that, across multiple industries, companies with higher diversity outperform their peers in terms of revenue, profitability, innovation and staff turnover.

Observed benefits of a more diverse company culture

Enhances company performance

Companies with increased diversity are

36% 
more likely to **outperform their peers in profitability**¹

Increases revenue gains


Companies with more diverse management teams have

19% **higher revenues**² 


Fosters innovation

56% of big revenue companies strongly believe that **diversity helps drive innovation**³ 

Impacts recruiting

83% of candidates report that **diversity and inclusion is important in evaluating job offers**⁴ 

Reduces turnover

70% would consider finding a new job if their employer did not demonstrate a **commitment to diversity**⁴ 

Improves decision-making

Teams with inclusive leaders are **20%**  more likely to **make high-quality decisions**⁵

Sources: 1) "Diversity wins," McKinsey, May 2020; 2) "How diverse leadership teams boost innovation," Boston Consulting Group, 23 January 2018; 3) "Fostering innovation through a diverse workforce," Forbes Insights, page 5; 4) Yello white paper: Job seeker survey reveals what matters; 2019; 5) "Why inclusive leaders are good for organizations, and how to become one," Harvard Business Review, 29 March 2019.

KPMG



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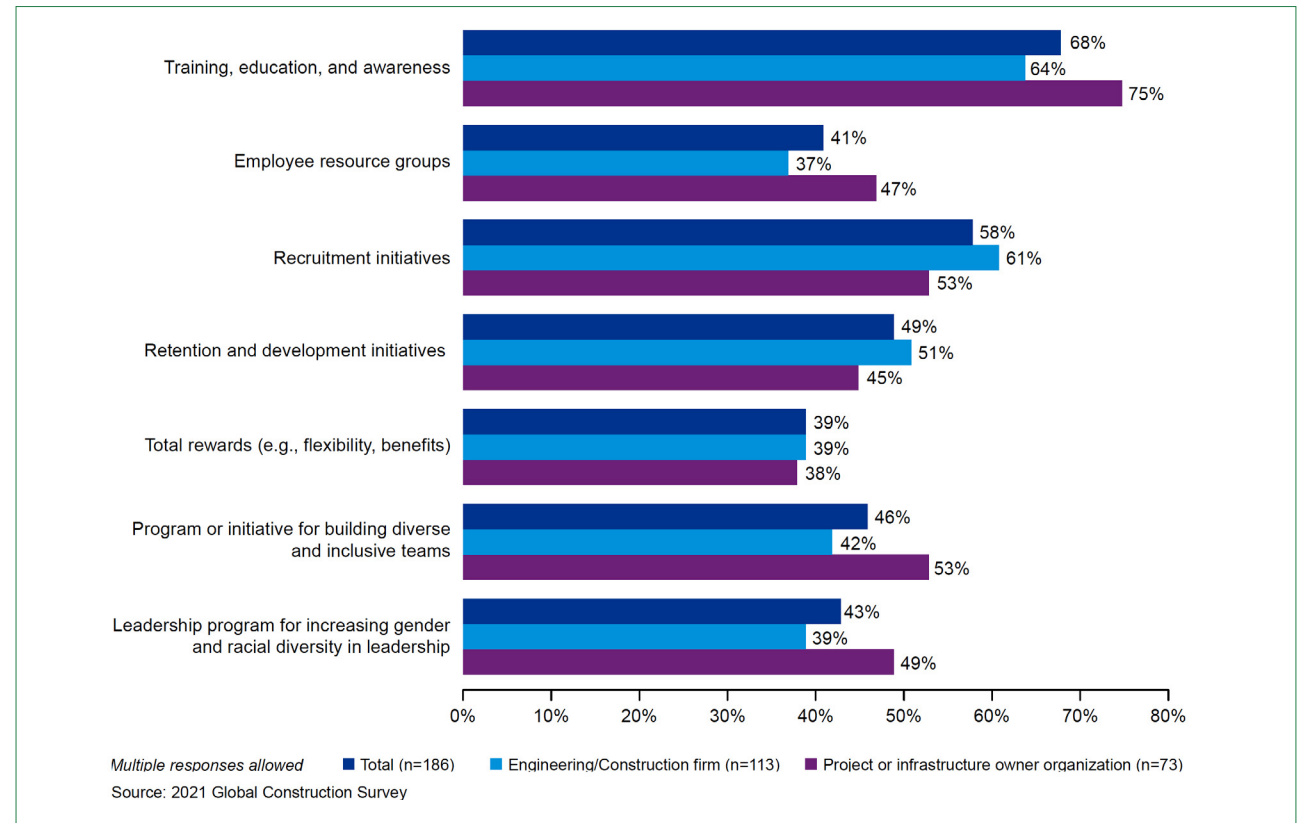
PROCESS IMPROVEMENT

WORKFORCE PLANNING

What are businesses doing to improve their diversity and inclusion?

There are large swathes of the population in many countries that could be brought into the workforce, but historically have not been recruited into the industry. Construction has not performed well historically in diversity and inclusion, and so organisations are only at the early stages of developing initiatives to address this. The graph to the right represents results from a Global KPMG survey, showing the steps that organisations are taking to increase the diversity of their workforce.

Which of the following workplace culture plans or initiatives does your company have, related to diversity, equity, and inclusion?



KPMG



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Multiple businesses Redesigning the value chain

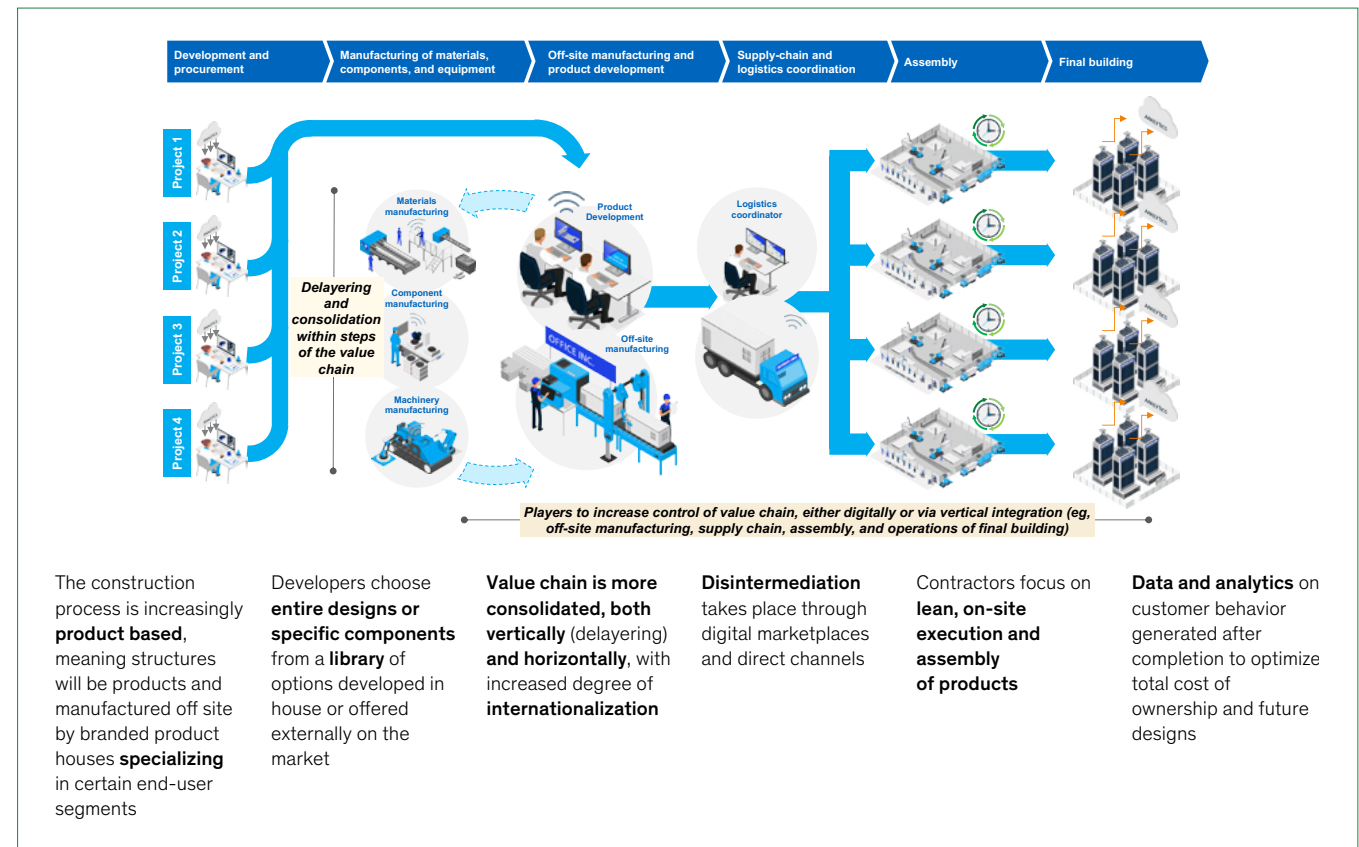
REDESIGNING THE VALUE CHAIN

IDENTIFYING CROSS-INDUSTRY COLLABORATION OPPORTUNITIES

Individually, the developments described above will be significant; however their cumulative effect should be far greater. If these developments are realised in a cohesive way, with businesses across the value chain collaborating on new ways of working, construction processes can change from being standalone, manual and unique to standardised, consolidated and integrated.

The construction ecosystem of the future

A more standardized, consolidated, and integrated construction process





Multiple businesses

Identifying cross-industry collaboration opportunities

Why does industry need to collaborate?

Without the strong collaboration that is required to generate robust global arrangements on things like standards, the construction industry will forfeit the productivity gains that a proper modernisation of the industry would bring. Collaboration across the industry will be required to profit from many of the innovations discussed above. As a highly fragmented industry with capabilities disaggregated across different types of organisations, collaboration will be required to create the foundations for new technologies and methods of construction to be widely adopted.

What does industry-wide collaboration look like?

Competitive tensions are required for a healthy and productive industry, which is why governments typically use laws and regulations to maintain competitive markets. However, the industry as a whole will benefit from collaboration in a number of key areas:

STANDARDS

The industry must identify key standardisation topics, for example standards in software systems, standard interfaces between prefabricated modules and components, standardised definition of costs, classifications and measurements to allow project benchmarking, and standards in legal arrangements, such as alliances and ECI contracts.



Atkins bringing players together on standards

Global professional services firm Atkins is acting as a convener for an ISO Steering Group, with members from private construction companies, government and academia. It advises on industry standards for information management, specifically on the use of BIM during the construction phase of projects.

DATA AND BEST PRACTICE SHARING

Increased knowledge sharing among peers can help to close the gap between technological development and application. This could be facilitated through a national or international platform for sharing among firms. A joint effort based on shared commitments – on deploying new technologies, for instance – could help to reduce the risk of investment for individual companies.



Desso sharing circular practices with a larger network

Desso (a Tarkett company) works closely with one of its yarn suppliers, which turns recovered post-consumer carpet fibres into new yarn. The two companies have shared their experiences within the Circular Economy 100 network – an innovation programme bringing together companies, governments, cities and academic institutions – in an effort to inspire circular-economy thinking among other companies.



Multiple businesses

Identifying cross-industry collaboration opportunities

REDESIGNING THE VALUE CHAIN

IDENTIFYING CROSS-INDUSTRY COLLABORATION OPPORTUNITIES

CROSS INDUSTRY COLLABORATION ACROSS THE VALUE CHAIN

The current tendency is to push risk down the value chain instead of pulling innovations out of it. An independent platform bringing different players together could focus on creating horizontal linkages.



Cross-functional collaboration in the Canadian Construction Association

The Canadian Construction Association, the national voice for the construction industry in Canada, represents more than 20,000 member firms in an integrated structure of about 70 local and provincial associations. Its [Lean Construction Institute](#), founded in 2015, provides a platform for all supply-chain participants – owners, designers, contractors, traders and allied services – to collaborate on the development and application of lean tools and techniques along the building life cycle.

MARKETING THE INDUSTRY

In an industry with high turnover and low diversity, there is an opportunity for employers to work together to encourage people to enter the industry. There is also an opportunity to coordinate engagement with civil society, involving the community on discussions about construction's affects in general as well as on specific projects.



Coordinated marketing by the Considerate Constructors Scheme

The [Considerate Constructors Scheme](#) – a non-profit organisation founded by the United Kingdom construction industry to improve its image – addresses concerns relating to the general public, the workforce and the environment. It has established a Code of Considerate Practice to guide the behaviour of its members.

A COMMON APPROACH TO PROJECT MANAGEMENT

Developing a common framework for project management in construction, either within an organisation or ideally across a jurisdiction, allows more standardised training, tools, and sharing of knowledge and best practice.



Businesses and government

Government's role in paving the way

Why does government need to get involved in industry transformation?

As a regulator and policy-maker, a national government can influence the construction industry in various ways. Primarily, it acts as a warden of health, safety and environmental conditions in and around construction. It can influence the speed and direction of technology development and diffusion, and it can influence the value-chain as a significant purchaser of construction services.

What are the key roles government needs to play?

To encourage and support transformation efforts, governments can contribute in the following ways:

SMART REGULATION

Enhance competition and productivity by simplifying and harmonising building codes and standards, ensuring that they are regularly updated (to reflect technology, product developments and new methods of construction) and outcome-oriented. Permit and consent processes can be sped up through digitisation, and by using risk factors to determine approval processes.

CONVENING AND FACILITATING CRITICAL DISCUSSIONS

As an objective player in the industry with a holistic focus on economic and social outcomes, government can bring industry together to focus on the biggest issues. Transformation will be most effective where industry and government are able to forge a partnership based on a common vision for the sector. Both groups will have specific objectives, however they will need leaders that can take a 'best for industry' perspective and work towards system change.



The Construction Accord as a platform for sector-wide collaboration in NZ

At its outset, the Accord brought industry and government together under a shared vision and principles for the industry. The Accord acted as a platform for industry and government to resolve challenges faced during the initial Covid-19 outbreak in 2020, and continues to convene the industry on critical issues such as workforce shortages and supply chain constraints.



Amalgamating under a common purpose with Constructing Excellence

Following the UK government's milestone reports on issues in the construction industry and government's role, particularly in procurement (*Constructing the Team - Latham* and *Re-thinking Construction - Egan*), an industry-wide organisation was brought together in 2003 under the banner Constructing Excellence. It brought together bodies from academia, private and public sectors under a common purpose of reforming the industry.



Businesses and government

Government's role in paving the way

PROMOTION AND FUNDING OF R&D

Governments can create a more fertile environment for developing technological innovations by providing appropriate support to companies and academia, such as start-up funding/venture capital and tax incentives. As well as upfront investment, government can help to disseminate these innovations across the industry, for example by providing financial support for demonstration projects involving new technologies and processes or setting up incentive schemes for innovation deployment.



Callaghan Innovation supporting new products and innovations in NZ

A number of innovative products are already hitting the market in New Zealand. There are several government and non-government initiatives to support and fund innovation, for example [Callaghan Innovation](#).



Providing a research fund for industry at the US Federal Highway Administration

In 2015, the US Federal Highway Administration provided – through multiple schemes – funding of almost \$800 million for hundreds of research projects related to improving the design, construction and operation of roads, tunnels and bridges.



Covering costs to de-risk business improvements in Singapore

The Singapore government, through its Construction Productivity and Capability Fund, partly reimburses businesses the cost of:

- BIM software/hardware, consultancy and training
- equipment and machines that improve productivity by at least 30%
- development projects featuring process innovations



Businesses and government

Government's role in paving the way

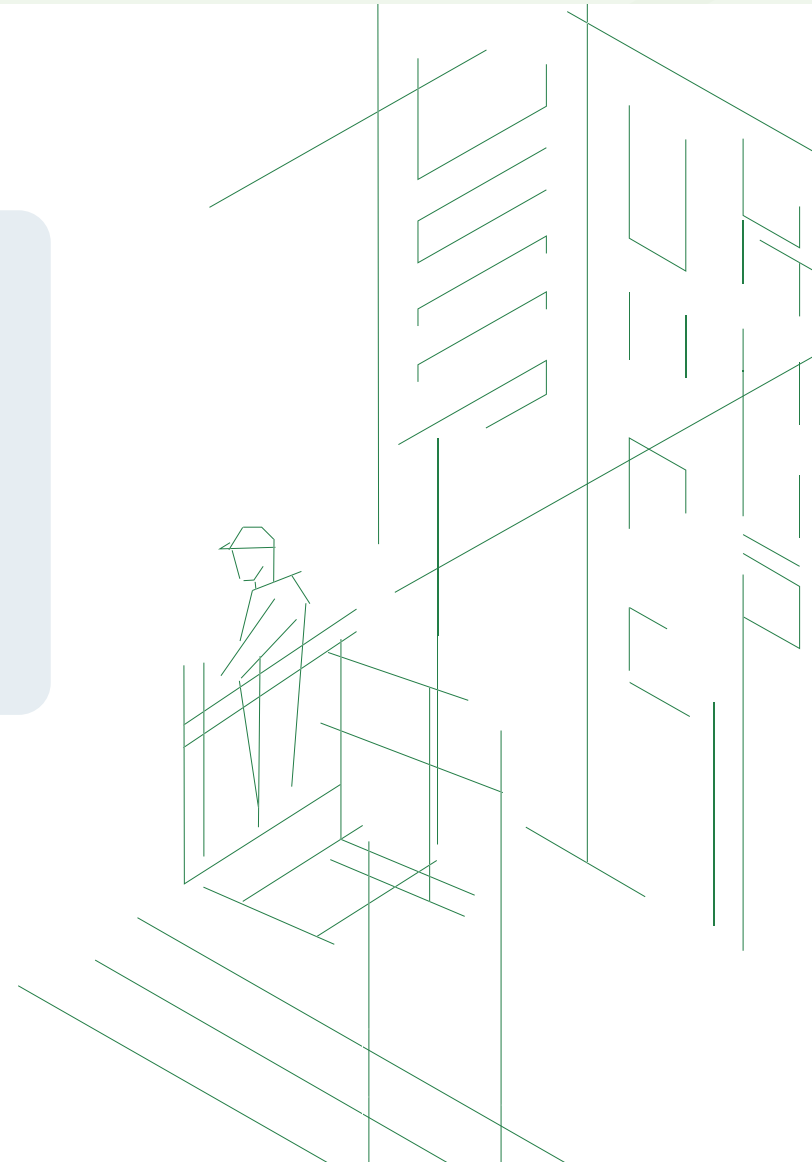
PUBLIC PROCUREMENT

As the industry's most important client, governments need to use their spending power to drive change in the industry by ensuring procurement processes and requirements stimulate innovation and whole-life-cycle optimisation. For major projects in particular, government can create innovation-friendly and whole-life-cycle-oriented procurement. This can be done by ensuring that bids are evaluated based on total cost ownership (TCO), i.e. lifecycle or whole-of-life costing, or require new materials and technologies to be part of the proposal. This is most achievable when delivered through collaborative delivery models. 'Flagship' projects can then be used to generate, capture, and replicate innovative ideas and make them available to the industry.



Capturing lessons and innovation for the industry at Crossrail

The Crossrail project in London systematically generates, captures and replicates innovative ideas and eventually translates them into practical innovations and industry standards. It also aims to raise the bar for other construction projects by making these ideas, technologies and practices available to the industry as a whole.





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