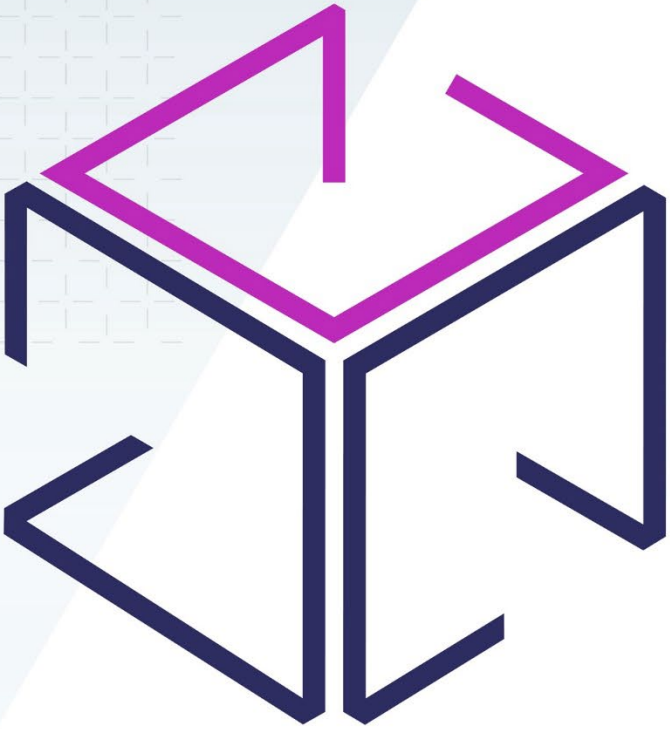
Workforce Foresighting Hub



Adopting Manufacturing Led Construction.

A Workforce Foresighting Hub findings report in collaboration with MTC.

Date: September 2024

UKRI Innovate UK

Right skills, right time, right place

Acknowledgements

Attributions - The Workforce Foresighting process integrates data from the following international data sets:

IfATE – Institute for Apprenticeships and Technical Education, England

ESCO – European Skills, Competencies, Qualifications & Occupations, EU

ONet – Occupational Networks Online, USA

In accordance with licence and publishing requirements of these organisations for the use of their data sets, the Workforce Foresighting Hub team states that –

The IfATE data used contains public sector information licensed under the Open Government Licence v1.0.

The ESCO data is used in accordance with the EUROPEAN UNION PUBLIC LICENCE v. 1.2 EUPL © the European Union 2007, 2016

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Any errors, omissions and incorrect data are the responsibility of the Workforce Foresighting Hub team and all queries should be addressed to info@iuk.wf-hub.org

The method and process used in the Workforce Foresighting process is under development and there may be errors and omissions in the data provided.

This report was produced following workshops undertaken October – December 2023 using the data set and tools available at that time.

Contents

1.0 Executive Summary

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Section	Title
1.1	Foresighting cycle summary
1.2	Organisational change
1.3	Future Occupational Profile highlights
1.4	Specific areas of concern
1.5	Recommended next steps
1.6	Introduction to the visualisation tool

1.1 Foresighting cycle summary

The construction sector is a major economic driver and one of the largest contributors to UK GDP, contributing circa 8% to the UK economy. It is also one of the largest employers, with over 2.7m people working within the sector, with CITB estimating that this number is required to grow by 225,000 between 2023 and 2027 (Construction Industry Training Board (CITB), 2023).

The long-term pipeline for infrastructure and construction is positive overall but also requires a change in the way assets are delivered, due to well documented challenges currently experienced within the sector. The UK construction sector is undergoing a transformative period marked by sustainability initiatives, enhanced efficiency measures, regulatory changes, and an unwavering commitment to safety. This evolution has ushered in innovative technologies and construction processes that promise to revolutionise the industry.

The construction sector is moving towards a manufacturing led approach to delivery, that seeks to leverage some of the benefits of manufacturing, particularly productivity, quality, and health and safety. Currently within the construction industry, raw materials are delivered to site and then assembled, with a heavy reliance on the skill of the personnel involved. A manufacturing led approach would support a move from being less reliant on the skills of individuals, towards the use of standardised processes that can be used to assemble standardised products in a repeatable and reproducible manner. To enable the successful deployment of this approach, it is imperative that the UK has the skills, knowledge, and experience to leverage their potential benefits.

The cycle was sponsored by two key stakeholders, Offsite Alliance and MOBIE, who are ideally positioned within the sector to ensure that its findings and key recommendations for industry and education providers are actioned appropriately, ensuring future impact. MTC acted as the convener of the cycle, identifying a need within the construction sector to run a foresighting cycle and were capably supported by Dynamic Knowledge as Lead Educator and Mott McDonald inputting as a Lead Technologist.

The findings from the workshops and initial analysis completed to date indicate several shifts in the capabilities required by the Construction sector, with an emphasis on both prototype and process development across the supply chain, which is expected given the need for new and innovative ways to deliver assets for clients. The Future Occupational Profiles (FOPs) generated by the AI tool, currently have low suitability and alignment with current standards and qualifications, which was expected for roles such as: Construction Technologist, Value Procurement Specialist and Sustainability Professional. However, there are several FOPs where a greater level of suitability and alignment would be expected due to the roles being mature within sectors across the UK, such as: Manufacturing Operative, Manufacturing Technician and Construction Project Manager. These FOPs will need to be analysed further to understand the nature of the misalignment and ascertain whether this will be realised in the future or there are gaps in the capability set.

The Foresighting process has enabled the engagement of Industry, Technologists and Educators to convene with the collective aim of ensuring that the UK has the skills and competencies to serve the future needs of the Construction sector. Engagement with the 3 above mentioned groups of individuals was limited in certain workshops and this may have had an impact on the data set and cycle. It is therefore recommended that the data set and outputs are tested with a wider industry audience, than those convened by the Foresighting cycle, to test the data set, to ensure it is truly reflective of the changes within the sector. It is paramount that the cycle is used as a springboard to continue collaboration between the

parties, resulting in a continual evaluation of the sector's future training and educational needs.

As the foresighting process is a research and development project, there are a number of key areas that should be considered for future cycles as lessons learned:

- Continuous improvement of the Foresighting process. Future cycles should incorporate a clearer capture of the current state of workforce capabilities to facilitate more accurate comparisons.
- Enhanced stakeholder consultation during the initial phases of the Foresighting cycle can seed the process with relevant capability sets, reducing the need for extensive quality assurance later.
- Allowing adequate time for technologists to quality assure data outputs during early workshops can streamline the process and reduce the need for subsequent data cleansing.

1.2 Organisational change

Organisations within the construction sector must evolve their capabilities to align with future requirements. This involves not only enhancing existing skills but also adopting new ones to support the implementation of advanced technologies and processes. These changes are necessary to maintain competitiveness and efficiency across the value chain.

Functional Shifts

The Foresighting process identified five primary functional areas where organisational changes are most pronounced:

1. **Design**: The design function will see an increased emphasis on new product engineering and evaluation ahead of development and implementation phases. This shift reflects a need for more innovative and adaptable design capabilities to meet future demands.

2. **Implementation**: Organisations will experience changes in their implementation functions, primarily due to greater adoption of new technologies and increased product sales volume. This necessitates a focus on scaling production capabilities efficiently.

3. **Logistics**: As production scales up, logistics functions will need to be adapted to ensure smooth procurement, delivery, and materials management. This includes integrating advanced supply chain management practices to support higher production levels.

4. **Support**: The support functions may see a relative decrease in prominence. However, this could be attributed to data gathering omissions and requires further analysis to confirm.

5. **Enterprise**: The enterprise functions will require increased attention to strategic planning, leadership, management, human resources, and compliance. This is essential for navigating a competitive and regulated market environment.

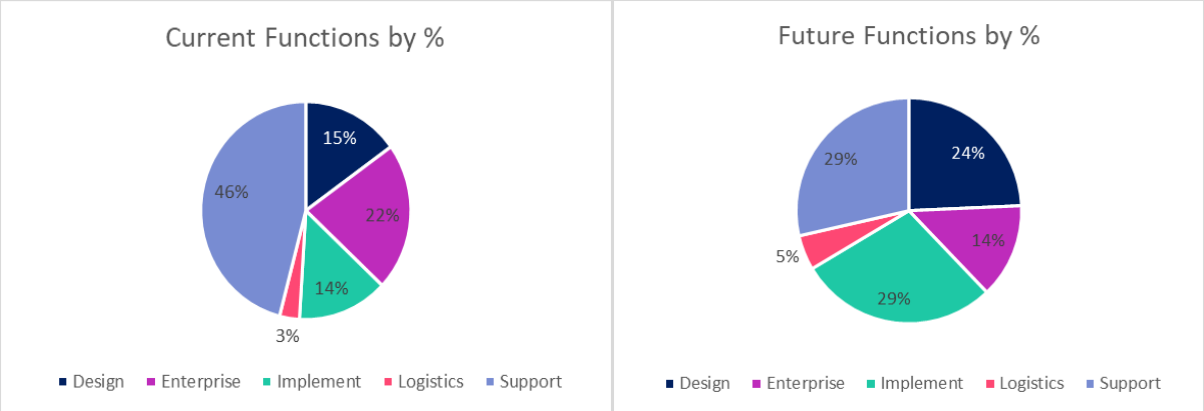

Figure 1: Current and Future Supply Chain - Capability Functions Summary by %

1.3 Future Occupational Profile Highlights

The Future Occupational Profiles (FOPs) developed in this cycle serve as crucial tools for aligning current workforce capabilities with future industry needs. These profiles were created through workforce Foresighting workshops, combining capabilities from existing occupational standards and new data gathered during the process. The primary purpose of FOPs is to provide a framework for comparing current occupations with future requirements, facilitating the identification of skills gaps, and informing workforce development strategies.

Key Findings:

- **Role Adaptation and Development**:
  - FOPs outline the expected evolution of current roles, suggesting necessary adaptations to meet future demands. This includes identifying areas where current occupational standards require updates and where new capabilities should be incorporated
  - Employers can use FOPs to evaluate and modify existing apprenticeship standards, ensuring that their workforce is equipped with the skills needed for future roles. This can be achieved through targeted short courses and continuous professional development (CPD) initiatives.

- **Education and Training Alignment**:
  - Educators are encouraged to review and adapt current curricula based on the requirements highlighted by FOPs. This ensures that new entrants to the workforce are trained in line with future industry needs.
  - The alignment between current educational provisions and FOPs is quantitatively evaluated using fit and surplus metrics. These metrics measure how much existing standards cover the FOPs (fit) and identify any redundant material not required for future roles (surplus). An optimal alignment would have a high fit and low surplus.

- **Priority Future Occupational Profiles**:
  - The report identifies priority FOPs across various role levels, including Technician/Operator, Supervisor/Coordinator, Technical Professional, and Technical Specialist roles. These priority profiles highlight the most critical areas for development to meet future capabilities.

- **Data-Driven Insights**:
  - The development and refinement of FOPs are supported by a robust data set, including international occupational standards and employer feedback. This data-driven approach ensures that the profiles are relevant and comprehensive, reflecting the real-world needs of the industry.

  - Visualisation tools and detailed instructions provided in the report enable stakeholders to interact with and understand the data, supporting informed decision-making for workforce planning and educational program development.

In summary, the Future Occupational Profiles offer a strategic approach to bridge the gap between current workforce capabilities and future industry needs, providing actionable insights for both employers and educators. It is important that the implications of changes underway in the industry are understood by both industry and trainers to inform a conversation about how those changes may create new roles and change some existing roles, to ensure the industry is fit and adaptable for a changing future. These profiles are instrumental in guiding the adaptation of roles and the development of educational content, ensuring a well-prepared and future-ready workforce.

1.4 Specific areas of concern

The report identifies several critical areas requiring attention to ensure that the construction industry's workforce can meet future demands. These areas are based on the comparison of current Institute for Apprenticeships and Technical Education (IfATE) standards with the Future Occupational Profiles (FOPs). The specific concerns are as follows:

- **Low Suitability of Existing Standards**: Many current occupational standards exhibit low suitability for future roles. Notable examples include:

  - Operations Manager (Client Organisations)
  - Design Technician
  - Construction Project Manager
  - Construction Technician
  - Manufacturing Technician
  - Sustainability Professional (Design and Consultation Organisations)
  - Integration Technician
  - Construction Technologist (including Integration)
  - Value Procurement Specialist (Integrators Organisations)
  - Project Delivery Coordinator (Installer Organisations)
  - Process and Quality Engineer (Manufacturers)

- **Mismatch in Skill Requirements**: There is a significant gap between the skills and competencies required for future roles and those provided by current standards. This gap highlights the need for substantial updates and revisions to the existing training frameworks and curricula to ensure they align with emerging industry needs.

- **Need for Enhanced Collaboration**: The findings emphasize the necessity for increased collaboration between industry stakeholders, educators, and standard-setting bodies. Such collaboration is essential to develop and implement new standards that can adequately prepare the workforce for future challenges. This includes regular updates to training programs and the incorporation of new technologies and methodologies.

- **Adaptation of Training and Development Programs**: Current training and development programs need to be adapted to include short courses and continuous professional development (CPD) opportunities. This adaptation will help in bridging the gap for incumbent workers and those transitioning into new roles.

- **Feedback and Continuous Improvement**: The Foresighting process should be continuously updated based on feedback from employers and other stakeholders. This iterative process will help in refining the Future Occupational Profiles and ensuring that the workforce development plans are responsive to evolving industry requirements.

Addressing these areas of concern is crucial for the construction industry to effectively navigate future challenges and leverage new opportunities. This will require a coordinated effort across various sectors to update and refine educational and training standards continually.

To Summarise:

- None of the future profiles have high levels of suitability and coverage in the current IfATE occupational standards, this is due to there not being off-site occupational pathway or standard available.
- 3 out of 23 future profiles have some levels of suitability and partial coverage in the current IfATE occupational standards, the potential requirement could be to update and create new standards which will then inform impact on qualifications and training but also should impact employer workforce planning.

1.5 Recommended actions

Use the Future Occupational Profiles to:

- To address skill gaps, leverage Future Occupational Profiles (FOPs) to update standards and provide CPD courses for current and transitioning workers.
- Advocate for revised standards aligned with future workforce needs.

We recognise that more input is required from regulators and the construction community in order to address the skills gaps that are identified across the whole supply chain. Failure to address these gaps will risk shortages in skilled workers, hindering the UK's overall construction objectives.

Skills gaps are concerned with the gaps in employers' own workforce, whereas skills shortages are concerned with the difference in labour market demand and supply. For reporting purposes, we use 'skills gaps' generically to cover gaps, shortages and mismatches and provide findings which provide insight into each issue.

The recommendations in this report emphasise the importance of immediate and coordinated efforts by educators, employers, and other stakeholders to address the anticipated skills gap in the construction sector.

	Topic	Actions	Who	When	Result
Short Term Actions	Reskilling and Upskilling Current Workforce	Tailor course content to match new capabilities with existing occupational standards, focusing on design and other lifecycle activities.	Educators, Awarding Bodies, Employers	Prepare ahead of the scale-up need	Availability of short-term training for the current workforce to meet immediate technology demands.
	Recruitment from Other Industries	Identify and reskill individuals with transferable skills from other sectors, particularly for high-demand roles such as Maintenance and Operations Engineering Technicians.	Employers, Training Providers	Immediate	Mitigation of workforce shortages in high-demand areas through targeted recruitment and training initiatives.
Medium term actions	Integration of Future Skills Training	Formalise changes to occupational standards and training programs for new entrants, integrating future skills requirements defined by the Future	Educators, Awarding Bodies, Employers	As soon as possible for prioritised FOPs	Development of training programs that meet both current and future skills needs, reducing lead time for new workforce entrants

		Occupational Profiles (FOPs).			
	Modular Approach to Course Updates	Implement modular changes to existing courses rather than complete redesigns, facilitating quicker adaptation to evolving skills requirements.	Educators, Training Providers	Ongoing	Flexibility in educational programs, enabling rapid response to industry needs.
General Actions for Educators	Assessment and Feedback	Review Institute for Apprenticeships and Technical Education (IFATE) standards and relevant qualifications with employers, providing feedback and identifying gaps.	Educators, Employers	Ongoing	Comprehensive understanding of current training provisions and identification of areas for improvement.
	Commissioning New Continuing Professional Development (CPD) Courses	Evaluate existing CPD provisions, commission new courses where necessary, and facilitate collaboration to maintain a unified approach.	Educators, Training Providers	Short-term	Enhanced CPD offerings to upskill current workforce members across all role families.
Additional Recommendations	Dissemination of Findings	Set up a working group to create an action plan, share findings widely among stakeholders to influence workforce development initiatives.	Convener, Sponsor, Stakeholders, Industry Groups	Following Publication	Broad access to insights and strategic direction for workforce initiatives
	Ongoing Review and Adaptation	Regularly review findings with stakeholders and adapt Future Occupational Profiles to better fit emerging roles	Stakeholders, Sponsor Leads, Participants	Before Formal Publication	Robust and validated actions.

Table of abbreviated recommendations leading to action:

A Review and Dissemination of Findings	Convener and Sponsor to set up working group to take the findings and recommendation and create an action plan and advance through the Skills Value Chain to cause action. It is essential to share the findings widely among stakeholders, industry groups, and local skills bodies. This will promote access to the insights gained and influence the strategic direction of workforce development initiatives.
B Short-term action	As part of the working group, educators and employers should collaborate to deliver timely short-term training solutions for the current workforce. This is to cause action regarding developing short term training solutions for the future workforce. This includes developing and offering Continuing Professional Development (CPD) courses that address immediate skills gaps and ensure workers are equipped with the necessary competencies.
C Mid-term actions	The ongoing working group mid-term action planning should include a concerted effort to integrate new skills and knowledge into existing training programs. Educators and employers need to update curricula and training standards to reflect the evolving demands of the sector, ensuring that both current employees and new entrants are adequately prepared.
D. General action for Educators to support Employers' demand for future skills	Employers and educators must work together to review and influence the update of IfATE standards and relevant qualifications. This involves using the insights from the Foresighting process to inform the development of new standards and qualifications that align with future workforce needs. This will contribute to the working group skills framework.
E Further foresighting subjects	The working group should seek additional sponsors and propose further subjects for Foresighting. This continuous cycle of Foresighting will help to stay ahead of emerging trends and technologies, ensuring the workforce remains adaptable and prepared.
F Lesson Learnt	The Workforce Foresighting Hub should promote the value gained from participation in workshops. Sharing lessons learned will help to refine the Foresighting process and enhance the quality of future outputs
G Recommendations to Workforce Foresighting Steering Board	Through engagement with the working group, the Workforce Foresighting Steering Board should encourage and enable collaborative solution development by maintaining a focus on both current needs and future requirements. The steering board should facilitate ongoing dialogue among stakeholders to ensure that the actions taken are dynamic and responsive to changing industry landscapes.

By implementing these recommended next steps, stakeholders can ensure that the sector is supported by a skilled and adaptable workforce, capable of meeting the challenges and opportunities of a rapidly evolving industry.

1.6 Introducing the Visualisation Tool

The Workforce Foresighting Hub's Visualisation Tool is a powerful, innovative system, which will enable the reader to explore and analyse Foresighting data to determine the capabilities required for future roles. Links throughout this report make it easy to identify existing standards which meet the needs of these future roles and pinpoint where new standards are necessary to develop a skilled workforce equipped to adopt new technologies.

The data is generated by the Foresighting cycles, integrating the expertise of technologists/domain specialists, employers, and educators. The data informs the development of future curriculum and course content as determined by the action plan. Using AI tools validated by human oversight, and by linking to external data sources, the tool identifies differences at the level of occupation/role as well as detailed changes required to knowledge, skills and behaviours thus delivering insights for learners, providers, creators, and assurers of skills.

Detailed instructions on how to use the Visualisation Tool can be found in the appendix.

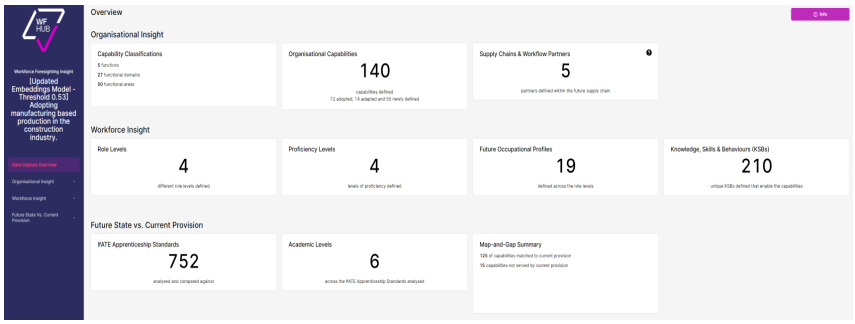

Figure 2 - Visualisation Tool Dashboard

Figure 3 - Supply Chain Capabilities Identified During the Workshops

2.0 Aligning the Challenge and Solutions with national priorities

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Section	Title
2.1	Positioning and context of national challenge
2.2	Background information - reports that informed the consider, identify, etc
2.3	Key Stakeholders in industry and government
2.4	Potential and prioritised Solutions – Technologies
2.5	Expected timing of solutions to impact workforce
2.6	Understanding the current state - industrial process / current supply chain
2.7	Prioritisation and choice of Foresighting topics based on these solutions
2.8	Catapult / Sponsor summary / profile page

2.1 Positioning and context of national challenge

The construction sector is a major economic driver and one of the largest contributors to UK GDP, contributing circa 8% to the UK economy. It is also one of the largest employers, with over 2.7m people working within the sector, with CITB estimating that this number is required to grow by 225,000 between 2023 and 2027 (Construction Industry Training Board (CITB), 2023). This growth is vital to the delivery of national infrastructure such as hospitals, schools, and transport links, as well as homes for the ever-growing UK population, which is due to increase by 9.9% (6.6 million people) between now and 2036. (Office for National Statistics (ONS), 2024)

The long-term pipeline for infrastructure and construction is positive overall but also requires a change in the way assets are delivered, due to the well document challenges currently experienced within the sector. The UK construction sector is undergoing a transformative period marked by sustainability initiatives, enhanced efficiency measures, regulatory changes, and an unwavering commitment to safety. This evolution has ushered in innovative technologies and construction processes that promise to revolutionise the industry. However, the successful integration of these innovations hinges on aligning the workforce's future skills with emerging technologies. Without a concerted effort to develop the workforce's capabilities to meet these emerging demands, the construction sector faces the risk of a critical skills gap and a bottleneck in the adoption of transformative technologies, potentially impeding its continued growth.

2.2 Background information - reports that informed the consider, identify and preparation of the cycle

Over recent years, the number of reports and calls for action within the construction sector have been rapidly growing, with there being a number of key documents and reports that outline the Government's commitment to improve the delivery of their built environment assets, with one key thread being the inclusion of 'Modern Methods of Construction' (MMC) and 'Offsite Manufacturing', as the key vehicle to achieving this. Several of the key reports and a synopsis of their influence on this Foresighting Cycle can be found below:

Transforming Infrastructure Performance Roadmap
(Infrastructure and Projects Authority (IPA), 2021)
TIP's Roadmap to 2030 describes a vision for the future in which priority is given to the societal outcomes needed, the use modern digital approaches and technologies, as well as the improved delivery models to achieve them. It recognises that to achieve its vision, systems have designing, constructing, and operating in the built environment must be more resilient, adaptive, and sustainable. With an active pursuit of value-based procurement and decision-making, high quality, sustainable, resilient infrastructure is central to the government's vision for the future of the UK. The Government has also adopted a presumption in favour of offsite and with this comes several new delivery approaches, including platforms and MMC, that offer a wide range of benefits, including those beyond just improving project delivery.

One of the key themes for delivering the TIP programme surrounds building expertise and capability in the UK, investing in UK skills, technology, and innovation. Developing and deploying people with the skills, expertise and capability to act as clients and supply chain

providers to deliver high quality, balanced outcomes in a complex and multi-stakeholder environment.

The Construction Playbook (UK Cabinet Office, 2022)
The Construction Playbook is the result of extensive collaboration from across the public and private sectors to bring together expertise and best practices, to transform the way Government assesses, procures, and manages public works projects and programmes. It builds on the Infrastructure and Projects Authority's recently published flagship change programme 'Roadmap to 2030' and supports the government's ambition to transform our infrastructure networks over the next decade and beyond so we can build back better, faster, and greener.

The Playbook seeks to harness existing best practice and learn from this to drive progress and strengthen the health of the sector, including addressing low levels of productivity and future skills shortages. It outlines 14 key policies to drive better, faster, greener delivery through transforming delivery to a safer, more innovative, manufacturing-led approach which will increase the end-to-end speed of projects and programmes.

The government's Construction Playbook strongly promotes the use of MMC in public sector contracting, with an expectation that MMC methods are the default approach in all appropriate contracts.

Analysis of the National Infrastructure and Construction Pipeline 2023 (NCIP)
(Infrastructure and Projects Authority (IPA), 2023)
The NCIP provides an assessment of the expected infrastructure assessment over the coming decade, providing industry with a predicted spend to support with investing in the right skills, technologies, and practices for the future. The pipeline forecasts an upper estimate of £775 billion of investment in infrastructure over the coming decade, with over £60bn associated with projects that contain 'MMC' and offsite manufactured solutions. The projects included in the pipeline have a broad range of approaches, technologies, and innovations such as automated design or offsite construction, all with a focus on improving value and efficiency in construction.

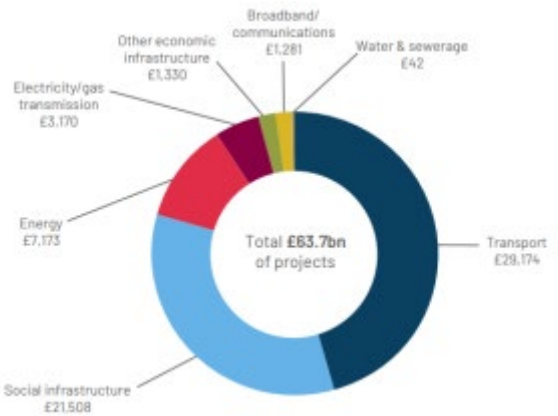

Figure 4 - Planned investment in the pipeline to include some delivery via MMC (Infrastructure and Project Authority (IPA), 2024)

This pipeline provides a framework against which both Government and Industry can invest in technologies and the associated skills and competencies, developing new talent. The skills challenge is a huge one, both at professional level and in most of the building trades, as the report shows.

CLC Industry Skills Plan (Construction Leadership Council (CLC), 2023)
CLC work in collaboration with Government and organisations with a vision of a new era of deliver in the built environment, including ensuring the sector has the resilience to grown, attract and retain talent amongst other key initiatives. The skills plan aims to offer short term and long-term solutions to skills challenges, looking to deliver the 225,000 extra workers required by the UK (Construction Industry Training Board (CITB), 2023), building on three aligned priorities: culture change; routes into construction and built environment; competence and future skills.

CIC diversity and Inclusion (Construction Industry Council (CIC), 2024)
The sector is currently a poor reflection of diversity of today's society across the UK, with the sector consisting of white males, with the age profile peaking between 50 & 64 years old. This means that construction will lose a quarter of its workforce - over 500,000 UK-born workers - in the next 10-15 years (Construction Industry Council (CIC), 2024). These new deliver methods help to open the construction sector to a more diverse workforce by providing a safer and more controlled working environment than traditional building sites, particularly for women and people with disabilities, who have historically been underrepresented in the sector.

2.3 Key Stakeholders in industry and government

There are several key stakeholders and voices within both industry and government who are championing the incorporation of a manufacturing led approach to construction and ensuring that there is a future workforce that has the skills and competencies to support this transition in the coming years.

Industry
Mark Farmer wrote the report 'modernise or die' in 2016 that details the UK construction labour model, focusing particularly on housing, that highlights challenges encountered because of survivalist business model, the absence of alignment between industry and client needs and of the incentives and means to invest. The consequence of this has been underinvestment in training and development, innovation and raising productivity.
Layout 1 (constructionleadershipcouncil.co.uk)

CLC work in partnership with Government and organisations of all sizes across the industry to ensure the construction sector has the voice, support and resilience needed to grow, improve productivity, attract, and retain talent, and successfully transition to Net Zero.

CITB is the industry training board for the construction sector in England, Scotland, and Wales, with the remit of supporting the construction industry to attract talent and to support skills development. They hold a key role in supporting the industry to train and develop its workforce, ensuring that a training and skills system is developed that meets its future needs.

BE-ST, formerly Construction Scotland Innovation Centre, support the built environment sector to access and grow new skills specifically needed for a transition to a zero-carbon built environment, including both new build and retrofit.

Government
The Ministry of Housing, Communities and Local Government (MHCLG) invest in local areas with the aim of driving growth and creating jobs, whilst also delivering the homes that the UK needs and overseeing local government, planning, and building safety. The well documented growing population in the UK, and the failure to build the number of homes to keep up with

this unprecedented demand, will require governmental support to advert a housing crisis. MHCLG will be instrumental in supporting the outcomes and recommendations of this report, with respect to both the delivery of future homes to meet demand and the creation of local jobs to achieve this.

Infrastructure and Projects Authority (IPA) are a vital component in ensuring that there are the relevant skills and competency available within the sector, as they deliver a vast range of UK infrastructure projects, including: railways, schools, hospitals, and housing. IPA define their purpose as to drive continuous improvement in the way government delivers infrastructure and major projects with aspirations to achieve nothing less than world class. The solutions discussed in this report are seeking to do the same, improve the way that assets and infrastructure are delivered in the UK and ensuring there is a skilled workforce to do so.

Department for Science, Innovation and Technology are central to driving scientific and technological innovation, that seeks to change lives and sustain economic growth. As a key contributor to Research & Development funding in the UK, they are an important factor in the development of the technology and innovation required to transform the UK construction sector, as well as ensuring that the appropriate skills and training are available to capitalise on the innovation.

2.4 Potential and prioritised solutions – Technologies

The solutions being promoted as the best means of supporting the sector with a move towards being more productive and resolving some of the other well document issues, with delivering construction projects traditionally, are not specifically technology related but revolve around the methodology for the delivery of assets. The construction sector is moving towards a manufacturing led approach to delivery, that seeks to leverage some of the benefits of manufacturing, particularly productivity, quality, and health & safety. Currently within the construction industry, raw materials are delivered to site and then assembled, with a heavy reliance on the skill of the personnel involved. A manufacturing led approach would support a move from being less reliant on the skills of individuals, towards the use of standardised processes that can be used to assemble standardised products in a reliable and repeatable manner. The following potential solutions are those currently seen by the industry as a method of achieving the desired outcomes.

Offsite Manufacturing - an approach to construction, where buildings are designed to be manufactured away from a construction site, with most of the work completed in a controlled factory environment. This results in a minimal amount of work to complete onsite, with the final assembly and finishing touches remaining.

Modern Methods of Construction (MMC) – seeks to unlock the benefits of using 7 predefined categories construction that span all types of pre-manufacturing, including factory produced products and systems, site-based materials, and process innovation.

Platforms – A kit of parts approach to construction that utilises common, repeatable assets with interoperable components, it aims to drive a new market for manufacturing in construction, to provide a predictable pipeline of demand that affords industry the confidence to invest in new products and technologies and to create stable and inclusive employment where jobs are most needed.

cih_ed1-2_the-rulebook.pdf (constructioninnovationhub.org.uk)

2.5 Expected timing of solutions to impact workforce

The design and delivery of the correct training provision and courses to support the sector with meeting their pressing productivity targets and the ever increasing need to consider sustainability and Net Zero is urgent. The way buildings and assets are delivered in the UK is ever evolving, and because of this and the skills required to support this transition are not readily available. This Foresighting process has considered the skills and competencies required in Horizon 2, with it estimated that the Horizon 2 commences in 2 years' time and concludes in 8 years.

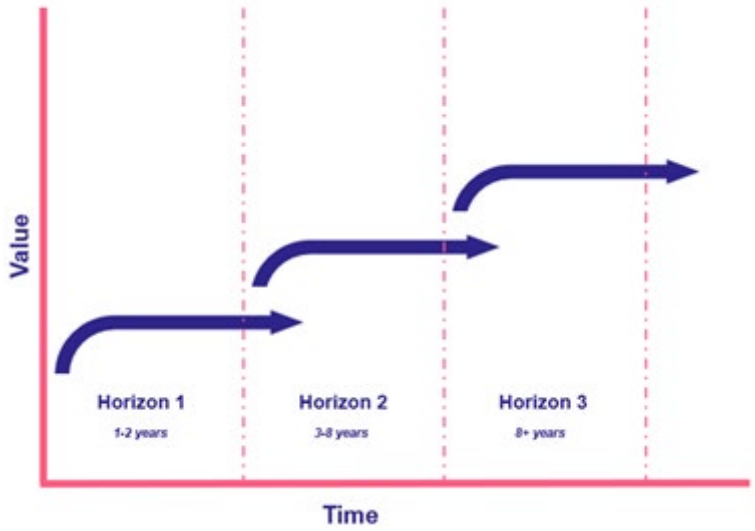

Figure 5 - Three Horizons Timeline

2.6 Understanding the current state - industrial process / current supply chain

The current construction value chain runs on a project-by-project basis, with each project dependent upon the location and type of construction being considered. This has led to a fragmented value chain, with each project being determined as fixed term and individual in nature. Although each project does appear to differ, there are several clear stages to each project, design, production of raw materials, manufacturing of components/assemblies and construction.

The various parties and actors within the supply chain can be found in Fig. 6, with their interactions dependent upon the type of build and contracts being utilised, with a brief description of each of the parties responsible for the delivery found below.

Figure 6 - Construction Value Chain (International Finance Corporation (IFC), 2018)

Developers: Acquire land, conduct feasibility process, apply for planning permission, appoint a design team to produce the initial scope, high level concept design and support the business case.

Architects & Engineers: Produce the concept and detailed design of the asset, ensure compliance with UK regulations and building code.

Contractors: Responsible for the completion of construction, overseeing and managing teams, materials, and equipment, ensuring the correct levels of quality and health and safety are achieved.

Material and Equipment Suppliers: Supply manufactured materials and equipment to the contractors at site.

The RIBA plan of work is a framework that outlines 8 key stages for the delivery of an asset, highlighting core tasks, statutory processes, procurement routes and key information exchanges for a traditional build. This has been updated to include a Design for Manufacture and Assembly (DfMA) overlay, that considers the impact of manufactured products, systems, and solutions on the current process, with an extract found in Fig 7. This demonstrates how not only the supply chain alters due to differing delivery methods but also where in the process they are engaged, with an emphasis on early engagement and upfront collaborative design work.

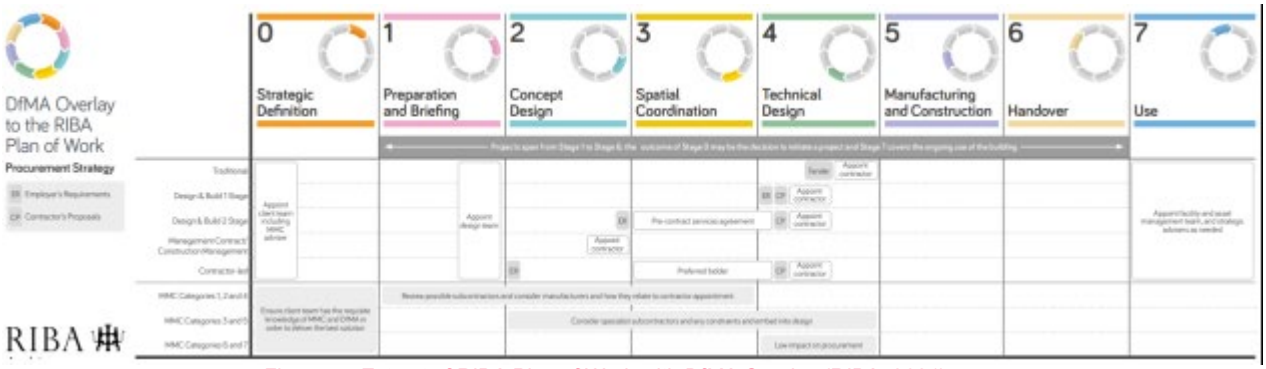

Figure 7 - Extract of RIBA Plan of Work with DfMA Overlay (RIBA, 2021)

2.7 Prioritisation and choice of Foresighting topics based on these solutions

When considering the possible topics for this workforce Foresighting cycle, several different aspects were considered, including how to best bound the cycle. With the overwhelming amount of material available on the pressing need for offsite manufacturing and a manufacturing led approach to construction, it was felt that this was the best route to pursue. There was also clear recognition that the cycle could not cover all aspects of the construction sector, as such it was limited to the design, build and assembly of the assets, with operation and maintenance being excluded for this cycle.

Cycle description

The adoption of manufacturing systems engineering thinking, processes, tools, and technologies to enable the construction sector to achieve the productivity, sustainability and safety goals articulated in national strategic objectives - i.e. Net Zero.

Established manufacturing engineering solutions including - integrated systems, standardised solutions and digitalisation of design/production/installation activities will need to be adopted, or adapted, across the whole supply chain.

2.8 Catapult / Sponsor summary / profile

Catapult centre name: MTC
Catapult centre website: https://www.the-mtc.org/

Sponsor name: Offsite Alliance
Sponsor Website: HOME | The Offsite Alliance | Enabling Offsite Construction

Sponsor name: MOBIE
Sponsor website: MOBIE - Ministry of Building Innovation + Education

3.0 Results – Findings, Data and Insight

3.0 Results – Findings, Data and Insight

Section	Title
3.1	Findings, methodology and presentation
3.2	Insight into organisational changes
3.3	Occupational change insight
3.4	Future Occupational Profiles compared with current provision
3.5	Summary and use of the findings
3.6	Recommended next steps

3.1 Findings, Methodology and Presentation

This section describes the future organisational capabilities that will be required to meet the Challenge using the proposed Solution (technology) and which occupations are likely to change to deliver these capabilities. Summary information is provided with a narrative based on the underlying data which is also provided using bespoke visualisations to enable greater insight and access to detail. This section of the report is aligned to the needs of those responsible for workforce planning – employers, educators, and skills providers. The two parts interpret the data findings and contain links to the relevant visualisation elements.

Organisational changes

Providing insight into Organisational Changes – this indicates how organisations will need to adapt their current capabilities to achieve the implementation of the Solutions that respond to the Challenge addressed by this Foresighting project.

Typically, this will also require the adoption of new capabilities and a change in the distribution of these capabilities across value chain partners. This change in capabilities for an organisation and their value chain partners then defines the skill changes required in the different role groups of each supply chain partner.

Occupational changes

A set of 'Future Occupational Profiles' (FOPs) is produced by the foresight process that demonstrates how current occupations may need to change in the future. FOPs are generated using a combination of attributes from the underlying capability classification and from data collected in the workshops. The FOP generation algorithm works to group capabilities into logical sets reflecting role families, function, proficiency and capability similarity. As part of the foresight process the generated FOPs are reviewed, revised, and distilled by the Employer group. This agreed set of FOPs are then compared with selected current education provision; the default reference is the set of Institute for Apprenticeships and Technical Education (IfATE) occupational standards; to assess which current training and education provision could be used in the future. Two bespoke metrics, match and surplus are used to evaluate the alignment of current provision with the set of FOPs proposed. Summaries are presented of the key findings related to each supply chain partner.

Findings are aimed at both Employers and Education and Training Providers and identify matches and gaps in future training needs compared with current provision to guide further detailed investigation.

Highlighted changes to future provision

The report identifies suggested changes to education and training provision – principally occupational standards that will deliver the knowledge, skills and behaviours required by future occupations. In some cases, this will include the development of short courses and continued professional development (CPD) to upskill the current workforce to meet future needs. Additionally, foresighting outputs can be used to develop programmes, qualifications, and occupational standards for new entrants to the workforce joining via apprenticeship, taught qualification, or other training programme.

The insight and data in this part of the report are primarily aimed at educators training providers, occupational standards bodies, and awarding organisations. Combined with insight arising from the supply chain capability changes, the provision insight offers an effective way for employers to identify training opportunities that align to their future needs.

Method

The Workforce Foresighting Hub process uses a series of structured workshops and surveys to capture and summarise input from relevant sector experts – covering technology, workforce development and education. At several points in the workshop and analysis sequence the Foresighting process utilises large language models and artificial intelligence (AI) to parse and assist in the analysis of the content generated by workshop participants. For example, the AI model can compare capability statements with existing standards more thoroughly and rapidly than human comparison could achieve. All AI derived outputs are reviewed and validated by the participant groups through the workshops and integral quality assurance reviews of the foresight process.

3.2 Insight into organisational changes

Organisational insight indicates how diverse types of organisations in the value chain will need to make functional changes to align their future capabilities to those required to respond to the Challenge being addressed. This provides useful insight for these organisations and in turn, provides a data rich and well-founded basis to understand how future occupations and their skillsets may need to change to meet that challenge. This is developed in section 3.3 of this report.

Organisation functions

The Workforce Foresighting Hub process uses a data structure built on five functional areas which are common to any business:

Design	The function of an organisation that focuses on activities relating to product, service, or solution design.
Implement	The function of an organisation that focuses on activities relating to producing / making / providing its products or services.
Logistics	The function of an organisation that focuses on activities relating to procurement, delivery, materials, or services necessary for operations – service / manufacturing, etc.
Support	The function of an organisation that focuses on activities relating to users, in-service support, repair / maintenance, recycling, end of life disposal.
Enterprise	Core functions of an organisation - e.g., strategic planning, leadership and management, human resources. Digital backbone and data systems. Integration of relevant statutory / regulatory requirements and compliance.

This functional structure is developed to levels of detail that enable the Foresighting process to reference external data sets including ONET (US) Occupational Information Network [1], ESCO – European Skills, Competences, Qualifications and Occupations[2], IfATE – (UK) Institute for Apprenticeships and Technical Education[3] .

The five root functions comprise ~ 40 Domains which are broken down to ~ 140 Functional Areas. This architecture is used to position ~ 25,000 capability statements which are the building blocks used in the workforce foresight process. Each capability statement has several attributes. Some are static and reflect the position of the capability statement in the

architecture, others are dynamic and are assigned values through a cycle and set of workshops.

The data-architecture is implemented in a bespoke ‘data-cube’ which underpins the foresight process, workshops, and enables extensive use of LLM and AI tools. Additionally, a key feature of the data-cube is that the data from each foresight topic cycle is added into the data set and can then be used, where relevant, in future cycles. This ensures that the capabilities of the system are dynamic and up to date.

Identifying the Future Supply Chain Capabilities

The following charts and graphs summarise the changes in the set of capabilities that will be required by the supply chain in the future. The pie-charts reflect the distribution of capabilities across the five functions. The future state data is captured in three Technologist workshops and the current state data is generated using information collected about current occupational standards used across the existing supply chain. This latter information is not as detailed as that produced by the workshops and is indicative and used to provide a point of comparison.

The initial pie charts illustrate the changing proportions of the five functions comparing future needs with current state. This indicates an overall relative:

- Increase of Design, Implementation and Support related capabilities
- Decrease of Support and Enterprise related capabilities

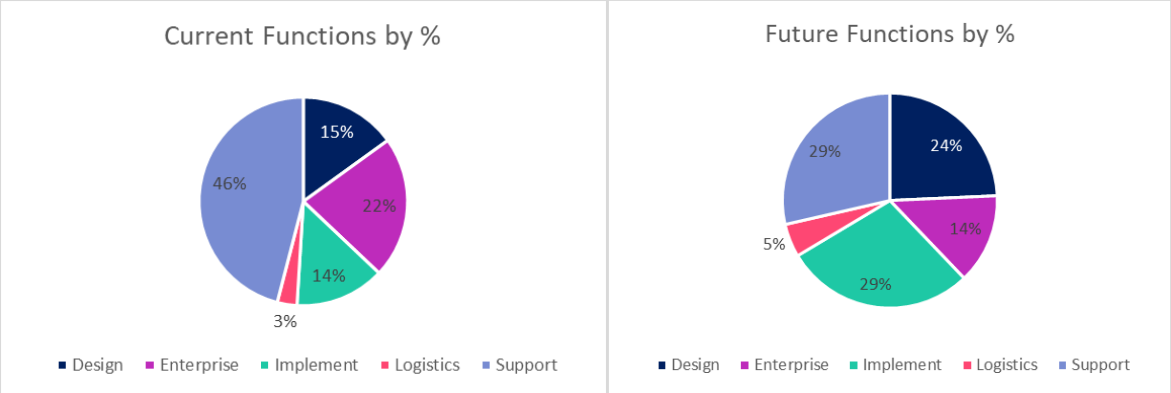

Figure 8: Current and Future Supply Chain - Capability Functions summary by %

Please note the current state has been built by proxy using a review of the existing commonly used apprenticeships standards in the industry, while the future state is dependent on data captured through the workshops which may have omissions, so this information is to be used to provide context to trends rather than specific analysis.

This information is useful to indicate relative changes, but the underlying change will be a result of future scale as well as how functions change relative to each other. To gain more detailed insight, these overall comparisons of functional areas are analysed using the current and future capability counts within each function using the next level of classification architecture – Functional Domain.

The graphs show the change in capabilities at domain level within each of thew five main Functions. The domain data is ranked with greatest change at top of the list. These graphs provide insight into both the relative importance of each domain and scale of the changes that will be required from the current state.

The charts that highlight the domain changes across different cycles, will have some variability and empty rows due to the nature of the data.

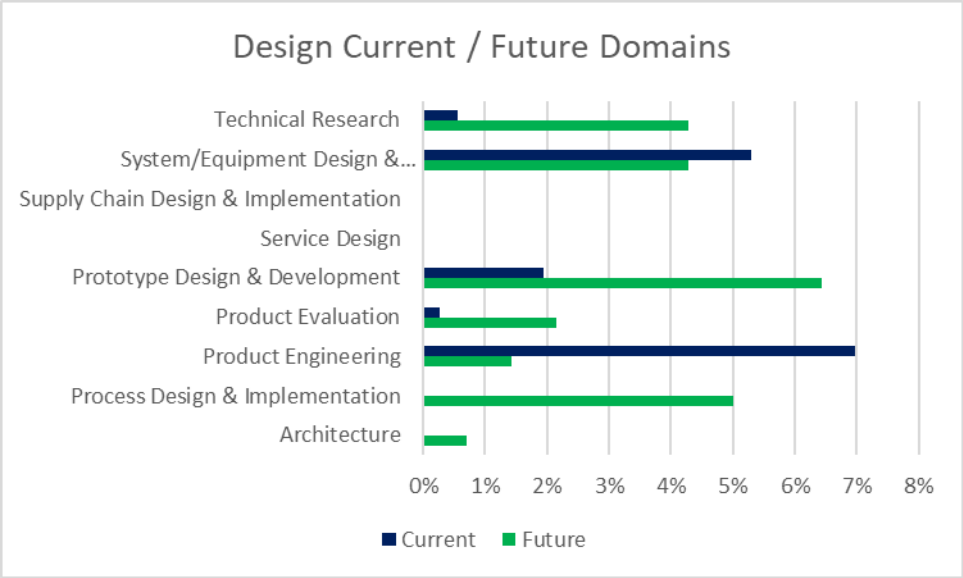

Figure 9 - Design Function - Current to Future - Domain changes

The current / future comparison for Design reflects the foresighted transition to an increase in new products, engineering, and evaluation ahead of the development and implementation phase.

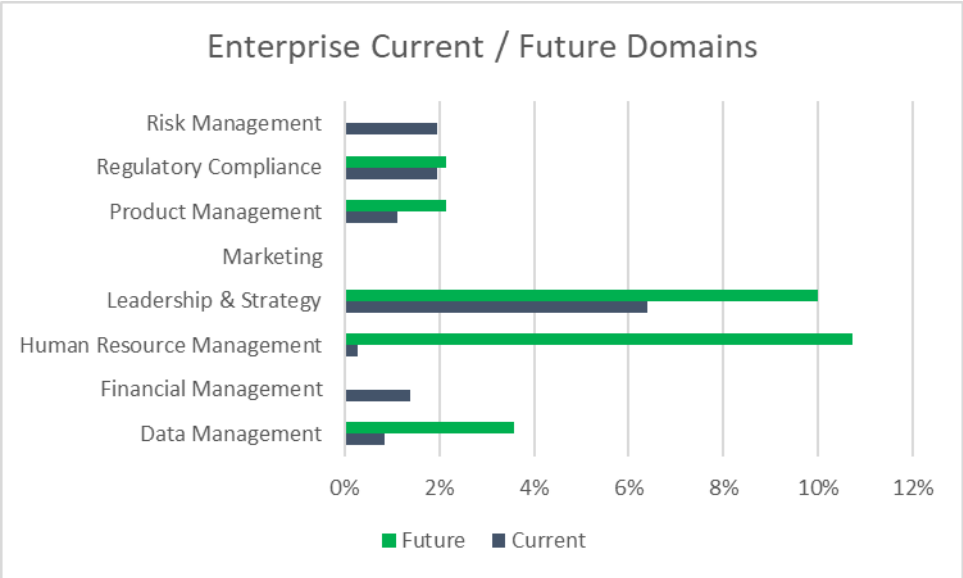

Figure 10: Enterprise Function - Current to Future - Domain changes

The current / future comparisons in the Enterprise area show the increased need associated with a maturing and competitive regulated market and the need to increase human resources.

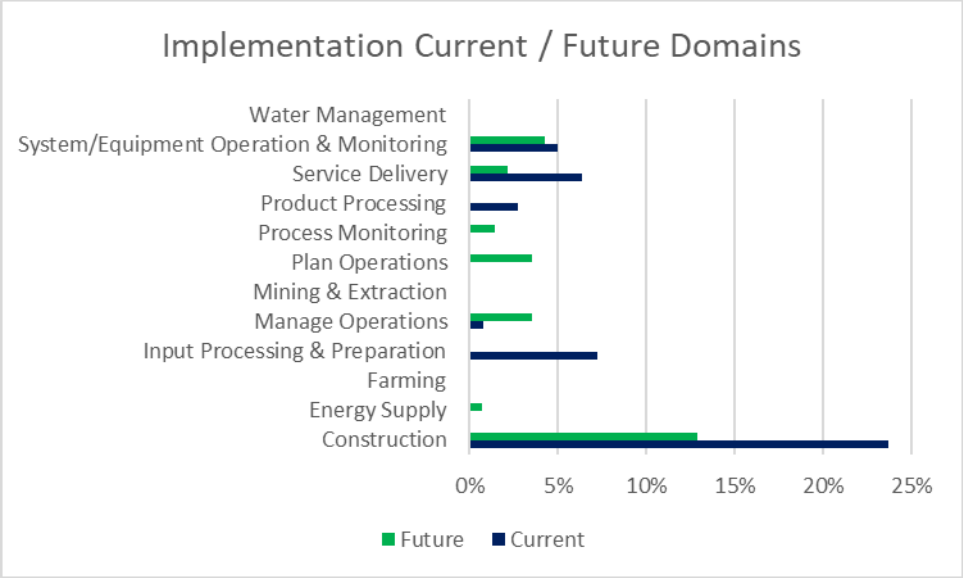

Figure 11: Implement Function - Current to Future - Domain changes

The current / future comparison of implementation functions reflects the changes associated with greater adoption and product sales volume.

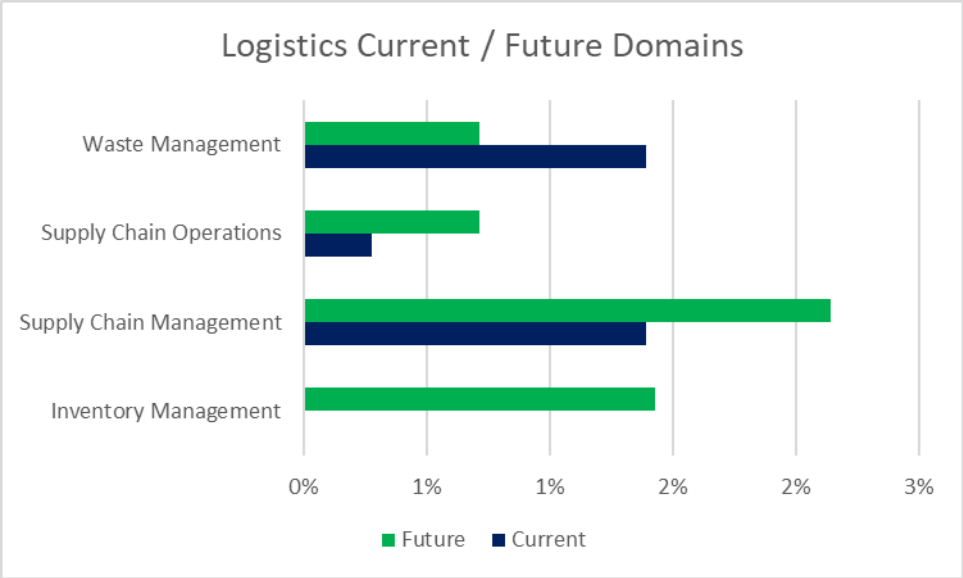

Figure 12: Logistics Function - Current to Future - Domain changes

The current and future comparison for logistics is as expected for organisations gearing up to work at a higher scale of production.

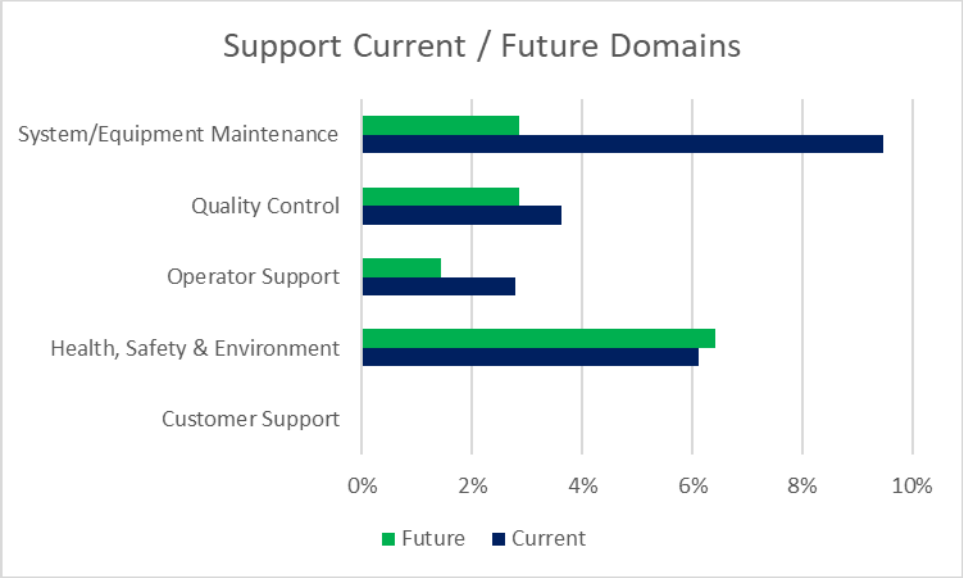

Figure 13: Support Function - Current to Future - Domain changes

The current and future support comparison reflects the current prominent levels of Health and Safety – the reduction in proportions may be due to omissions during the data gathering and analysis.

Visualisation Instructions

Detailed instructions can be found in the appendix.

Visualisation Data Link	What is it and what can it be used for?
Organisational Capabilities	*The data presented here can provide an indication of how well served the sector is.* *This page provides a high-level summary of each capability statement generated in the cycle.* *The capability statement describes the depth and nature of each capability within an Organisation against a defined reference.* *The page also provides a way of reviewing the capabilities through the lens of the Capability Classification Framework (Design/Implement/Logistics/Support/Enterprise). This information can be used to provide insight about the types of capabilities and their distribution across the classification framework.* *This can be used to identify which capabilities may be supported by existing provision, and where there may be gaps that require new development to support.*

3.3 Occupational Change Insight

This insight into occupational change uses the understanding of how capabilities will change across business functions (section 3.2) to inform proposals for how occupations and their associated skills sets for each value chain partner may also need be updated to reflect change for each role group within that Partner.

Please note that this report is based on the functionality of the Visualisation report from July 2024. Due to the continued development of the system / processes and visualisation tool, there may be additional tabs / information developed following this report publication. Following the publication of the report new standards may have come about which will not feature in this data set. If you have any questions, please contact the Workforce Foresighting Hub.

Supply chain partner organisation types

The workforce Foresighting process recognises that different partners in a supply chain will require appropriate capabilities, and these are determined and agreed in the initial workshops.

In this cycle, the following Supply Chain Partners were identified and then used during participant workshops and data analysis to determine the organisational needs:

1. Client Organisations
2. Design and Consultation Organisations
3. Integrators Organisations
4. Manufacturers
5. Installer Organisations

This categorisation enables the analysis and reporting of the major areas of occupational change by business function for each partner, recognising that each will have distinctive characteristics and requirements.

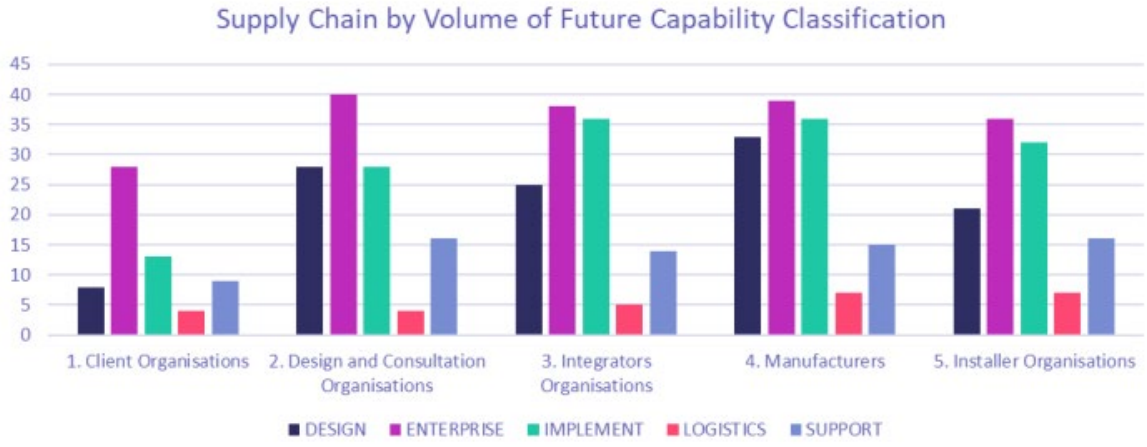

Figure 14: Supply Chain by Volume of Future Capability Classification

This graph illustrates the distribution of capabilities by function across the Value Chain Partners. These capability sets are used to form the set of Future Occupational Profiles within each Role Family.

Visualisation Instructions

Detailed instructions can be found in the appendix.

Visualisation Data Link	What is it and what can it be used for?
Value Chain Capabilities	This page provides an overview of the identified capabilities at a Supply Chain / Workflow Partner level. By selecting/deselecting each Supply Chain / Workflow Partner you can review the capabilities identified as required in that area of the Supply Chain / Workflow. This can be used to generate organisational capability profiles for each area of the workflow /supply chain to help prioritise and focus the acquisition of new capabilities that will be required in the future. It can also be used to generate combined organisational profiles, where an organisation may be involved in more than one area of the supply chain.

Role Levels

The Foresighting process uses the concept of Role Families to represent future occupations. This approach acknowledges that the workforce is not homogeneous, there will be varying levels of proficiency required across a workforce and qualifications and training may be aligned/require different types of vocational or academic qualifications. Additionally, the role family approach seeks to avoid presuming that the future workforce will be "current state plus."

For this cycle, the following role levels were determined through the workshops:

1. Technical Operator
2. Supervisor/Coordinator
3. Technical Professional
4. Technical Specialist

Proficiencies

Each of these role groups will require proficiency that relates to their role and the needs of each Supply Chain Partner. The foresight process uses the following proficiencies:

Awareness (A) - Has a foundational knowledge of tools, technology, techniques relevant to sector, industry, and company. Sufficient comprehension to know where to seek further information/details as necessary for a particular issue.

Practitioner (P) - Has the ability to apply and use independently a tool, system, or process. Understands the implications, consequences, and impact for their role/function. Knows what key actions are required and in what context.

Expert (E) - Has detailed knowledge of process, system, tool, or technology. Can support others and identify improvements required for a process, system, or tool. Can implement improvements personally or direct and guide others.

In the workshops participants apply their insight to assign proficiency for each role group for each capability. Individual responses are aggregated to arrive at a consensus.

A summary of the distribution of required proficiency for the role levels in the cycle are:

	Technical Operator	Supervisor / Coordinator	Technical Professional	Technical Specialist
Awareness	12%	0%	0%	3%
Practitioner	85%	76%	47%	27%
Expert	4%	24%	53%	70%

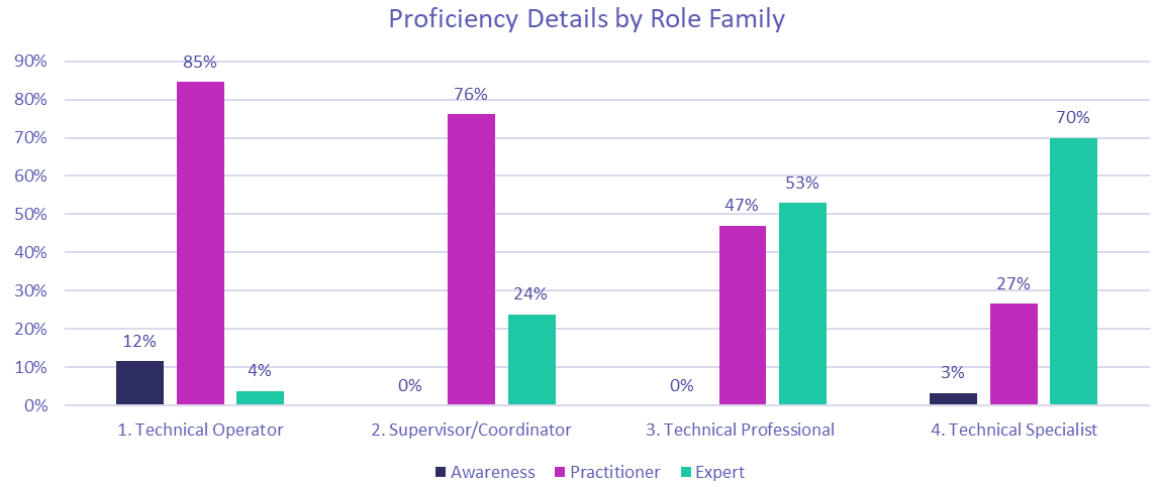

Figure 14: Proficiency details by Role Level

Future Occupational Profiles

The FOPs (Future Occupational Profiles) are a construct created and used during workforce Foresighting workshops and analysis to capture future skills needs in a form that may be compared with current occupation definitions – typically occupational standards.

The familiar nature and structure of 'FOP's assists with their evaluation and validation by employers and educators and enables the analytical comparison that results in useful indications of matches, surplus and gaps of future skills needs compared with current state. This then allows recommendations for action to be made based on future need and current fit to those needs.

FOPs are used to describe and suggest occupations, or roles, that may be required in the future and provide a framework to indicate capabilities and related duties. They can be used to review the impact on current roles and the adaptation that may be required in the future.

> **Educators** can review current occupational standards against the requirements of the FOPs and interpret which need to be changed to fill the gaps between the current and future state.
> **Employers** can consider existing apprenticeship standards and make a judgement on adapting an existing apprenticeship standard to upskill their workforce to meet the requirements of a particular FOP.
> **Educators** may react to these specified skill requirements from Industry by editing, adapting, or creating new content.

FOPs and indicative skills need

Combining proficiency with the identified FOPs, the following graphs indicate the priority needs across the supply value chain for each Role Group to deliver future capabilities.

Technician / Operator Role Level FOPs

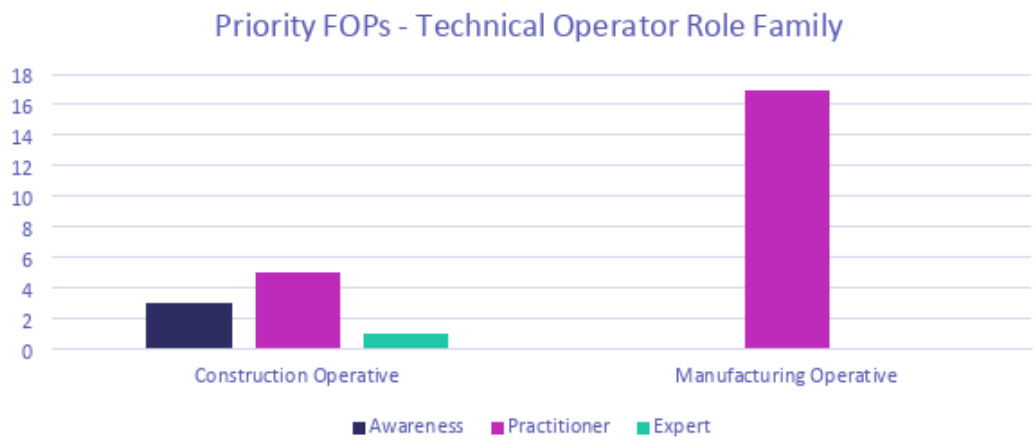

Figure 15: Priority FOPs – Technical Operator Role Level

Supervisor / Coordinator Level FOPs

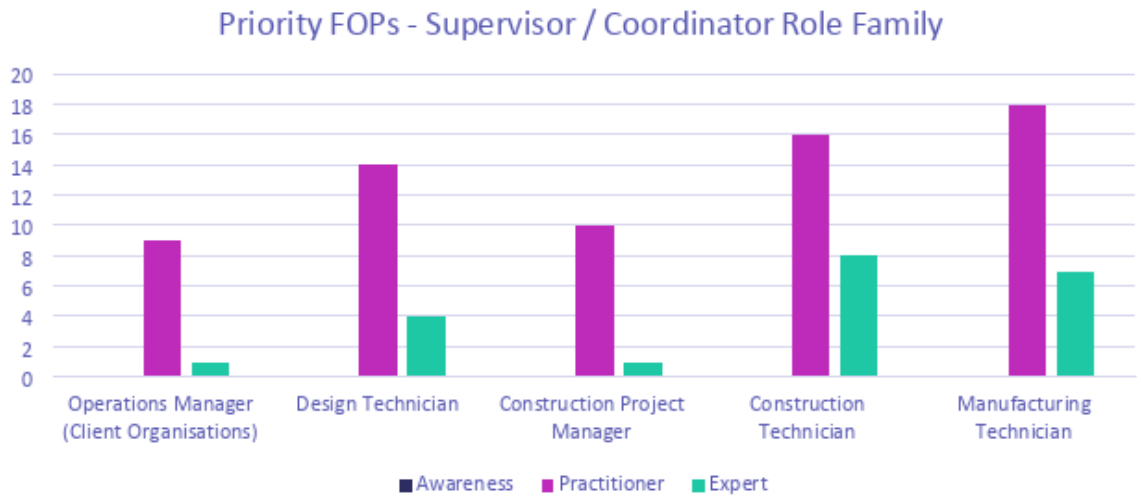

Figure 16: Priority FOPs – Supervisor / Coordinator Role Level

Technical Professional Role Level FOPs

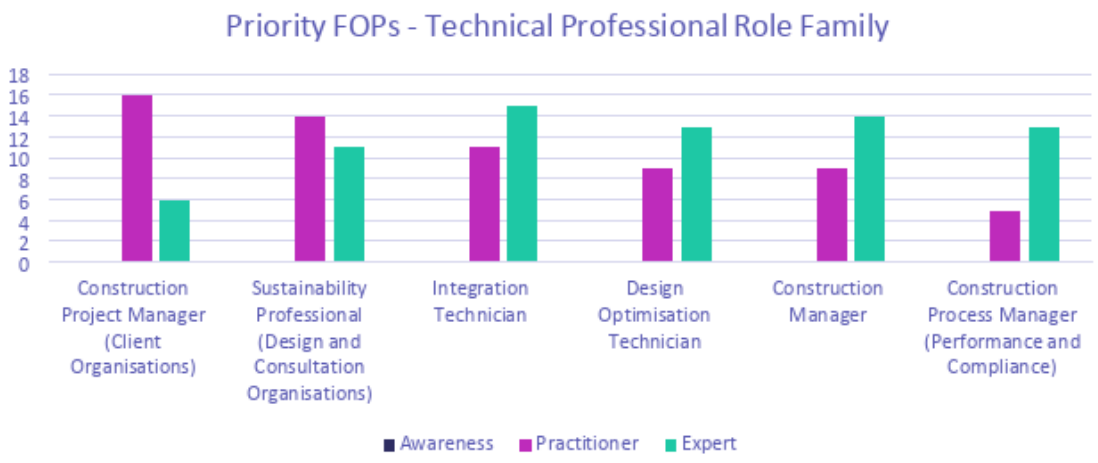

Figure 18: Priority FOPs – Technical Professional Role Level

Technical Specialist Role Level FOPs

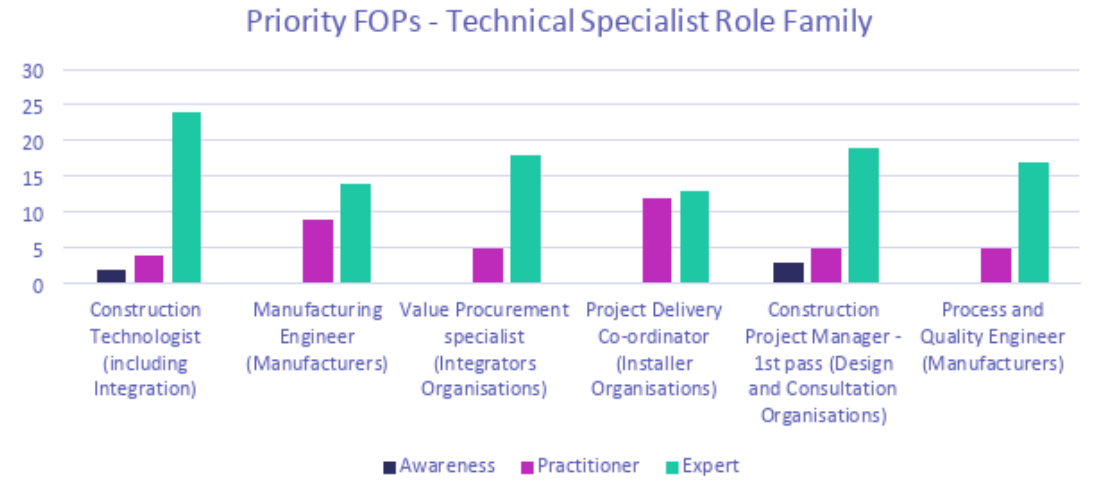

Figure 19: Priority FOPs – Technical Specialist Role Level

Visualisation Instructions
Detailed instructions can be found in the appendix.

Visualisation Data Link	What is it and what can it be used for?
P-FOP Matrix	This page provides a detailed breakdown of future occupational profiles that could be required in the future workforce. These were generated using a combination of attributes collected through the workshops and an algorithm. These suggested profiles were then reviewed and ratified by small groups of employers who were able to add/remove capabilities and uprate/downrate proficiency levels required. You can view all the P-FOPs in a role family by selecting one (or more) of these from the drop down. This will then allow you to select the P-FOPs aligned to that role family. The populated table allows you review and compare different P-FOPs within or across role families. You can view the capabilities in each P-FOP and the assigned proficiency levels. You can also toggle 'Hide Empty Capabilities' on/off to reduce the view down to only those capabilities included in the role family you are reviewing.

3.4 Future Occupational Profiles compared with current provision

The Workforce Foresighting process has developed two metrics to quantify the alignment between a FOP and a current standard or qualification:

> **Fit** – expressed as a %, it is a measure of the proportion of a FOP that is covered by an existing standard or qualification.
> **Surplus** – expressed as a %, it is a measure of the redundant material in an existing standard that is not required for a FOP.

An ideal existing qualification or standard would have a high fit and low surplus – this implies good coverage of the FOP but with little material that is not relevant to the FOP. Conversely a poor candidate would have a low fit and high surplus. Using these two metrics it is possible to quantitively evaluate, rank, and compare a range of existing provisions against a set of FOPs describing future needs.

By looking at how current occupational standards fit the Future Occupational Profiles, the most suitable and efficient route for change can be determined, e.g. a fit factor of less than 33% probably indicates that the current standard is unlikely to a good candidate for change, however a fit factor of 66% suggests that less adaptation will be necessary to meet future needs.

This interpretation is represented by a simple nine-box model to position the suitability of a given current occupational standard to a future occupational profile:

Factor scores

Fit Factor	*Fit score*	*Surplus Factor*	*Surplus score*
0 - 32%	*1*	*81-100%*	*1*
33-65%	*2*	*51-80%*	*2*
66-100%	*3*	*0 - 50%*	*3*

(Multiplying the Fit score by the Surplus score gives a Suitability Grid score of 1-9 as below)

Suitability Grid

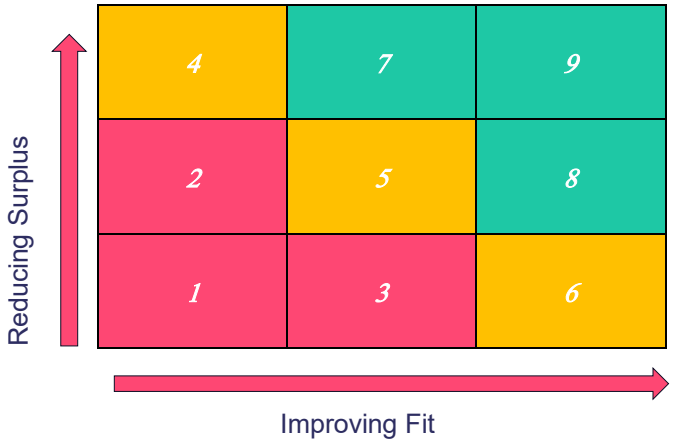

Figure 20: Fit Factor scores and Suitability Grid

For this Foresighting cycle, it was found that a higher threshold on surplus factor is more useful in filtering out less relevant IfATE standards whilst a slightly lower threshold on fit factor is useful to ensure relevant standards might be included.

Using this score and indicated 'RAG status' the following interpretation can be made:

High Suitability – 7,8,9 – Standards have good coverage for the FOPs identified
Represents good candidates from current occupational standards used as the basis of development to meet FOP requirements and inform elements of short course and CPD provision.

Some Suitability– 4,5,6 – Standards that have some / partial coverage for the FOPs identified.
These are likely to require extended work to meet FOP requirements, further review of the data may be necessary. They are likely to contain some useful information to inform elements of short course and CPD provision.

Low Suitability – 1,2,3 – for standards that have poor / low coverage for the FOPs identified.
These are unlikely to be adaptable to meet future needs but may contain some useful information to inform elements of short course and CPD provision. This can be assessed using the data visualisation tools.

FOP findings compared with current standards

Using the approach described above and applying the 'RAG' scores to each FOP indicating the suitability of current occupational standards selected from the IFATE set, the following table begins to identify areas of action and concern for the provision of future skills for each Supply Chain Partner to respond to the Challenge.

Using Site Operator as an example, all three role families are represented, and from looking at the data extracted we can identify that there is good coverage of Future Occupations in the roles of Maintenance Technician based on the current IFATE standards.

As expected, the IFATE standards provision is stronger for the Operator/ Technician role groups than for Engineer/ Senior Engineer, and this is reflected in the suitability findings for Design Specialists.

Supply Chain Partner - Client Organisations

Role Level	Primary Value Chain / Workflow Partner	Selected Future Occupational Profiles	Current Suitability Summary
2 Supervisor Coordinator	1. Client Organisations	"Operations Manager (Client Organisations)"	Low Suitability
3 Technical Professional	1. Client Organisations	"Construction Project Manager (Client Organisations)"	Low Suitability

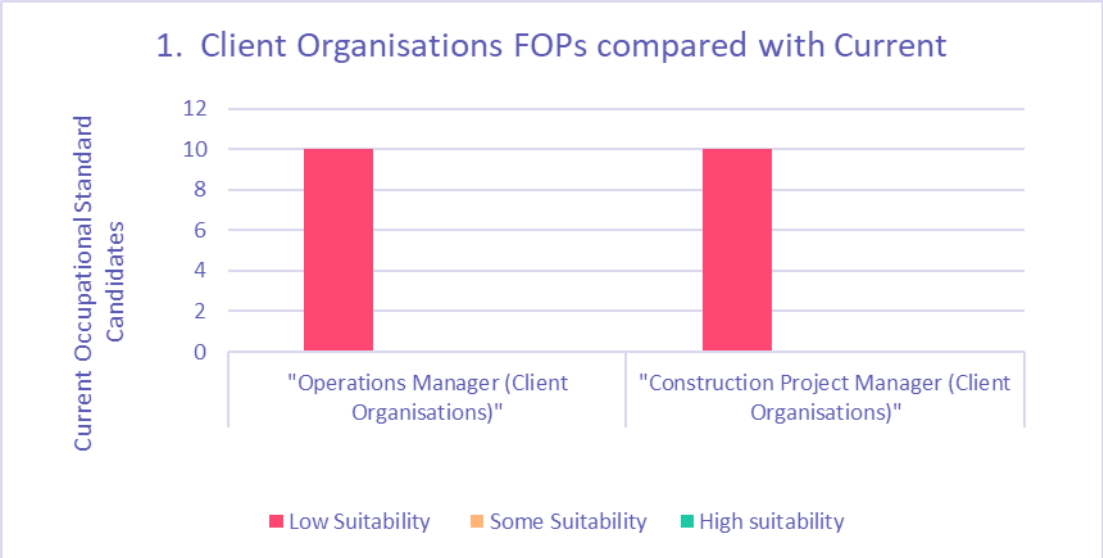

Figure 21: Count of current provision (IfATE Standards) and suitability to FOPs

Supply Chain Partner - Design and Consultation Organisations

Role Level	Primary Value Chain / Workflow Partner	Selected Future Occupational Profiles	Current Suitability Summary
2 Supervisor Coordinator	2. Design and Consultation Organisations	Design Technician	Low Suitability
2 Supervisor Coordinator	2. Design and Consultation Organisations	Construction Technician	Low Suitability
2 Supervisor Coordinator	2. Design and Consultation Organisations	Manufacturing Technician	Low Suitability
3 Technical Professional	2. Design and Consultation Organisations	"Sustainability Professional (Design and Consultation Organisations)"	Low Suitability
4 Technical Specialist	2. Design and Consultation Organisations	"Construction Technologist (including Integration)"	Low Suitability
4 Technical Specialist	2. Design and Consultation Organisations	"Construction Project Manager - 1st pass (Design and Consultation Organisations)"	Low Suitability

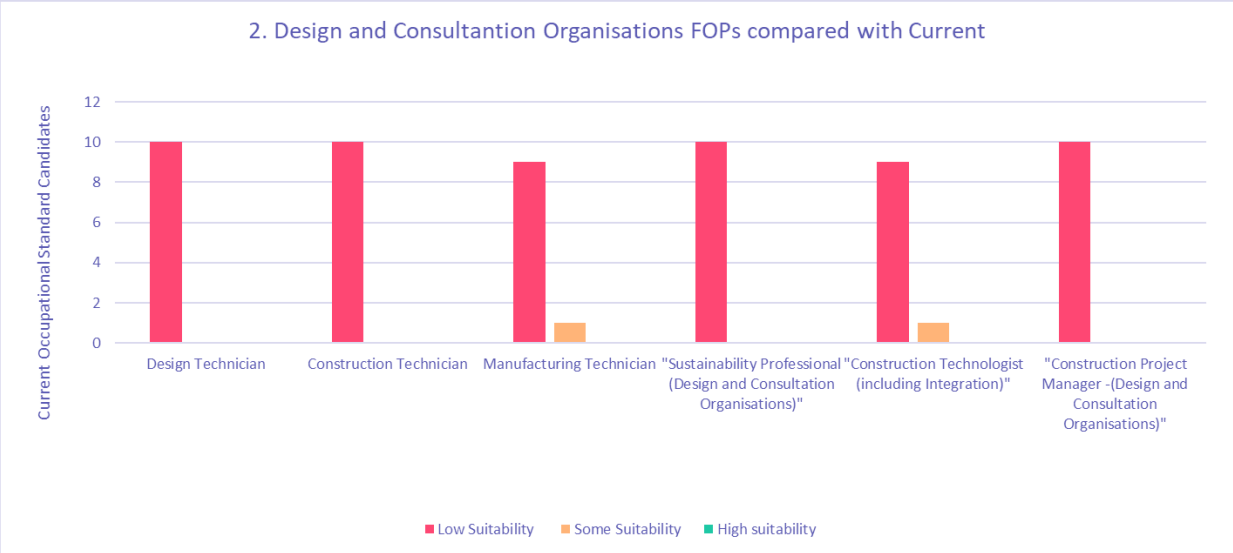

Figure 22: Count of current provision (IfATE Standards) and suitability to FOPs

Supply Chain Partner - Integrators Organisations

Role Level	Primary Value Chain / Workflow Partner	Selected Future Occupational Profiles	Current Suitability Summary
3 Technical Professional	3. Integrators Organisations	"Integration Technician"	Low Suitability
3 Technical Professional	3. Integrators Organisations	"Design Optimisation Technician"	Low Suitability
4 Technical Specialist	3. Integrators Organisations	"Value Procurement specialist (Integrators Organisations)"	Low Suitability

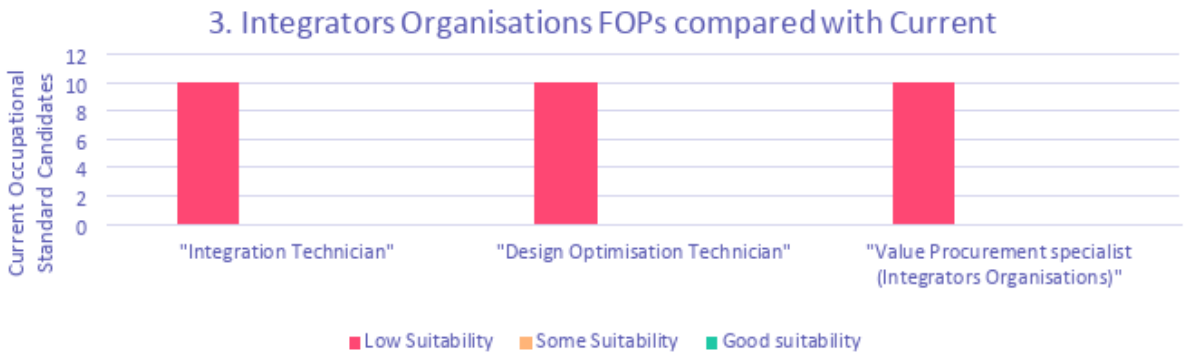

Figure 23: Count of current provision (IfATE Standards) and suitability to FOPs

Supply Chain Partner - Manufacturers

Role Level	Primary Value Chain / Workflow Partner	Selected Future Occupational Profiles	Current Suitability Summary
1 Technical Operator	4. Manufacturers	"Manufacturing Operative"	Low Suitability
2 Supervisor Coordinator	4. Manufacturers	Construction Project Manager	Low Suitability
4 Technical Specialist	4. Manufacturers	"Manufacturing Engineer (Manufacturers)"	Some Suitability
4 Technical Specialist	4. Manufacturers	"Process and Quality Engineer (Manufacturers)"	Low Suitability

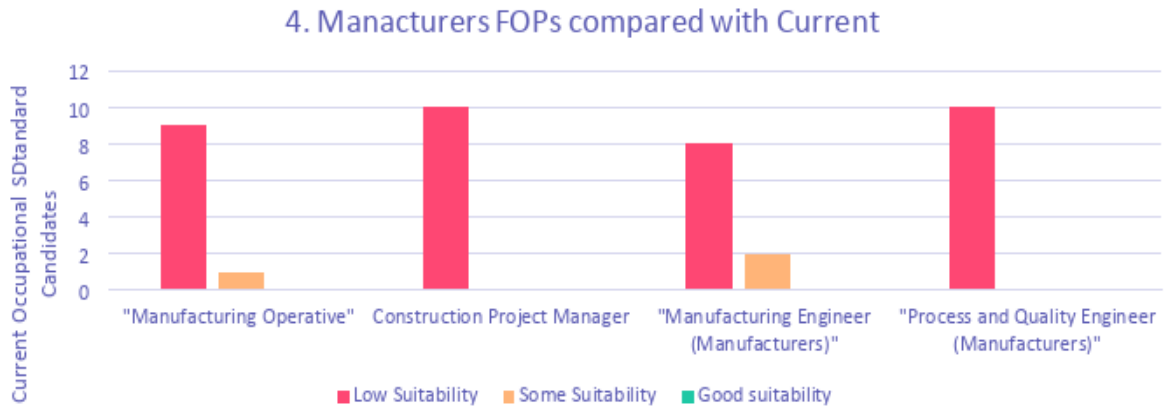

Figure 24: Count of current provision (IfATE Standards) and suitability to FOPs

Supply Chain Partner - Installer Organisations

Role Level	Primary Value Chain / Workflow Partner	Selected Future Occupational Profiles	Current Suitability Summary
3 Technical Professional	5. Installer Organisations	Construction Operative	Some Suitability
3 Technical Professional	5. Installer Organisations	"Construction Manager"	Low Suitability
3 Technical Professional	5. Installer Organisations	"Construction Process Manager (Performance and Compliance)"	Some Suitability
4 Technical Specialist	5. Installer Organisations	"Project Delivery Co-ordinator (Installer Organisations)"	Low Suitability

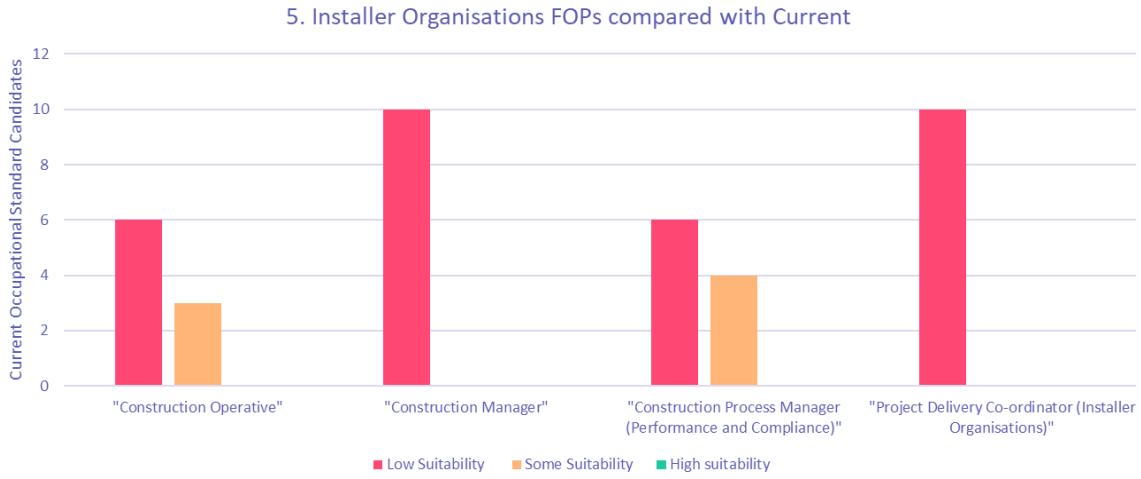

Figure 25: Count of current provision (IfATE Standards) and suitability to FOPs

3.5 Summary of findings

The below table counts the number of IFATE standards by Suitability score for each FOP.

Role Level	Primary Value Chain / Workflow Partner	Future Occupational Profiles	Low Suitability	Some Suitability	Good Suitability	Overall Suitability RAG
1 Technical Operator	5. Installer Organisations	"Construction Operative"	6	3	0	Some Suitability
2 Supervisor Coordinator	1. Client Organisations	"Operations Manager (Client Organisations)"	10	0	0	Low Suitability
3 Technical Professional	1. Client Organisations	"Construction Project Manager (Client Organisations)"	10	0	0	Low Suitability
2 Supervisor Coordinator	2. Design and Consultation Organisations	Design Technician	10	0	0	Low Suitability
2 Supervisor Coordinator	2. Design and Consultation Organisations	Construction Technician	10	0	0	Low Suitability
2 Supervisor Coordinator	2. Design and Consultation Organisations	Manufacturing Technician	9	1	0	Low Suitability
3 Technical Professional	2. Design and Consultation Organisations	"Sustainability Professional (Design and Consultation Organisations)"	10	0	0	Low Suitability
4 Technical Specialist	2. Design and Consultation Organisations	"Construction Technologist (including Integration)"	9	1	0	Low Suitability
4 Technical Specialist	2. Design and Consultation Organisations	"Construction Project Manager - 1st pass (Design and Consultation Organisations)"	10	0	0	Low Suitability
3 Technical Professional	3. Integrators Organisations	"Integration Technician"	10	0	0	Low Suitability
3 Technical Professional	3. Integrators Organisations	"Design Optimisation Technician"	10	0	0	Low Suitability
4 Technical Specialist	3. Integrators Organisations	"Value Procurement specialist (Integrators Organisations)"	10	0	0	Low Suitability

1 Technical Operator	4. Manufacturers	"Manufacturing Operative"	9	1	0	Low Suitability
2 Supervisor Coordinator	4. Manufacturers	Construction Project Manager	10	0	0	Low Suitability
4 Technical Specialist	4. Manufacturers	"Manufacturing Engineer (Manufacturers)"	8	2	0	Some Suitability
4 Technical Specialist	4. Manufacturers	"Process and Quality Engineer (Manufacturers)"	10	0	0	Low Suitability
3 Technical Professional	5. Installer Organisations	"Construction Manager"	10	0	0	Low Suitability
3 Technical Professional	5. Installer Organisations	"Construction Process Manager (Performance and Compliance)"	6	4	0	Some Suitability
4 Technical Specialist	5. Installer Organisations	"Project Delivery Co-ordinator (Installer Organisations)"	10	0	0	Low Suitability

Top Fits

From a FOP perspective and utilising the suitability grid we can determine which of the groups of current occupational standards are more applicate than others.
The FOPs with 'some suitability' as a score resulting from their comparison with current IFATE standards and provision are:

1. Construction Operative
2. Manufacturing Engineer
3. Construction Process Manager

Role family	Future Occupational; Profiles	IfATE Apprenticeship Standard	Suitability Score
1 Technical Operator	"Construction Operative"	Process industry manufacturing technician	4
1 Technical Operator	"Construction Operative"	Science manufacturing technician 2023	4
1 Technical Operator	"Construction Operative"	Lean manufacturing operative	4
3 Technical Professional	"Construction Process Manager (Performance and Compliance)"	Construction quantity surveyor (degree)	4
3 Technical Professional	"Construction Process Manager (Performance and Compliance)"	Design and construction management (degree)	6
3 Technical Professional	"Construction Process Manager (Performance and Compliance)"	Construction design and build technician	4
3 Technical Professional	"Construction Process Manager (Performance and Compliance)"	Building services engineering site management (degree)	4
4 Technical Specialist	"Manufacturing Engineer (Manufacturers)"	Digital manufacturing engineering leader	6
4 Technical Specialist	"Manufacturing Engineer (Manufacturers)"	Building services design engineer (degree)	4

This is a wide-ranging field so use of the data visualisation tool is recommended to access the next layer of detail and review the specific standards that have been identified as having Good Suitability / Some Suitability or Low Suitability.

As a comparison we can also list the standards that score lowest against the required FOPs. This suggests that there is little suitable in the IFATE standards to support these Future Role Profiles.

FOPs with the lowest scores are:

- "Manufacturing Operative"
- "Operations Manager (Client Organisations)"
- “Design Technician”
- “Construction Project Manager”
- “Construction Technician”
- “Manufacturing Technician”
- "Construction Project Manager (Client Organisations)"
- "Sustainability Professional (Design and Consultation Organisations)"
- "Integration Technician"
- "Design Optimisation Technician"
- "Construction Manager"
- "Construction Technologist (including Integration)"
- "Project Delivery Co-ordinator (Installer Organisations)"
- "Construction Project Manager - 1st pass (Design and Consultation Organisations)"
- "Process and Quality Engineer (Manufacturers)"

Although a number of the above FOPs are recognised as prevalent roles across the Construction sector, the low suitability scores highlight the evolving nature of the roles and the demands of a shift towards manufacturing led construction.

Review of Findings

The findings of this section should be reviewed by those involved in the process prior to formal handover. Whilst the data acquisition and analysis were continually quality assured during the workshops and reporting, review and feedback will secure the validity of the actions proposed by the Convener in line with the recommendations that follow in Section 3.6.

The Future Occupational Profiles are the major output of the process and are used to evaluate the need for action. Further work to adapt combinations of FOPs to better fit emerging roles is anticipated as employers plan their actions to meet future needs.

Use of the findings

Whilst some of the FOPS (Future Occupational Profiles) are generic, some are more specific to this cycle. Building on this initial highlighting of opportunities and issues, further direction from Employers is required regarding workforce development plans and the level of demand

for specific roles. This feedback shared with Educators can enable the development of the education and training provision for the future. Using the analysis of current IFATE occupational standards to inform the content, level, and delivery of this provision. This deeper investigation will be supported by the data sets and visualisation tools accompanying this report.

Within an organisation a job role might incorporate several occupational profiles or only parts of one depending on the size and scope of the employer. Similarly, a college course might be designed to address one or several occupational profiles alongside or independent of other pre-existing course material. The Future Occupational Profiles and the associated capability sets provide employers with building blocks to help in the design of future roles and inform workforce planning. Similarly, the findings and data provide educators with building blocks to guide the development of course modules and content to prepare the future workforce.

In summary, FOPs can be used to:

- Highlight where roles related to a current occupational standard require updating. For incumbent or transferring workers this could be met by short course and CPD events.

- Influence and inform changes to occupational standards used to define the education and training of new entrants to the future workforce.

Lessons learnt

The Foresighting process is continually updated and improved for future cycles. Some areas for further consideration include:

- Capturing the “Current state” in terms of existing workforce capabilities at the outset would enable helpful comparisons and remove the need to develop a “proxy” current state as for this cycle.

- Additional consultation with stakeholders during the ‘Identify’ and ‘Prepare’ phase of the Foresighting Cycle to ‘seed’ the process with capability sets and existing workforce occupational profiles could reduce the need for level of quality assurance and prevent potential data omissions.

- Allowing sufficient time, 2 weeks has been suggested, for Technologists to quality assure the ‘Data-Cube’ future capability outputs in between the early workshops in the ‘Carry-out’ phase of the Foresighting cycle, would remove a need for further data cleansing later in the process.

The above points will be drawn into future MTC workforce Foresighting projects.

Visualisation Instructions

Detailed instructions with illustrations can be found in the appendix.

Visualisation Data Link	What is it and what can it be used for?
P-FOP Detail	This page allows you to review a specific Occupational Profile, including the capabilities contained within it and the Knowledge, Skills & Behaviour (KSB) tags associated with the capability. You can select an individual Role Family and linked P-FOP in the two available dropdowns. The table in the lower section of the page will then be populated with all relevant capabilities. The search control above the table allows you to filter content of any of the columns of data. A key piece of functionality in this table is the presence of the KSB tags associated with the capabilities.
Future KSBs Summary	This page provides a view of the complete set of capabilities within the cycle along with all the associated KSB tags which are linked to them. It is the superset of all details displayed on the P-FOP detail page. This is used to: • To review the identified Knowledge, Skill, and Behaviour tags for a given capability, to support development of future education and learning material. • To review the requirements from a capability level, rather than a role family/occupational profile grouping.
P-FOP Distribution	This page allows provides a breakdown of the Capabilities within the selected Cycle and how they are distributed across the P-FOPs with the addition of a distribution chart showing the required proficiency across those P-FOPs. Clicking the “View P-FOPs” button alongside each capability will provide a list of the proficiencies (EPA) with the P-FOPs that fall into them. The exported version of this data will include a full breakdown of the FOP IDs which contain the capability within a specific proficiency. This is used to: • understand the levels/volumes of common/crossover Capabilities, to support prioritisation of Capability Development • identify which Occupational Profiles contain these common/crossover capabilities, and so which may be prioritised for development activity
Capabilities Matched to Current Provision	This page allows you to review and compare individual capabilities against ‘Duty’ statements in an Apprenticeship / Occupational Standard. You can select individual capabilities to review their specific matches. These matches are shown in the bottom panel, including the Standard, the Level, and the Duty Statement this is matched to. You can filter in several ways to focus your review: • By the Capability Classification Framework (left-hand panel). • By capabilities that **are** served by the reference mapping framework – the default is Institute for Apprenticeships and Technical Education (IfATE) provision. • By capabilities that **are not** served by the reference mapping framework, e.g., IfATE provision – these are capabilities required in the future that may require new/bespoke training

	and CPD materials to be developed to upskill/re-skill the workforce. This page can be used to identify where existing provision may exist across the broad spectrum of Occupational Standards, and not just within a narrow range of sector-specific Standards. The data also allows you to identify where provision may already exist to support specific capabilities.
Fit & Surplus Factors	This page allows you to review the 'Fit' and 'Surplus' of Prototype Future Occupation Profiles (P-FOP) against existing training provision e.g. Institute for Apprenticeships and Technical Education (IfATE). It is possible for the 'Fit' and 'Surplus' comparison to total over 100%, as they are two separate calculations based on a two-way comparison.
Fit & Surplus Matrix	This page is a visual representation of the 'Fit and Surplus Factor' insight. You can visually review 'Fit' and 'Surplus' of Prototype Future Occupation Profiles (P-FOP) against existing training provision e.g. Institute for Apprenticeships and Technical Education (IfATE). This can help you identify which provision may align strongest, or which may require adaptation, to provide the suitable provision fit for each future role. It will help you focus in on which provision to focus your attention for analysis.
P-FOP Capability Matches	This page allows you to view the matches between Capabilities and Institute for Apprenticeships and Technical Education (IfATE) Duty Statements. Clicking the arrow next to a number in the 'Matches' column will open a popup with more detail for each Capability. Each capability also includes Knowledge, Skill, and Behaviour Tags, to support with scaffolding future education provision. You can review individual Prototype Future Occupational Profiles (P-FOPS) or review all P-FOPs under a Role Family, to give a more holistic view of Capabilities and Matches Where a future capability has been matched to existing provision (currently, by default, IfATE apprenticeship standards) it is possible to interrogate the data and identify specific statements in standards that align to enable identification of existing training materials and activities that could be used or adapted to meet future requirements. This can be used to review the capability requirements for Role Families and P-FOPs, from Job / Occupation level through to Knowledge, Skill, and Behaviour level.
P-FOP vs Provision	This page allows you to compare FOPs against existing IfATE Standards. This is displayed as a Matched/Not Matched Capability, comparing the Capability in a FOP to the Duties in a Standard. The left-hand side allows you to select the Role Family and FOP, while the right-hand modal allows you to compare against the top 10 matched IfATE Standards for that Occupational Profile.
P-FOP Priorities	This page provides a summary of the maximum Education/Training Provision's Fit Factors identified for each P-FOP

3.6 Recommended next steps

The recommendations in this report emphasise the importance of immediate and coordinated efforts by educators, employers, and other stakeholders to address the anticipated skills gap in the construction sector. Actions can be divided into short-term and mid-term strategies.

	Topic	Actions	Who	When	Result
Short Term Actions	Reskilling and Upskilling Current Workforce	Tailor course content to match new capabilities with existing occupational standards, focusing on design and other lifecycle activities.	Educators, Awarding Bodies, Employers	Prepare ahead of the scale-up need	Availability of short-term training for the current workforce to meet immediate technology demands.
	Recruitment from Other Industries	Identify and reskill individuals with transferable skills from other sectors, particularly for high-demand roles such as Maintenance and Operations Engineering Technicians.	Employers, Training Providers	Immediate	Mitigation of workforce shortages in high-demand areas through targeted recruitment and training initiatives.
Medium term actions	Integration of Future Skills Training	Formalise changes to occupational standards and training programs for new entrants, integrating future skills requirements defined by the Future Occupational Profiles (FOPs).	Educators, Awarding Bodies, Employers	As soon as possible for prioritised FOPs	Development of training programs that meet both current and future skills needs, reducing lead time for new workforce entrants
	Modular Approach to Course Updates	Implement modular changes to existing courses rather than complete redesigns, facilitating quicker adaptation to	Educators, Training Providers	Ongoing	Flexibility in educational programs, enabling rapid response to industry needs.

		evolving skills requirements.			
General Actions for Educators	Assessment and Feedback	Review Institute for Apprenticeships and Technical Education (IFATE) standards and relevant qualifications with employers, providing feedback and identifying gaps.	Educators, Employers	Ongoing	Comprehensive understanding of current training provisions and identification of areas for improvement.
	Commissioning New Continuing Professional Development (CPD) Courses	Evaluate existing CPD provisions, commission new courses where necessary, and facilitate collaboration to maintain a unified approach.	Educators, Training Providers	Short-term	Enhanced CPD offerings to upskill current workforce members across all role families.
Additional Recommendations	Dissemination of Findings	Set up a working group to create an action plan, share findings widely among stakeholders to influence workforce development initiatives.	Convener, Sponsor, Stakeholders, Industry Groups	Following Publication	Broad access to insights and strategic direction for workforce initiatives
	Ongoing Review and Adaptation	Regularly review findings with stakeholders and adapt Future Occupational Profiles to better fit emerging roles	Stakeholders, Sponsor Leads, Participants	Before Formal Publication	Robust and validated actions.

Table of abbreviated recommendations leading to action:

A/B Review and Dissemination of Findings	Convener and Sponsor to set up working group to take the findings and recommendation and create an action plan and advance through the Skills Value Chain to cause action. It is essential to share the findings widely among stakeholders, industry groups, and local skills bodies. This will promote access to the insights gained and influence the strategic direction of workforce development initiatives.
C Short-term action	As part of the working group, educators and employers should collaborate to deliver timely short-term training solutions for the current workforce. This is to cause action regarding developing short term training solutions for the future workforce. This includes developing and offering Continuing Professional Development (CPD) courses that address immediate skills gaps and ensure workers are equipped with the necessary competencies.
D Mid-term actions	The ongoing working group mid-term action planning should include a concerted effort to integrate new skills and knowledge into existing training programs. Educators and employers need to update curricula and training standards to reflect the evolving demands of the construction sector, ensuring that both current employees and new entrants are adequately prepared.
E. General action for Educators to support Employers' demand for future skills	Employers and educators must work together to review and influence the update of IfATE standards and relevant qualifications. This involves using the insights from the Foresighting process to inform the development of new standards and qualifications that align with future workforce needs. This will contribute to the working group skills framework.
F Further foresighting subjects	The working group should seek additional sponsors and propose further subjects for Foresighting. This continuous cycle of Foresighting will help to stay ahead of emerging trends and technologies, ensuring the workforce remains adaptable and prepared.
G Lesson Learnt	The Workforce Foresighting Hub should promote the value gained from participation in workshops. Sharing lessons learned will help to refine the Foresighting process and enhance the quality of future outputs
H Recommendations to Workforce Foresighting Steering Board	Through engagement with the working group, the Workforce Foresighting Steering Board should encourage and enable collaborative solution development by maintaining a focus on both current needs and future requirements. The steering board should facilitate ongoing dialogue among stakeholders to ensure that the actions taken are dynamic and responsive to changing industry landscapes.

By implementing these recommended next steps, stakeholders can ensure that the construction sector is supported by a skilled and adaptable workforce, capable of meeting the challenges and opportunities of a rapidly evolving industry.

4.0 Appendices

4.0 Appendices

Section	Title
4.1	Mission – What is workforce foresighting
4.2	List of participants
4.3	Cycle timeline
4.4	Access to output data - link and authorisation
4.5	Glossary - common language
4.6	References
4.7	Visualisation links and illustrations
4.8	Supply Chain Capabilities

4.1 Mission – What is workforce Foresighting?

Addressing future workforce challenges

The global marketplace is changing at a rapid pace and the continued development of innovative technologies is creating opportunities for growth in all sectors.

Whilst we are well placed to take advantage in the UK, the Government and industry have identified that we need a workforce able to adapt to new capabilities that require different and often higher skill sets. The 'Manufacturing the Future Workforce' report, published in 2020, states: "Failure to address the workforce development challenge will mean missing out on opportunities to build the UK's manufacturing base and to take market leading positions."

Developing this workforce and preventing a skills shortfall will provide future-thinking organisations with the capabilities to successfully adopt innovation and enable the UK to build a prosperous economy.

The Skills Value Chain

A Skills Value Chain (SVC) approach promotes connectivity between upstream UK innovation and downstream skills systems, as well as enabling better co-operation within education and training provider eco-systems. It aligns and integrates innovation and skills strategies with a common purpose.

The SVC approach was proposed in the 'Manufacturing the Future Workforce' report, which examined global best practice and convened UK pioneers to explore how the UK can develop skills to exploit innovative technologies.

And it starts with workforce foresighting.

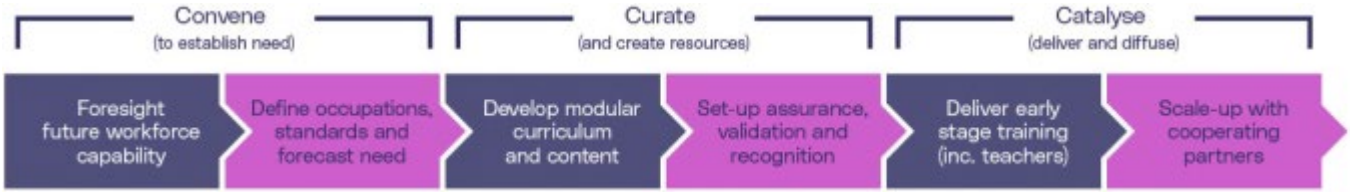

Figure 2617: The Skills Value Chain

Workforce Foresighting

Using the Skills Value Chain approach, the UK can start building the skilled workforce required by tomorrow's industries and employers, and understanding what these future needs will be is where workforce Foresighting comes in.

Workforce Foresighting is a systemic approach to identifying the organisational capabilities and workforce skills necessary to enable industry to adopt and exploit innovative technologies which respond to global, national and sector challenges.

The Workforce Foresighting Hub, initiated and funded by Innovate UK, and built in collaboration with the Catapult Network, provides the processes and data that inform insight and support the recommendations required for industry, policymakers, and educators to respond to continuing change.

Our Vision: To foster the organisational capabilities and workforce skills required to adapt to continuing change and enable adoption of innovative technologies to enable a prosperous UK industry.

Our Mission: To provide the process, insight and recommendations required to identify and address future skills demands to enable the UK to adopt innovation and succeed in the dynamic global marketplace.

Our Goals:

Define future capabilities required across a sector in response to a challenge, or technology innovation and consequently define the skill sets of the workforce of the future.

Understand and explain gaps between technology adoption, organisational capability and workforce profiles that could hamper innovation.

Identify and communicate insights, future requirements and the action required by industry and educators.

Enable and deliver a consistent approach to workforce Foresighting.

Outcomes:
The process integrates insight from experts in three categories – domain specialists/technologists, employers, and educators. Using a structured and facilitated series of collaborative information-gathering workshops, combined with data from open-source global data sets, the workforce Foresighting process can produce a wealth of detailed quantitative data to inform action.

At the heart of the Foresighting process are working groups consisting of the industry sponsor and centre of innovation, with support from the Workforce Foresighting Hub team, who undertake detailed analysis to report and summarise key data insights and recommendations for action. This report details future supply chain capabilities, prototype future occupational profiles and identifies changes required to current training provision for the sponsor to take forward and address skills challenges relating to the specific topic.

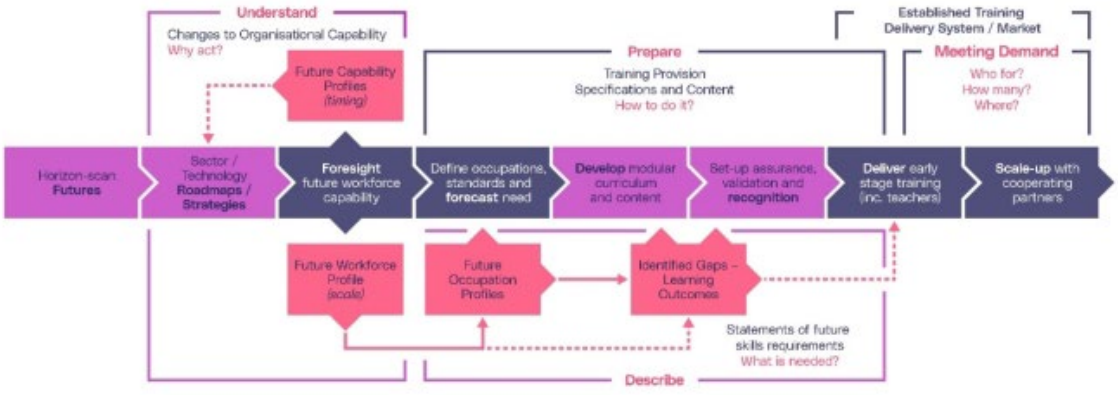

Figure 27: Workforce Foresighting & Skills Value Chain

Approach used - principles and implementation

The core of workforce Foresighting is convening three groups of relevant specialists to conduct structured, Delphi-style, facilitated workshops to capture and discuss the set of organisational capabilities that will be required to respond to and exploit technology innovation.

Organisational capabilities are captured using a bespoke classification that has been developed by the Workforce Foresighting Hub. The classification uses a structured common language to enable cross sector and cross centre collaboration and integration of data. Additionally, the classification enables data from several other national and international open-source workforce datasets to be integrated through the same common language. This data is held in a cloud based "data-cube" that is dynamically growing as each workforce Foresighting cycle adds to the shared data relating to future workforce capabilities.

Using innovative AI and Large Language Model data tools, the data-cube is used to undertake detailed analysis to 'map' future workforce capability requirements against the current education and training provision to identify where existing provision can be used and where new provision, CPD or qualifications are required.

As an agile development project, the Workforce Foresighting Hub team are constantly evolving and improving the detailed workshop process and workshop approach, but always consists of the following stages:

Considering – Clarifying the Challenge to be met (the 'what' and the 'when') and collating solutions (the 'how') as Foresighting topic suggestions align with strategic priorities

Identifying – Gain clarity and consensus about the solutions to be put forward – make the case for Foresighting

Preparing – The convening of specialists and scheduling of workshops

Carrying out – Run Foresighting workshops with experts, collate and analyse data

Communicating – Insights, findings and recommendations gathered from all research in report

Causing action – The driving of action based on the recommendations (promoting progress down the rest of the skills value chain) built on the findings and recommendations of Foresighting

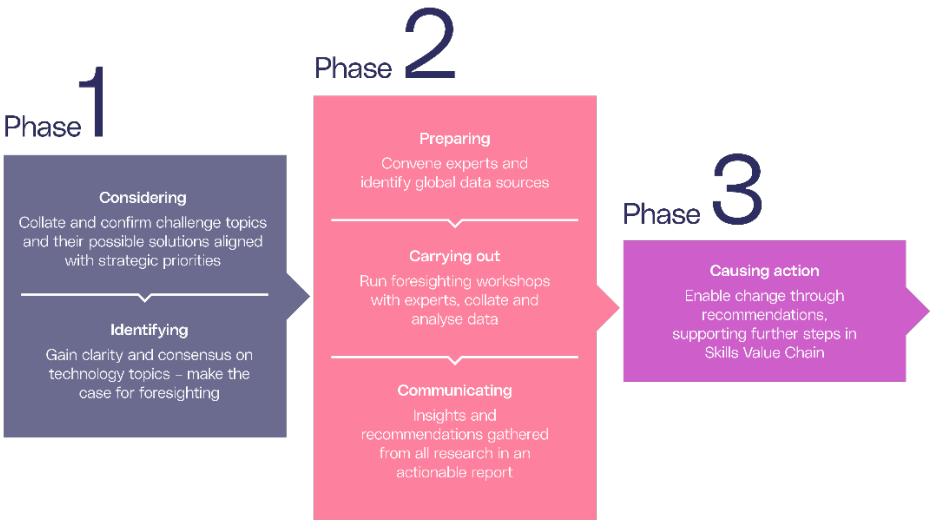

Figure 188: The Workforce Foresighting Process

Forecasting and Foresighting

The result of workforce Foresighting is understanding why skills requirements will need to change to enable the adoption of innovative technologies, and to define what this change is likely to be in terms of future occupations and shorter-term skills gaps. Forecasting of demand can then take these future focused findings and work with industry and government stakeholders to estimate the quantity of workers necessary for an industry to fulfil emerging skill demands at a given time and place. The two approaches are linked in that workforce Foresighting identifies the requirements and forecasting can then determine the quantity needed, the people needing the skills and therefore prepare programmes to deliver them.

Outcomes - insights and recommendations

Workforce Foresighting is a data intensive approach that can provide sponsors, stakeholders, and participants with detailed insight about future workforce requirements. A dynamic data set is provided for each cycle to allow all stakeholders and participants to freely access and interrogate the data. Additionally, the Workforce Foresighting Hub team will support the production of a report that provides targeted recommendations that require action to address gaps in training and education provision relevant to the challenge and planned technology solution.

The dynamic data portal provides a range of standard data sets and visualisations. Additionally, users can download data to undertake their own more detailed interrogation of data to guide and inform subsequent actions.

The key aspect is to provide insight about gaps – which capabilities required in the future are not addressed by aspects of current provision – apprenticeship standards, qualifications, or other provision. Gaps represent:

Short term CPD – topics required across the workforce to upskill members of current workforce

Medium term – topics to be included as current provision / standards are reviewed and updated
Longer term – new qualifications and standards that may be needed to equip new entrants

The insight produced by a workforce Foresighting cycle provides:

Technologists and technical leads with insight of the organisational capability sets required across future supply chain partners in response to the identified challenge.

Employers with insight about possible future roles and occupations that may be required across the whole workforce, operators to researchers, to ensure they are equipped and ready.

Educators with details of the gaps to be addressed by short-course training to upskill the existing workforce and insight about qualifications and provision that will be required to support new entrants in the future.

4.2 List of Participants

Industry Participants	Skills Participants	Technology Participants
Akerlof	Aliaxis	CITB
BE-ST	Gurbuild	Construction Leadership Council
BRE	Hawkins Brown	MOBIE
Curtins	KOPE	NOCN
Gurbuild	Modularise	NPTC
Mott MacDonald	Mott MacDonald	Opal Flame
MOBIE	Unipart Construction Technologies	Pearson
MTC		Supply Chain School
Opal Flame		University of Birmingham
Supply Chain School		
Turner and Townsend		

4.3 Cycle timeline

This cycle started the workshops as part of the Carry Out phase in September 2023. The Carry Out phase concluded in December 2023. This report was prepared following the data validation period and published in September 2024.

4.4 Access to output data - link and authorisation

Data Capture Overview

4.5 Glossary - common language

Term	Definition
Impact Domains	Innovate UK domains used as Strategic Categories to assist setting and monitoring priorities
National Challenge (Industry / Sector / Region)	A recognised technological or socio-political threat or opportunity for which there is consensus that workforce action is necessary
Challenge Response	Specific intervention aimed at the challenge
Capability (Organisation)	The collective abilities, and expertise of an organisation to carry out a function, because provision and preparation have been made by the organisation
Capability Classification	Classification provides a common, structured vocabulary to define capability
Capability Statements	Description of the depth and nature of each capability within an organisation
Capability Syntax	Common language to describe each capability application within organisation type
Competencies (Workforce / Individual)	'Proficiency, aptitude, capacity, skill, technique, experience, expertise, facility, fitness related to capability
Competency definition 'KSBs' (Knowledge, Skills, and Behaviours)	Knowledge, Skills, and Behaviours are the elements used to express the required competencies for each Role Group
Competency Domain	Used during Foresighting analysis to provide focus on existing and emerging competency needs
Delphi Process	Foresighting takes a Delphi approach which has come to represent consulting expert opinion. (Harking back to the Delphic Oracle of ancient Greece)
Foresight Cycle	Set of workshops, analysis and reporting that implements the Foresight Process for each subject
Foresight Process	A series of activities which are convened to understand future competence needs, the opportunities available and actions required to deliver the right skills at the right time and place
Foresighting Champion	An individual nominated within a new user organisation of Foresighting to facilitate and lead the use of Foresighting processes and tools with the support of the Project Team
Foresighting Subject	The application of specific technologies in the context of a given challenge and which are candidates for Foresighting
Future Competency Set	The KBS output from the Educator workshop for each Role Group

Map and Gap Analysis	A combined expert and automated process that maps the Future Competency Set against a selected reference framework
Organisation Type	Simple description of nature of organisation for which capability is required
Proficiencies	Proficiencies differentiate the degree of competencies required from differing Role Groups to support capabilities
Project Sponsor	Typically, a stakeholder in the challenge being successfully met who requires information to under-write plans to act
Role Group	Role groups are a collective of roles that exist in a typical manufacturing business / industrial sector
Syntax	The way in which a statement is phrased to ensure reliable, repeatable, and meaningful interpretation
Technologies	The technology that could be used to address the challenge
Working Scenario	To provide further context in relation to the subjects and used to position participants thinking during the detailed identification of future capabilities
Workshops	Online sessions used to undertake each step in the foresight process
Roadmaps	Sector, Industry, Regional view of emerging opportunities and their market entry
Participants	Technologists, Educators, Employers

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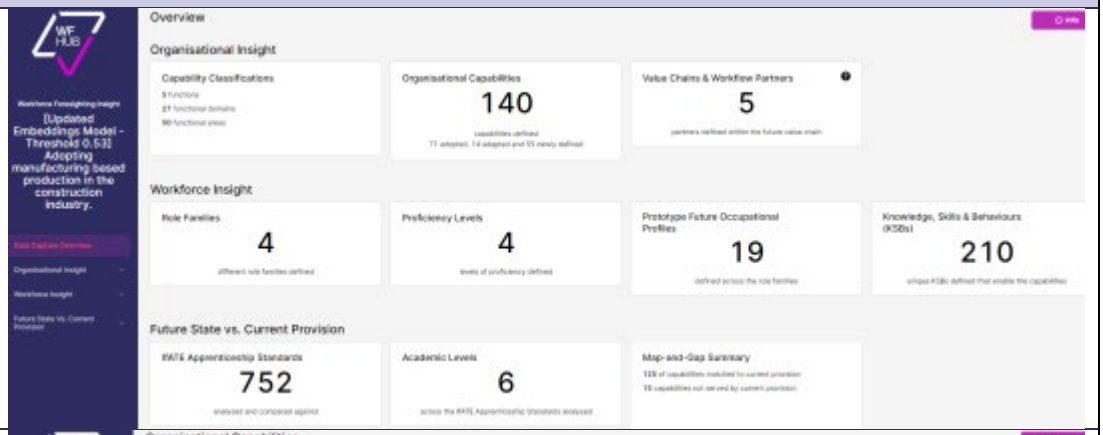
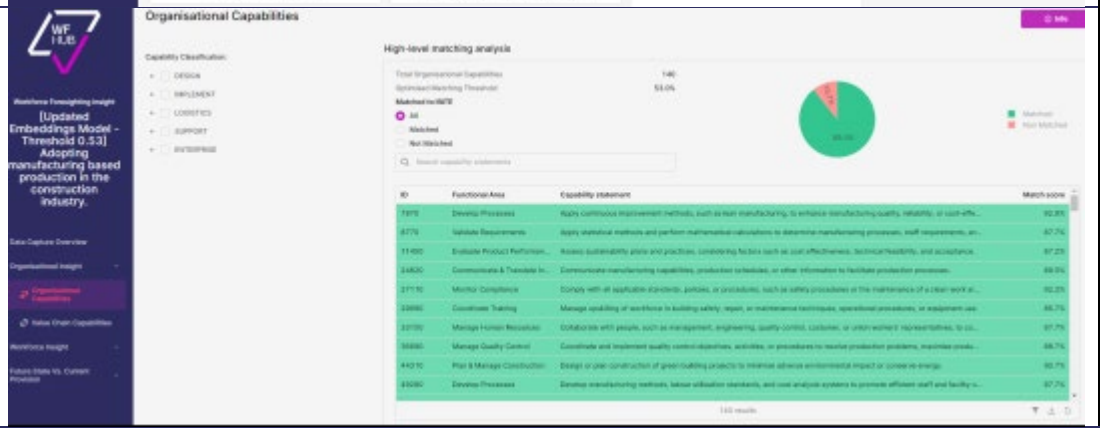
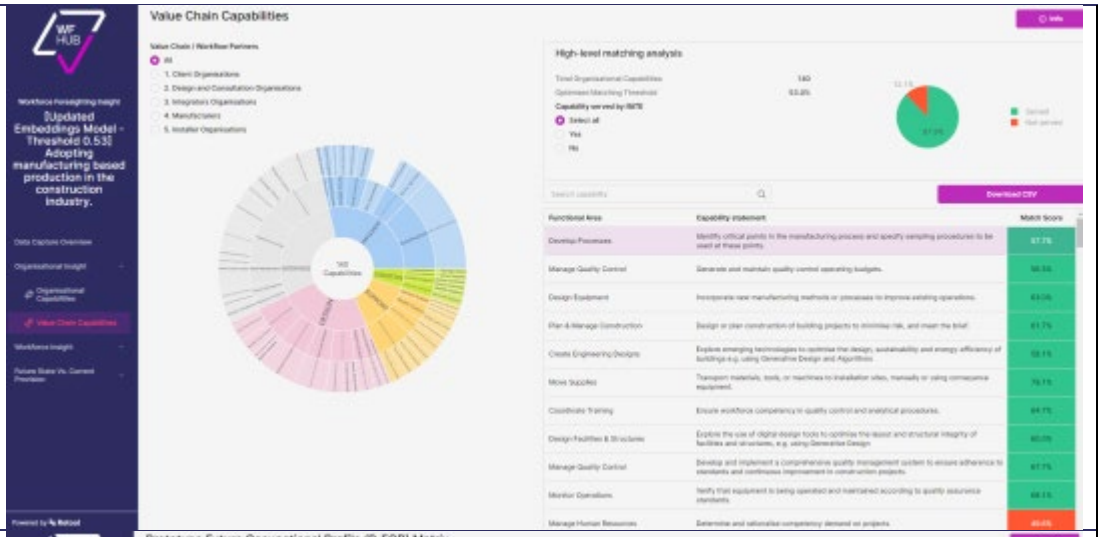
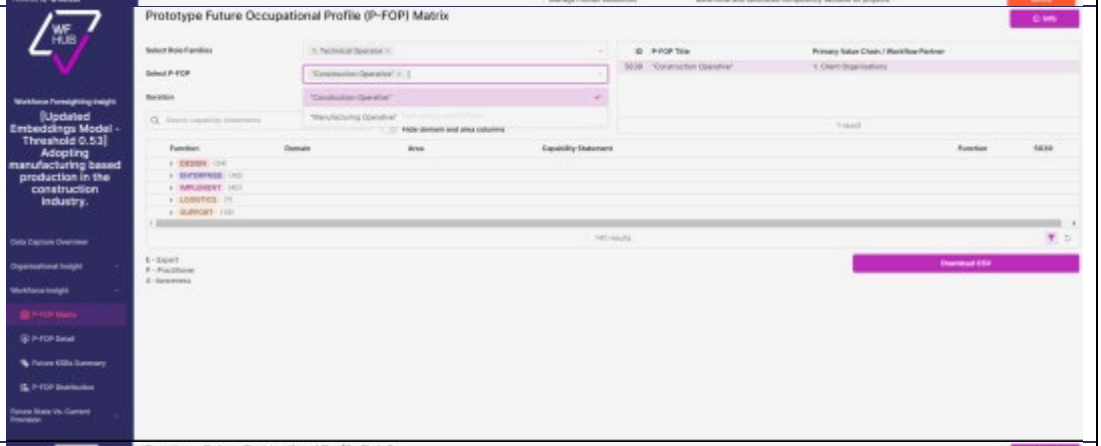
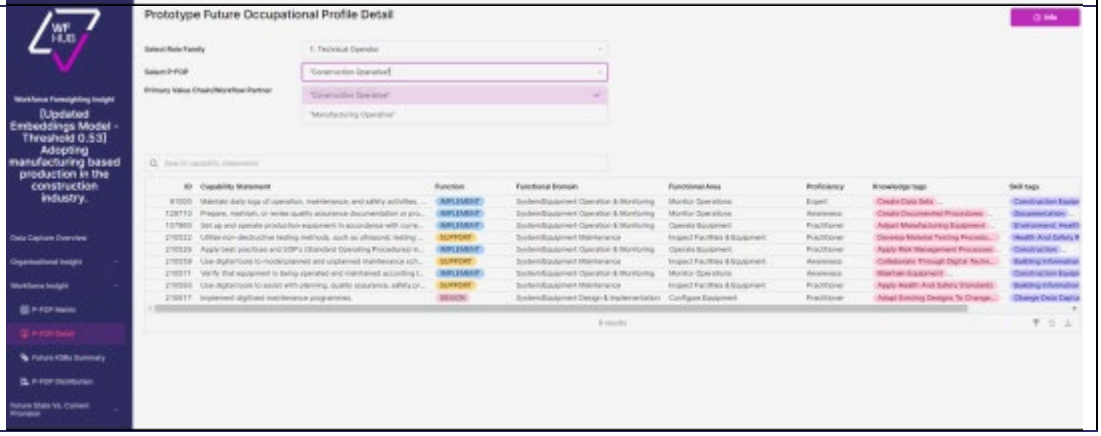
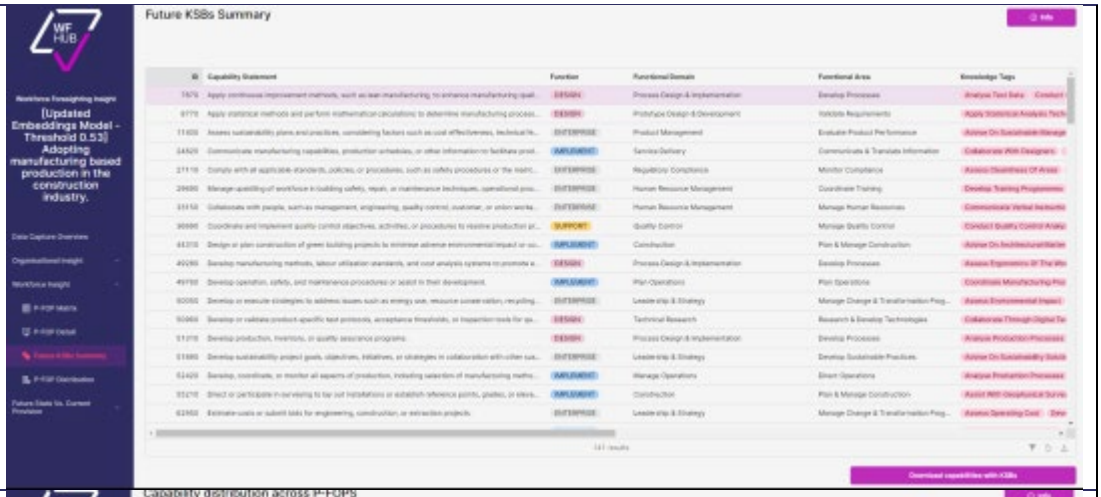
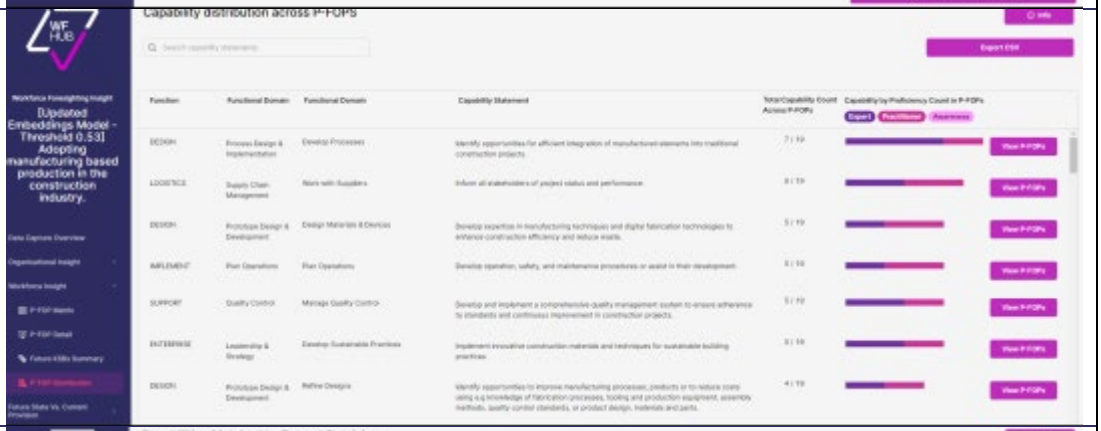
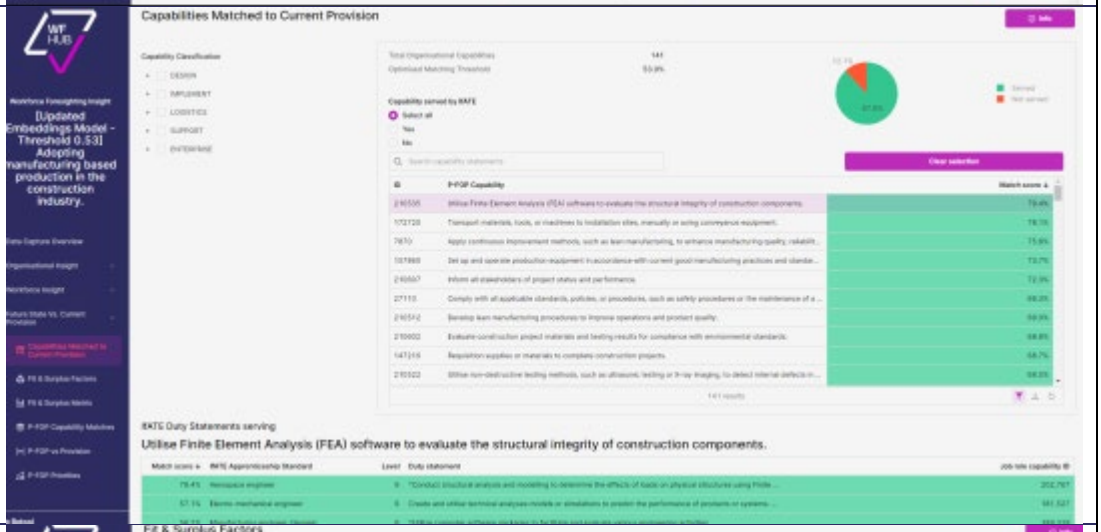
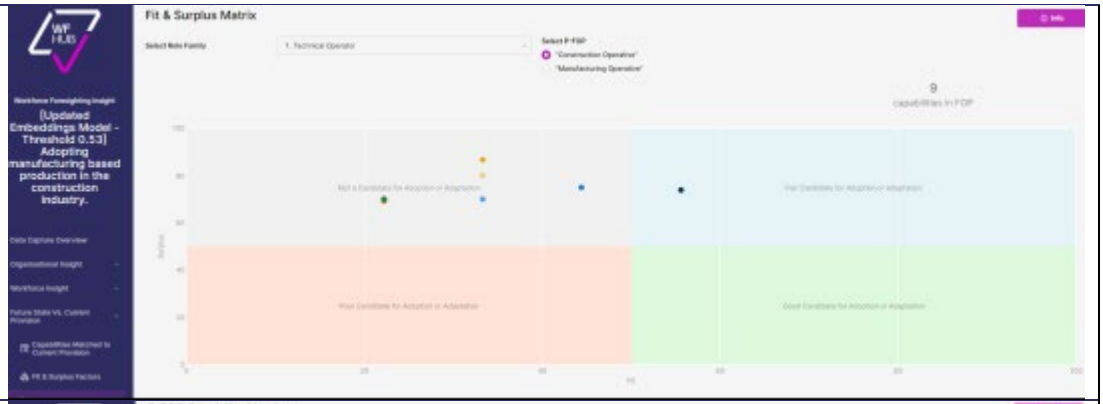
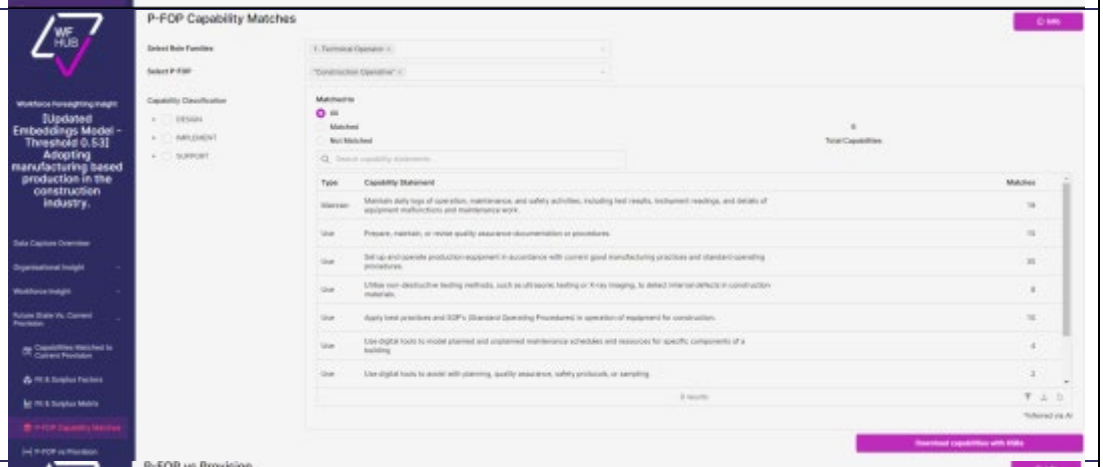
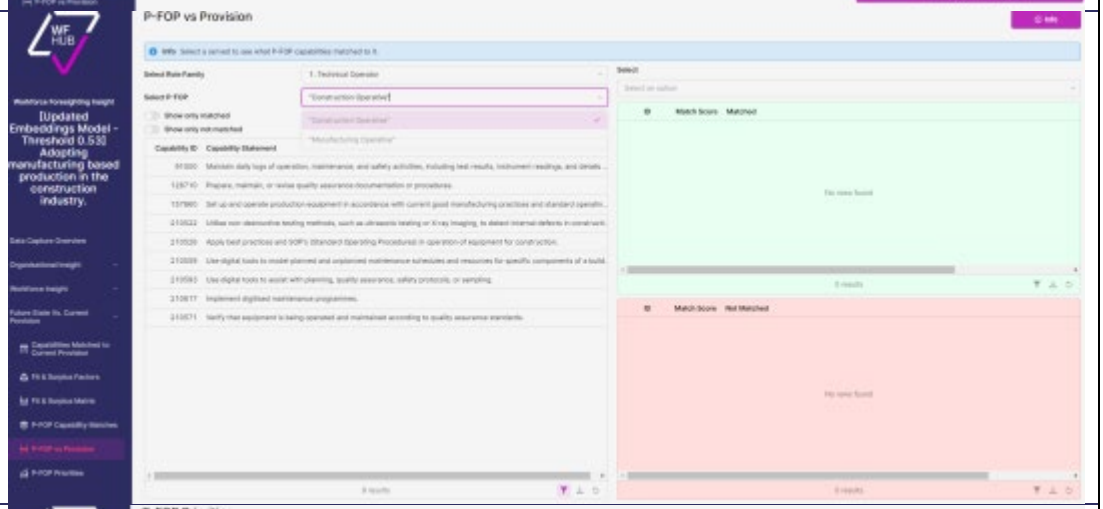
4.7 – Visualisation links and Illustrations

Link to Visualisation	View of data
Data Capture Overview	
Organisational Capabilities	

Value Chain Capabilities	
P-FOP Matrix	
P-FOP Detail	

Future KSBs Summary	
P-FOP Distribution	
Capabilities Matched to Current Provision	
Fit & Surplus Factors	

Fit & Surplus Matrix	
P-FOP Capability Matches	
P-FOP vs Provision	
P-FOP Priorities	

4.8 – Supply Chain Capabilities

This is an overview of the identified capabilities at a Supply Chain / Workflow Partner level and shows how the supply chain organisations' workforce structure needs to change to deliver the required capabilities.

Supply Chain Partner	Example of required change to deliver capabilities
1. Client Organisations	Determine and rationalise competency demand on projects Implement and evidence a competency to comply regime or scheme across all activities in supply chain. Implement strategic workforce planning Leverage multi-skilled approaches to aid workforce planning Implement multi-dimensional competence attributes to increase talent pool Collaborate with supply chain and other aggregators to increase and share talent pool Implement communication strategy to broaden appeal towards organisation activities and Net Zero credentials Apply competency data analytics across all performance data Implement competency-based upskilling/re-skilling solutions Establish data, information and knowledge management frameworks across all activities Implement strategic work planning Implement competency profiles for teams and individuals Align construction methods with value-based decision making Apply data analytics to competency management (Organisations, Teams and Individuals)
2. Design and Consultation Organisations	Identify opportunities to improve manufacturing processes, products or to reduce costs e.g. using knowledge of fabrication processes, tooling and production equipment, assembly methods, quality control standards, or product design, materials and parts. Develop expertise in manufacturing techniques and digital fabrication technologies to enhance construction efficiency and reduce waste. Develop guidelines for integrating off-site manufactured components with traditional construction processes Develop and implement a comprehensive quality management system to ensure adherence to standards and continuous improvement in construction projects. Develop innovative construction materials and techniques for sustainable building practices. Evaluate the technical performance of construction materials using standardised testing methods. Evaluate the suitability of construction materials for specific applications using material testing equipment. Stay updated with the latest green building certifications and regulations.

	Apply sustainable construction practices and methodologies to enhance operational planning. Develop expertise in sustainable materials and construction methods to support the adoption of green and eco-friendly practices in manufacturing systems engineering. Understand regulatory, technical, or market issues related to sustainability. Plan or supervise environmental studies to achieve compliance with environmental regulations in construction, modification, operation, acquisition, or divestiture of facilities. Conduct regular research and upskilling to stay updated with the latest construction technology and tools using industry publications and online resources. Analyse building codes, by-laws, space and site requirements, and other technical documents and reports to influence designs. Develop models of alternate designs or processing methods. Establish research programmes to support net-zero ambitions. Create systems to ensure compliance with regulations, e.g. environmental or governmental. Use product data to inform competency demand requirements. Use process data to inform competency demand requirements. Explore emerging technologies to optimise the design, sustainability and energy-efficiency of buildings e.g. using Generative Design and Algorithms. Use design tools and techniques to design buildings and optimise performance. Continually update and refine 3-Dimensional models using digital modelling systems. Use digital tools to assist with planning, quality assurance, safety protocols, or sampling. Implement the H&S and building safety standards and regulations. Model potential hazards and threats to people and premises within the construction environment. Implement innovative construction materials and techniques for sustainable building practices. Apply sustainable design principles and strategies to enhance the energy efficiency and environmental performance of estates, structures and premises. Implement programmes to improve sustainability or reduce the environmental impacts of engineering or architecture activities or operations. Apply environmental assessment reports, tabulating data and preparing charts, graphs, or sketches. Identify opportunities for efficient integration of manufactured elements into traditional construction projects. Test models of alternate designs or processing methods.

	Predict the performance of construction materials with technical performance data under different conditions e.g. using Machine Learning and Algorithms.
3. Integrators Organisations	Stay updated with the latest advancements in construction materials and building technologies to inform design decisions and promote innovation. Conduct technical research to identify and evaluate industry best practices for manufacturing systems engineering in the construction sector. Develop processes for efficient integration of manufactured elements into traditional construction projects. Use digital sequencing to model risk pathways and eliminate hazards. Develop in-person or virtual reality H&S training. Define relevant competences associated with building safety standards, guidance & best practices. Model the testing, operation, maintenance, or repair of facilities or equipment for future demands. Explore the use of digital design tools to optimise the layout and structural integrity of facilities and structures, e.g. using Generative Design. Apply safety regulations for those responsible in industrial safety, e.g. safety engineers, labour representatives, and safety inspectors. Evaluate construction project materials and testing results for compliance with environmental standards. Optimise material selection using data analytics tools for sustainable construction. Utilise technology to evaluate the technical feasibility of manufactured elements in designs e.g. Virtual Reality and Immersion. Collaborate with customers to assess the environmental impact of proposed construction or to develop pollution prevention programs. Utilising data analytics software to analyse and optimise construction project timelines. Apply anomaly detection methods to detect unusual patterns in construction site data. Establish KPIs for monitoring and evaluating effectiveness of building programs. Evaluate effectiveness of building programme delivery. Inform all stakeholders of project status and performance. Monitor potential hazards and threats to people and premises within the construction environment. Provide upskilling and reskilling programmes on safety procedures, best practices and live environments to enhance safety and security in the construction industry. Create a data visualisation dashboard using business intelligence tools to monitor and analyse construction risk metrics.

	Procure needed resources to implement construction programs or projects. Collaborate with clients, vendors, staff, and management personnel regarding purchases, product and production specifications or manufacturing capabilities.
4. Manufacturers	Develop standardised processes using Lean principles Implement regulatory requirements for construction projects. Develop and implement standardised processes for construction to improve efficiency and quality. Implement Building Information Modelling (BIM) technology for clash detection and coordination between design and construction teams Utilise Finite Element Analysis (FEA) software to evaluate the structural integrity of construction components. Plan the management of construction projects using scheduling of material deliveries and digital tools and software Coordinate and manage construction projects using established project management methodologies and principles. Develop digitised maintenance programs Contribute to statistical studies, technological advances, or regulatory standards and trends to stay informed of issues in the field of quality control. Implement lean manufacturing principles to streamline the production process and reduce waste in construction activities. Implement technology opportunities for optimising construction site planning, e.g., using Augmented Reality Implement technologies to enhance productivity and efficiency in construction processes, e.g., using Automation, Robotics, and Machine Learning Utilise process simulation software to assess and improve workflow efficiency. Utilise non-destructive testing methods, such as ultrasonic testing or X-ray imaging, to detect internal defects in construction materials. Conduct technical research to identify and evaluate industry best practices for manufacturing systems engineering in the construction sector. Identify opportunities to improve manufacturing processes, products or to reduce costs using e.g. knowledge of fabrication processes, tooling and production equipment, assembly methods, quality control standards, or product design, materials and parts. Develop expertise in manufacturing techniques and digital fabrication technologies to enhance construction efficiency and reduce waste. Evaluate the technical performance of construction materials using standardised testing methods. Quality assure supplies or materials to complete construction projects. Track and verify the origin and authenticity of construction materials e.g. using Blockchain.

	Interpret manufacturing capabilities, production schedules, or other information to facilitate production processes. Apply data analytics and machine learning techniques to streamline the production process in construction activities.
5. Installer Organisations	Develop standardised processes for construction using Lean principles Implement regulatory requirements for construction projects. Plan construction of building projects to minimise risk and meet the brief. Interpret regulatory requirements for construction projects. Interpret project specifications to determine appropriate construction methods e.g. using natural language processing. Establish construction sequences and lead times. Develop construction options to compare alternatives, in terms of performance, e.g. short-term costs, long-term costs, or environmental impacts. Implement technologies to enhance productivity and efficiency in construction processes, e.g., using Automation, Robotics, and Machine Learning Verify that equipment is being operated and maintained according to quality assurance standards. Utilise process simulation software to assess and improve construction workflow efficiency. Alter workflow schedules according to production operations. Utilise non-destructive testing methods, such as ultrasonic testing or X-ray imaging, to detect internal defects in construction materials. Use digital tools to model planned and unplanned maintenance schedules and resources for specific components of a building. Explore the use of digital tools for process optimisation and real-time monitoring of component installation in Construction. e.g. using Artificial Intelligence. Implement digitised maintenance programmes. Apply best practices and SOP's (Standard Operating Procedures) in operation of equipment for construction. Apply anomaly detection methods to detect unusual patterns in construction site data. Track and verify the origin and authenticity of construction materials e.g. using Blockchain.