INNOVATE UK

Talent & Skills Project Showcase

Day 2: Springburn Campus – Glasgow Kelvin College

UKRI Innovate UK

Welcome

Debbie Johnson

Head of Innovation Talent & Skills

Innovate UK

AGENDA

0930		Registration & Networking
1000	Debbie Johnson	Welcome & Introductions Incorporating 5min welcome from Glasgow Kelvin College
1015	Fran McIntyre	Keynote
1030	Abi Stocker	Behind the Breakthroughs: Who's driving innovation in the private sector workforce?
1100	Clare Porter	Tech Horizons and Workforce Readiness
1230	Lunch	
1330	Danielle Portsmouth	From Data to Decisions: Building Skills for Emerging Technologies
1500	Summary and close	

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Keynote

Fran McIntyre

Managing Director – Exec Committee
Innovate UK Business Connect

Unlocking the skills behind innovation

Abigail Stocker

Lead Specialist – Innovation Research,
Economics and Insights Team
Innovate UK

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Behind the Breakthroughs: Who drives innovation?

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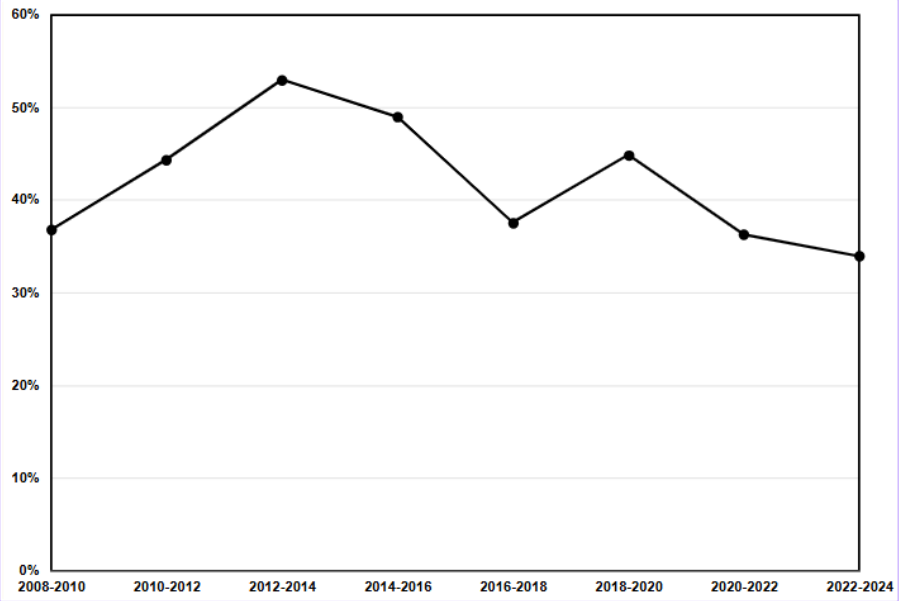
FROM SKILLS TO WORKFORCE

- Current understanding of who delivers innovation is narrow
- Overly focussed on formal R&D functions
- Invisible in official datasets, e.g., SOC codes
- Hidden within broader functions and embedded in multidisciplinary teams.

LACK OF UNDERSTANDING CREATES BLIND SPOTS

- Are we targeting and supporting the right people?
- Persistence of myths, e.g., ‘the lone inventor’
- Skills mismatches
- Wider context - innovation activity is declining
- ‘Lack of skills’ is a known barrier.

Percentage of businesses which were innovation active, 2008-2010 to 2022-2024



Source: UK Innovation Survey, 2025

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BUILDING A BETTER VIEW

- Worked with Perspective Economics to answer the question: **who delivers innovation in the UK's private sector innovation workforce?**
- Study combines survey data, analysis of labour market data, interviews and case studies
- Snapshot in time (i.e., not prescriptive).

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INSIGHT 1
INNOVATION IS A TEAM SPORT

- Results confirm that innovation extends beyond formal R&D functions, especially in SMEs
- Innovation relies on cross functional teams combining technical and non-technical expertise
- Teams are fluid and dynamic, flexing depending on where a business is in its growth cycle.

CASE STUDY
ROLLS-ROYCE

- One of the UK's leading engineering and advanced manufacturing companies
- **Innovation embedded across the organisation**, with ~700 employees demonstrating innovation-related skills
- Innovation is delivered by connected teams spanning research, engineering, digital operations and product development, not isolated innovators
- Strong talent pipeline, with ~600 apprentices and graduates joining annually
- **'Powered by people'** culture promotes collaboration, learning and diverse perspectives.

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WHO IS PART OF THE TEAM?

Innovation Roles Framework

Innovation Leadership

Chief Innovation Officer
Chief Technology Officer
Commercial Director
Director / Head of Innovation
Head of Strategy
Innovation Lead / Manager

Innovation Strategy & Insight

Innovation Analyst
Innovation Strategist
Innovation Consultant
Innovation Architect
Innovation Advisor
Data Scientist

Commercialisation & Growth

Innovation Engagement Officer
Business Development Lead / Manager
Brand Manager
Marketing Lead / Head of Marketing

Process Innovation

Change Agent
Innovation Coordinator
Technician
Implementation Engineer
Process / Process Development Engineer

Product & Service Innovation

Product Developer
Product Innovation Manager
Application Engineer
Software Engineer
Mechanical Engineer

Design

Design Consultants
Product Design
Service Designer
Design Lead

Entry & Emerging Roles

Innovation Intern
Innovation Associate

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INSIGHT 2
INNOVATION IS EMBEDDED

- Most roles aren’t explicitly linked to innovation
- Proportion of innovation roles linked to innovation in our business survey:
  - **3%** ‘explicit’
  - **11%** R&D
  - **86%** ‘implicit’

INNOVATION ROLES EVOLVE WITH THE BUSINESS

Roles category	Start-Up	Venture	Established
Entry & Emerging Roles	2.9% (n=13)	2.6% (n=29)	2.4% (n=135)
Design	7.5% (n=33)	8.2% (n=92)	7.9% (n=435)
Commercialisation & Growth	23.1% (n=102)	21.1% (n=236)	21.6% (n=1,194)
Process Innovation	4.8% (n=21)	5.6% (n=63)	10.3% (n=571)
Product & Service Innovation	9.3% (n=41)	8.3% (n=93)	10.1% (n=557)
Innovation Strategy & Insight	15.2% (n=67)	15.6% (n=175)	16.1% (n=889)
Innovation Leadership	37.3% (n=165)	38.5% (n=431)	31.6% (n=1,744)

Source: Perspective Economics, 2025. n=~7,000 profiles matched to companies.

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INSIGHT 3
THE ‘MISSING MIDDLE’

- Provision of early career and leadership roles, but challenges recruiting mid-level roles with technical and non-technical skills
- Product and service innovation, process innovation, design and commercialisation under resourced
- SMEs rely on a small number of staff to cover multiple innovation responsibilities
- **40%** reported no formal career path or progression route for innovation roles.

HOW DO BUSINESSES BUILD INNOVATION CAPACITY?

Leadership

- In businesses where senior teams actively champion innovation, allocate resources and create space for experimentation, innovation is integrated into strategy more effectively.

Partnerships

- Collaborations with Catapult centres, research businesses and industry clusters provide access to expertise, equipment and networks
- These connections are especially valuable to SMEs, helping to overcome scale and resource constraints.

Culture

- Open dialogue, cross-functional collaboration and tolerance for failure help to translate ideas into outcomes.

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CASE STUDY
TOKAMAK ENERGY

Tokamak Energy

- Fusion energy pioneer employing ~300 people across the UK
- Highly technical workforce supported by commercial, operational and strategic expertise
- Innovation culture built around two principles:
  - **Pace over perfection** – rapid experimentation and iteration
  - **Avoid paralysis by analysis** – empowering decisions under uncertainty
- **Skunkworks-style innovation teams** enable rapid prototyping, testing and learning with minimal bureaucracy.

‘The team culture is most crucial – innovation moves the quickest within an open remit’

Greg Brittles
Innovation Team Lead

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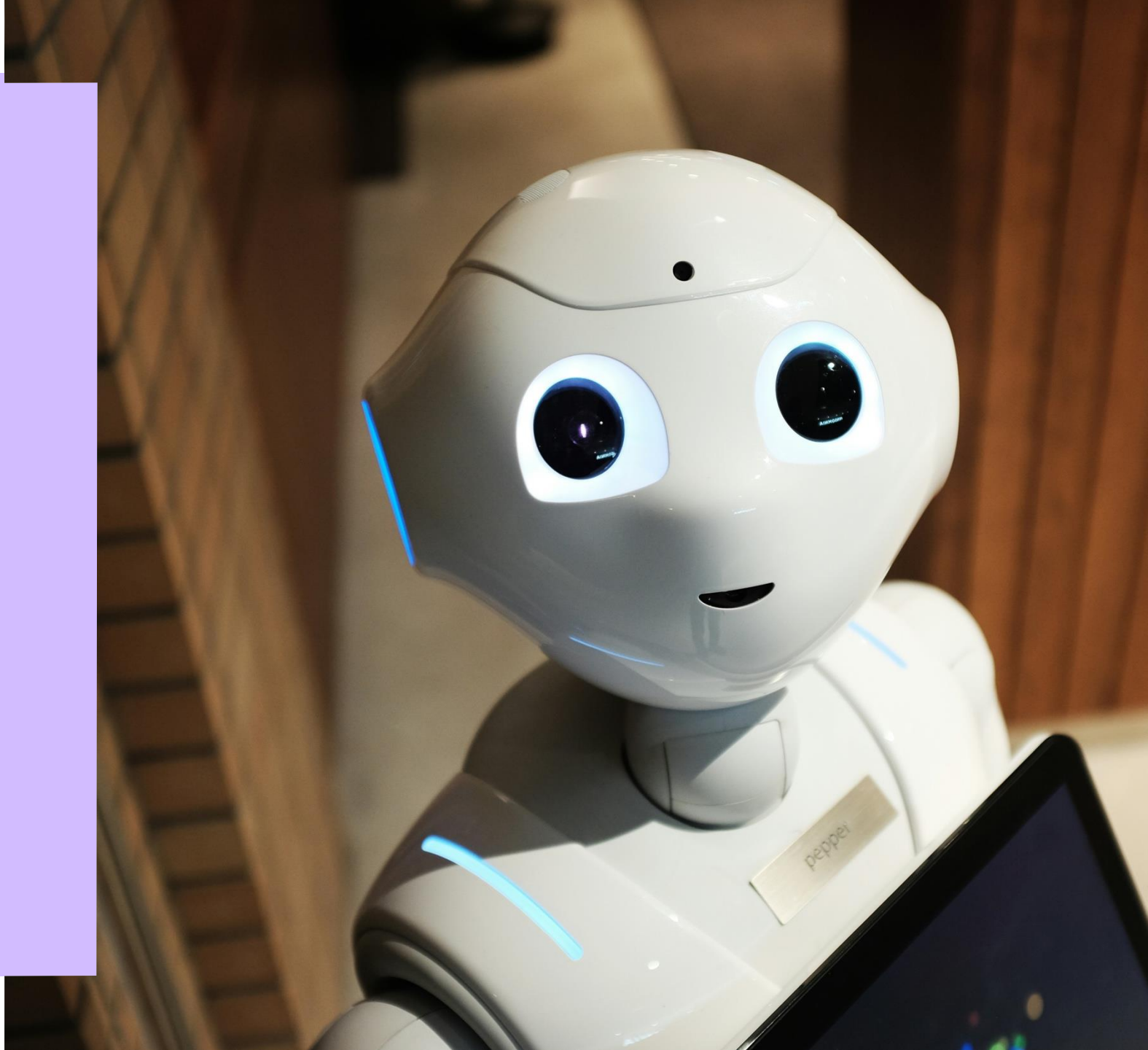
MAINTAINING MOMENTUM

- Culture and leadership essential for sustaining innovation
- Investment in people as important as investment in technology
- Large businesses tend to invest in structured talent pipelines; SMEs rely more on flexible resourcing and external collaborations
- Links to the Innovation Skills Framework.



BUILDING AN INNOVATION WORKFORCE

Businesses

- Invest in innovation culture, leadership and collaboration.
- Build clearer talent pipelines and career pathways through recognition of innovation skills.

Policymakers

- Improve visibility and measurement of innovation roles.
- Address mid-career and technician skills shortages.
- Support SMEs to access the talent and skills programmes needed to build innovation capacity

Educators

- Develop multidisciplinary skills, not just technical expertise.
- Align training with employer needs and innovation practice.
- Increase awareness of innovation career pathways.

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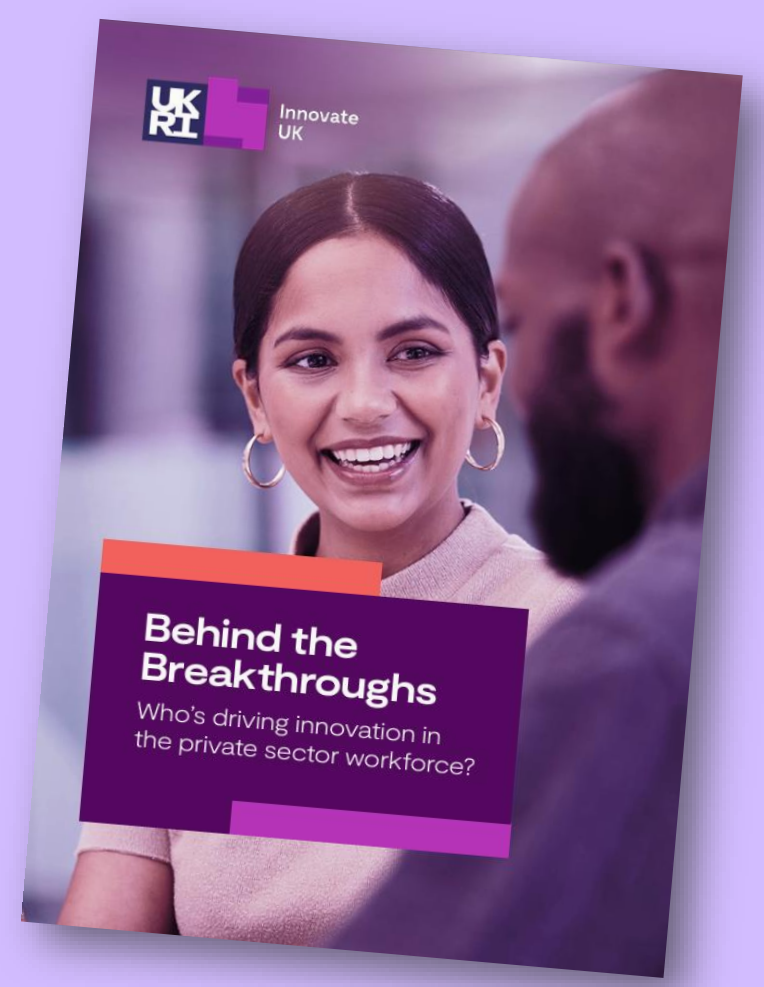
DOWNLOAD THE REPORT



Get in touch to discuss the research further
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THANK YOU

Any questions?

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Break

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Tech horizons and workforce readiness

Clare Porter
Director for Strategic Engagement
High Value Manufacturing Catapult

CATAPULT
High Value Manufacturing

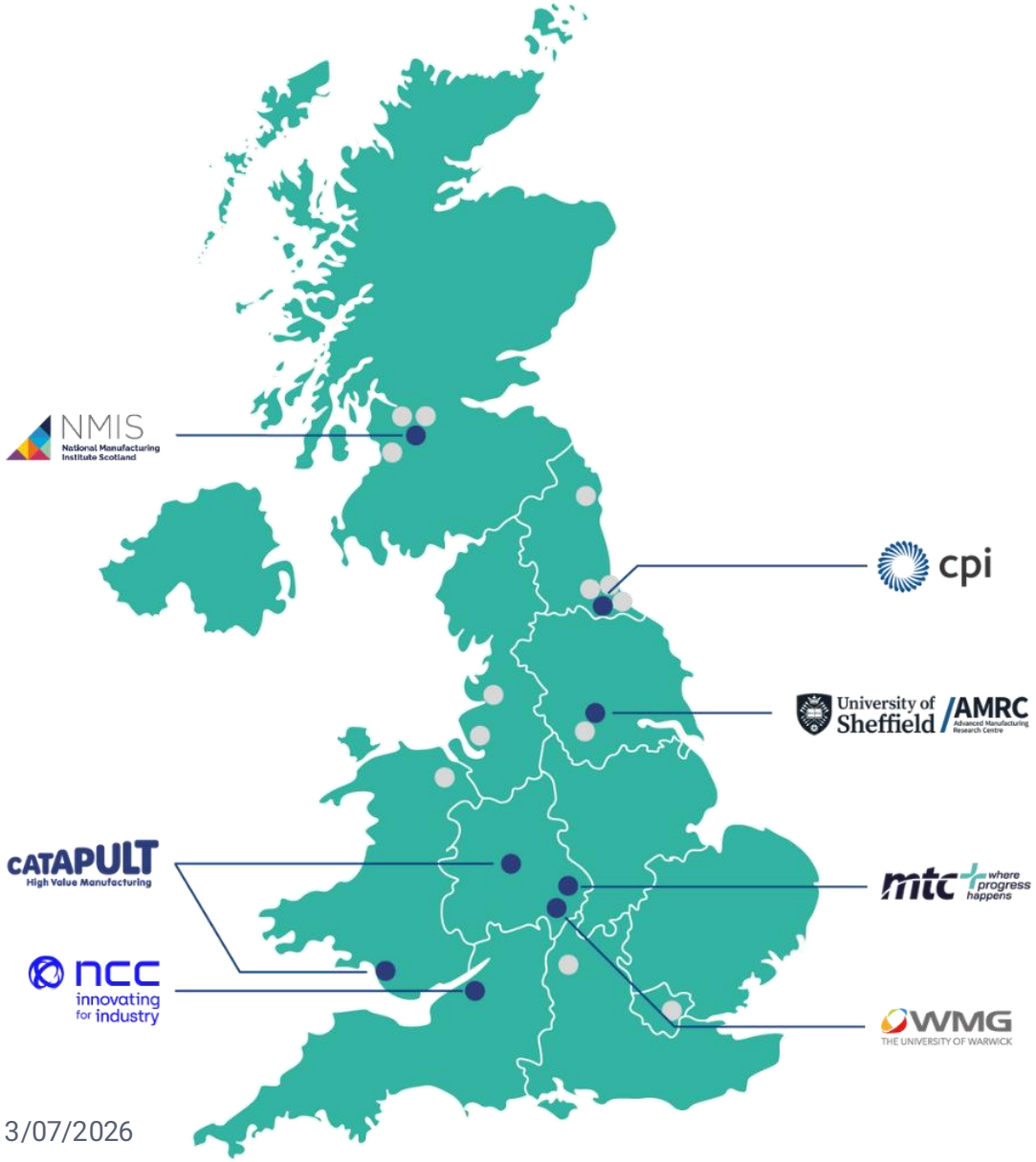
Technology Horizons & Workforce Readiness through **“People Roadmaps”**

9th July 2026

Clare Porter, Director for Skills, HVM Catapult

University of Sheffield AMRC Advanced Manufacturing Research Centre
cpi
mtc where progress happens
ncc innovating for industry
NMIS National Manufacturing Institute Scotland
WMG THE UNIVERSITY OF WARWICK

HVM Catapult overview



Established by Innovate UK in **2011**

Part of Innovate UK Catapult Network

Employing **3,500+** people

Since 2011:

41,142 Companies worked with

23,135 SMEs worked with

HVM Catapult strategic priorities

Developing a future fit manufacturing & engineering workforce that can innovate, scale and use technologies in the UK, to retain and create high value jobs needed for Industrial Strategy success

1. Future Skills for Industrialisation

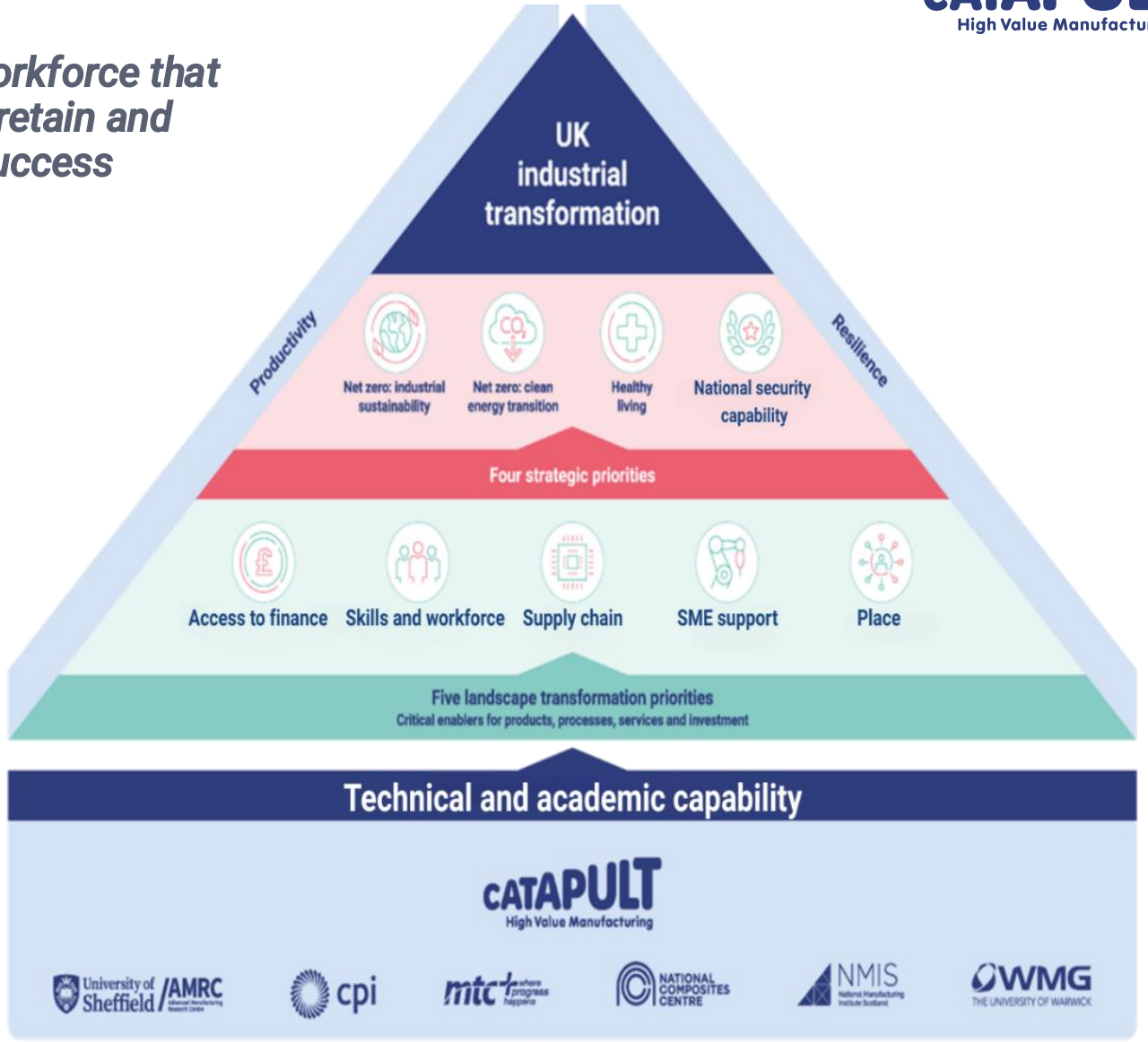
- Understand technology workforce impacts & the skills needed for digital, sustainable, and technology driven industrial transformation

2. Diffusing capability across the skills landscape

- Influencing national & local partners skills strategies and accelerating provider network ability to deliver future fit skills

3. Upskilling and reskilling the manufacturing & engineering workforce

- Specialist training that addresses skills landscape gaps & barriers preventing scale up of technologies' we develop



What is a People Roadmap?

Accelerating technology scale-up, diffusion and use through the early identification of workforce

- People Roadmapping is a repeatable methodology for providing insights on the impacts of HVM Catapult technologies on the tasks, roles & occupations that are vital for industrial strategy success
    - Aligned with the UK skills systems- demonstrating relevance & compatibility.
        - E.g., Skills England Standards Skills Classification, Standard Occupational Classification
- A step change in the articulation of workforce requirements **within HVM Catapult technology capability roadmaps**
- Project Specific purpose: to explore whether HVM Catapult's distinctive role in technology development and insight can be used earlier and more consistently to identify workforce impacts- providing clearer signals to employers, education and skills providers, funders and policymakers **for their response**.
- The project was not designed to solve current manufacturing labour shortages or to make a case for more provision.
- **Intended outcome:** strengthen workforce readiness so that technologies can be developed, scaled, diffused & used faster- supporting productivity growth
- **People Roadmaps is currently a pilot-stage methodology** but we have moved from concept towards a model for future implementation. i.e., a credible basis to build a repeatable model for embedding in the catapult roadmapping and technology approach as part of the catapult mission.

Rationale

HVM Catapult can strengthen & systematise its approach to the early identification of workforce impacts and skills needs arising from the technologies it develops

- **Skills Anticipation** is needed for IS success. Without an integrated, forward-looking framework, there is a risk that UK education & skills interventions **will continue** to arrive too late**, often when technologies are already mature-leading to skills shortage gaps**.
- **The broader national foresight & forecasting landscape** (incl: Skills England, CAs, industry, professional bodies) can be more closely connected to HVMC's technology insights, offering potential synergies & efficiencies
- **Innovate UK** wants catapults to work to a common framework that connects technology development to workforce impact, providing clearer strategic signals to industry, government, & the external skills landscape.
- **Practices across HVMC centres vary**, with workforce & skills activities at different stages of maturity. This reflects distinct histories & priorities. There is opportunity to develop a consistent methodology for linking tech. development to workforce & skills.
- **HVM Catapult technology roadmaps vary in how explicitly they address workforce impact & skills capability gaps**. Links between technology & skills are often made later in the process, sometimes only when training solutions are being considered, indicating scope & requirement for earlier anticipatory signalling.

Benefits

Technology, are scaled & benefits realised through a skilled workforce- increased productivity & growth

Skills foresighting embedded in catapults, leading to improved national workforce planning & a responsive skills system that meets industry need

Strengthened strategic positioning of workforce insight across the HVM Catapult, differentiating its offer in skills landscape

Informs HVM Catapult network workforce development planning

Informs Innovate UK strategy for Talent & Skills

Project Overview & Construct

Innovate UK funded project-a collaboration across the HVM Catapult network (skills & technology leads) & with the University of Cambridge- Institute for Manufacturing (IfM)

Work Packages

1. **The case for people roadmaps, including if, when, and how they are used-informed by a review of international practice.**
2. **How the findings and recommendations of the 2020 Manufacturing the Future Workforce report are being used.**
3. **A framework that integrates workforce requirements within HVM catapult, industrial & sector level technology roadmaps.**
4. **Identify workforce requirements of the HVM Catapult network to develop people roadmaps.**
5. **Scope the potential of existing AI solutions to standardise & produce an integrated people & technology roadmap.**

Project Outputs

1. Review of international approaches
2. Model People Roadmaps framework
3. Technology Roadmap Use Cases- Composites engineering; Digital Manufacturing; Bio-manufacturing, Near net shapes
4. Summary reports with findings across all work packages
5. Recommendations for implementation, e.g., application to future tech roadmaps & phased capability building to operationalise into next grant period

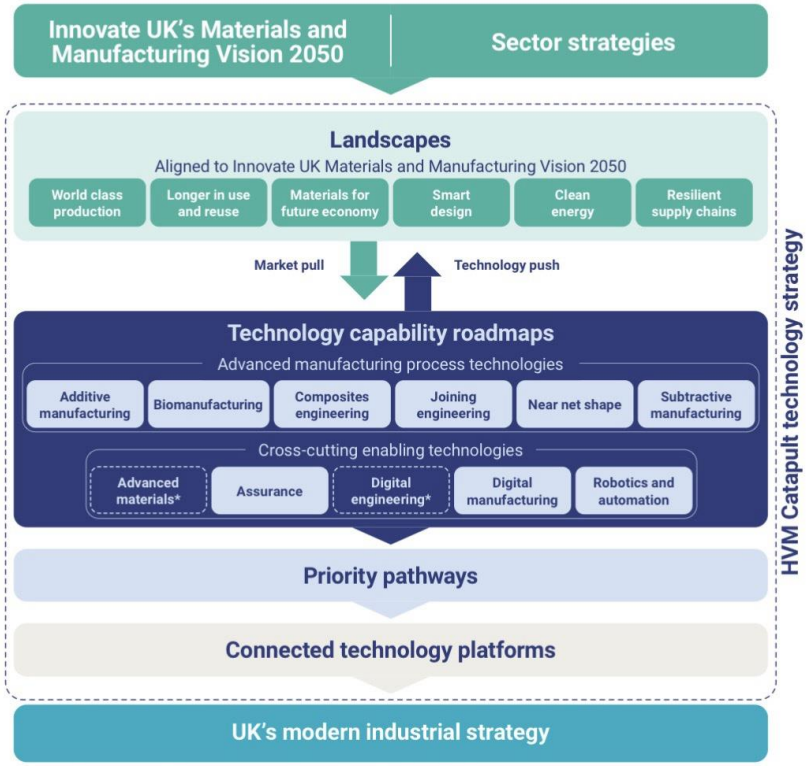
Technology Strategy & technology capability roadmaps

[HVM-Catapult-technology-strategy-2026.pdf]

The strategy structure

Our technology strategy is a direction-setting framework designed to align our centres and the wider innovation ecosystem around shared technology priorities.

Identifying industry needs and then establishing the pathways to deliver innovation priorities, it will guide capability development and investment to support the delivery of the UK's modern industrial strategy. It consists of four key components: landscapes, technology capability roadmaps, priority pathways and connected technology platforms.

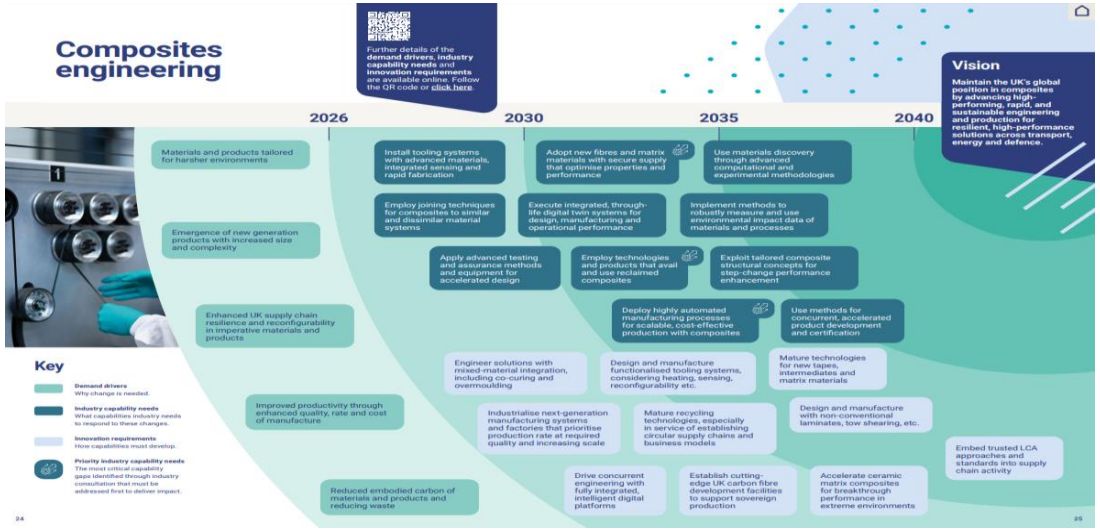


*Advanced materials and digital engineering roadmaps will be published at a later date.

Architecture of HVM Catapult technology roadmaps

Level 0

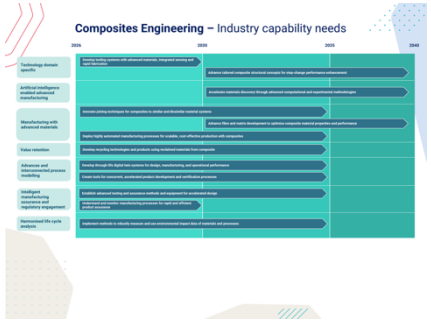
Level 1

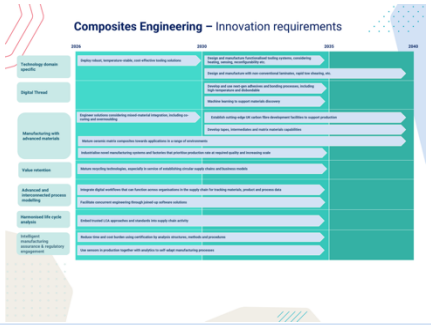


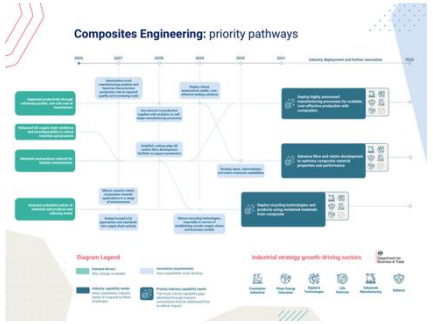
This is an executive summary of the technology *domain* highlighting priorities & key capabilities across the HVM Catapult network

Transformation map communicating the priorities for this technology *domain* mapped across time horizons

Level 2







Why: Demand drivers

Opportunities or challenges that create the need for new or improved manufacturing capabilities.

What: Industry capability needs

The practical abilities industry need to remain competitive in future & priorities for HVMC

How: Innovation requirements

Specific technologies, tools, processes, data, system enablers for development, improvement or integration to meet future technology capability needs.

Which: Priority pathways

The priority capability & underpinning innovation requirements. These define HVM Catapult's focus areas for capability development.

7 International Stakeholders

Early engagement has influenced the methodology

Commonwealth Scientific and Industrial Research Organisation (CSIRO) (Australia)

Fraunhofer-Gesellschaft (Germany)

National Institute of Advanced Industrial Science and Technology (AIST) (Japan)

Singapore Institute of Manufacturing Technology (SIMTech)

Research Institutes of Sweden (RISE)

Industrial Technology Research Institute (ITRI) (Taiwan)

Manufacturing USA

- **Role of RTO-** Workforce development is common in mandates & operations**, but skills anticipation is rarely formalised.** RTOs do play a unique convening role at the intersection of research, industry, and skills systems.
- **Use of technology roadmaps-** Several international RTOs demonstrate the value of linking technology roadmaps to workforce planning (SIMTech, Manufacturing USA, ITRI).
- **Link between technology maturity & workforce readiness.** (Fraunhofer, Germany & Manufacturing USA) informed the methodology's focus on when task and workforce impacts emerge across different time horizons.
- **RISE, Sweden, and SIMTech, Singapore,** reinforced the internal capability and skills-system connection
- **Quantitative forecasting** works for stable occupations but fails for emerging technologies
- **International examples provide useful elements**- *workforce taxonomies, skills mapping, provision-gap analysis, mixed methods & stakeholder participation,* **but not a full model that explicitly translates technology roadmaps into workforce and skills-system action**

UK stakeholder engagement key messages

Innovate UK, Skills England, Enginuity, IMechE, RAE, Make UK, Siemens, Gatsby

- Stakeholders want a clear bridge from technology to skills, curriculum and policy choices.
- They regard **changing tasks and human interaction** with technology as the most credible organising principle, rather than jumping too early to occupations, standards or knowledge, skills and behaviours.
- They **do not want new taxonomies** where existing system tools can be used. For people roadmaps to influence action, outputs need to align with the UK skills systems and be legible to those who operate within it.
- Informs project key conclusion:
    - people roadmaps should build on existing technology roadmaps, draw on relevant sectoral evidence where available, & act as a bridge rather than a parallel process- converting technology trajectory into workforce insight that can support capability building, skills provision response and inform wider policy.

4 Technology case studies inform the co-development of People Roadmaps framework & a future approach to the technology strategy

CATAPULT High Value Manufacturing

Composites Engineering

Digital Manufacturing

Bio-engineering

Near net shape

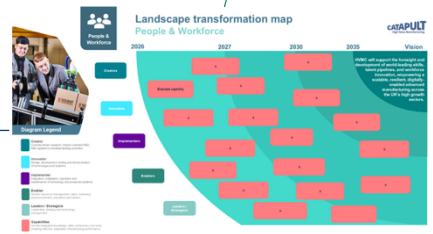
All 6 HVM Catapult centres were involved in the project through the technology & skills leads. The technology group chairs/ co-chairs, leading the case studies engage with counterparts across the network.

Analyse current technology roadmaps for explicit & implicit workforce requirements

Optimum level is being considered

Co-develop methodology & taxonomy for translating roadmap data to people roadmap framework

Workshops with technology & skills leads to test & pilot the methodology



Agree co-created framework & methodology for People Roadmaps

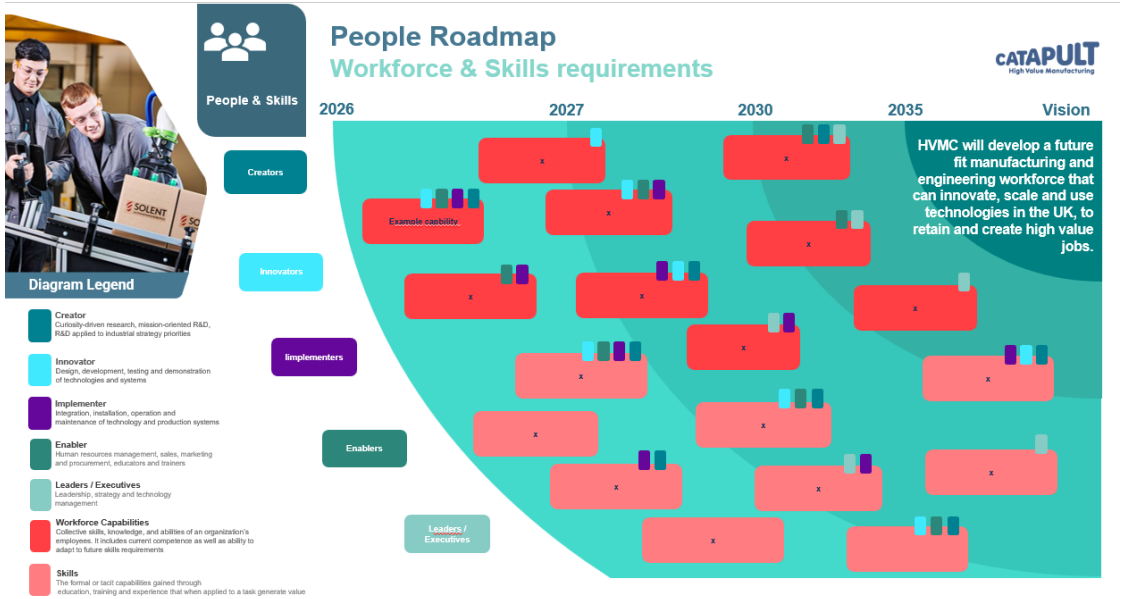
Validate results with stakeholders

Application of framework to roadmaps, future technology strategy & workforce activities

Developing the strategic methodology

The University of Cambridge Institute for Manufacturing is supporting the project

Each case study tech & skills lead tasked with reviewing their technology roadmaps for workforce impacts while the IFM developed a first draft methodology for co-development.



Workforce description by functions performed

Workforce	Functions	Description
Creator	Curiosity-driven research, mission-oriented R&D, R&D applied to industrial strategy priorities	Scientists and engineers (TRLs 1-4, MRLs 1-4s)
Innovator	Design, development, testing and demonstration of technologies and systems	Designers and engineers (TRLs 4-7, MRLs 4-7)
Implementer	Integration, installation, operation and maintenance of technology and production systems	Engineers and technicians (TRLs 7-9, MRLs 7-10)
Enabler	Human resources management, sales, marketing and procurement, educators and trainers	Professionals and technicians (TRLs 4-9, MRLs 4-10)
Manager / Executive	Leadership, strategy and technology management	Engineers and other professionals (TRLs 4-9, MRLs 4-10)

Source: Authors based on Aiken, J. et al (2024). Workforce readiness level (WRL) Deskbook (v1.01). MIT; Skills England (2015). Occupational Maps; Workforce Foresighting Hub; and Manufacturing USA ().

Methodology for 5 stage People Roadmapping process

CATAPULT High Value Manufacturing

1 → 2 → Validation Gateway → 3 → Validation Gateway → 4 → Validation Gateway → 5

WHY

Pre-work to construct the **WHY** narrative using technology roadmaps & sectoral strategies.

- Select **priority industry capability** & underpinning innovation requirements
- Key **trends & drivers** shaping the capability
- Sectoral pathways & **Industrial Strategy goals** the capability enables
- **Brief stage narrative** for each time horizon- what becomes technically feasible, which applications become viable, & what constraints remain

WHAT/ WHO

Workshops to pilot & validate the **WHY/ WHAT/ WHO** narrative & identify task changes, roles, and skills.

- For each maturity stage, **identify emerging tasks** for **Creators, Innovators Implementers**
- Identify tasks that are **growing, transforming, declining, or becoming obsolete?**
- Are new or hybrid roles emerging? Are any existing roles declining?
- What new skill or knowledge areas are becoming critical?

3

Post-workshop coding & classification to translate outputs into structured formats compatible with skills systems

- **Standardised AI prompts-** SSC data set; SOCs, workshop outputs, HECoS subject list
- Download data sets
- Transcribe workshop outputs
- Task AI to map & match tasks to classifications
- Task AI to match to HE subjects & apprenticeships standards
- Group themes & clusters

HOW

HOW workshop for skills provision mapping & gap analysis.

- **AI generated UK skills system provision gap analysis-** a structured assessment of whether the UK education and training system currently covers the knowledge areas tasks identified require.
- Review & validation by tech & skills leads

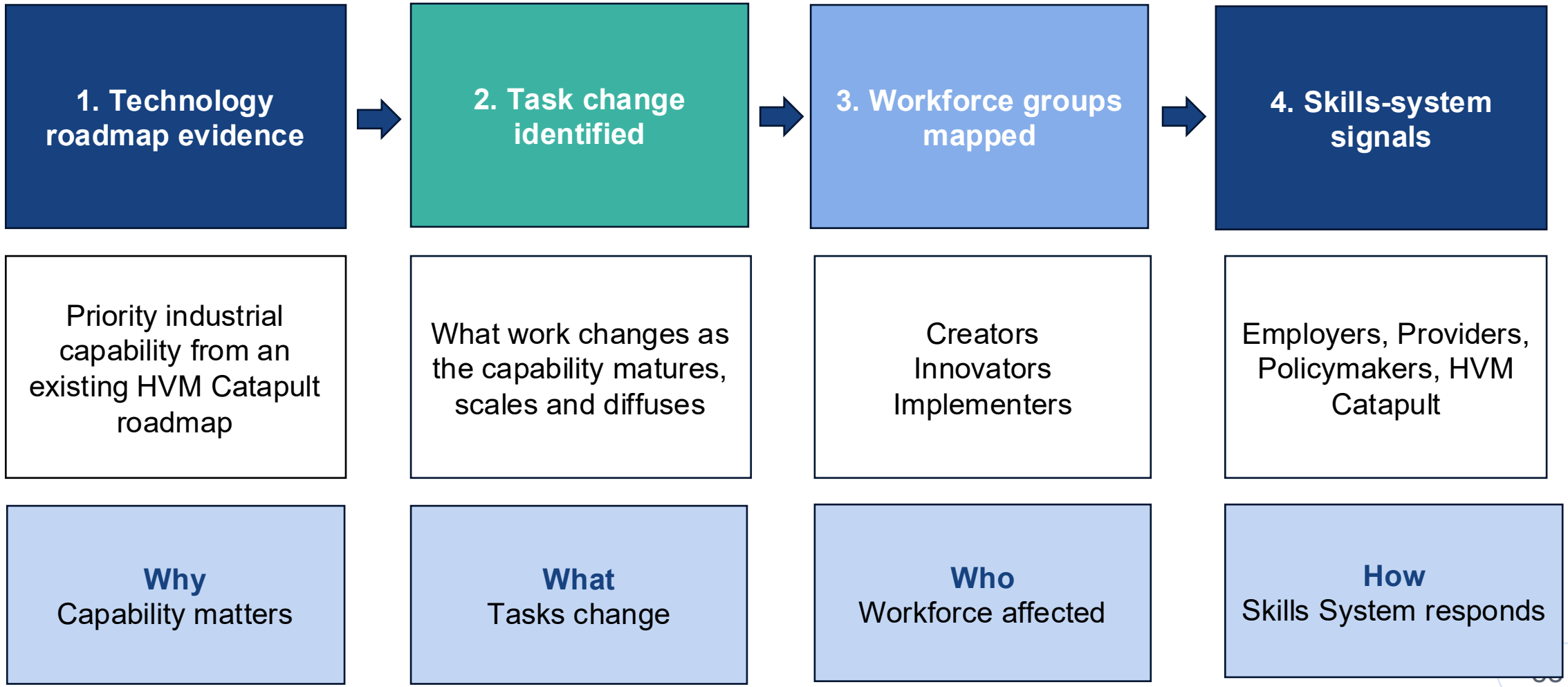
Outputs

Synthesis & communication tailored to stakeholder need

1. **Narrative briefing-** strategic context, tech trajectory, workforce implications; skills system signals
2. **Occupation & Task register-** identifies direction of change, cross cutting requirements
3. **Provision Gap matrix- identifies** where there is alignment and misalignment to existing provision/ future requirements

Priority industrial capability to task-level workforce insight

A people roadmap acts as a translation layer: *technology roadmap evidence in, task-level workforce insight out*



Pilot People Roadmap templates

The Why, What-Who & How

People Roadmap Template

Industry capability:

			Current state	Short-term	Medium-term	Long-term	
			Milestone:	Milestone:	Milestone:	Milestone:	
Why?	Industry capability need (i.e. must have practical ability)	Trends and drivers	20_	20_	20_	20_	Sectoral needs / application requirements (WHY?) Evolving narrative of how innovation requirements (e.g. technologies) underpinning capabilities translate into sectoral competitiveness and industrial strategy success
		Innovation requirement (i.e. technology/tool/ method/process to meet industry capability)	How do innovation requirements (e.g. technologies) underpinning industry capability needs translate into sectoral competitiveness and industrial strategy success?				
What & Who?	Workforce changes – CREATORS	Task changes					Creators (WHAT & WHO?) Evolving narrative of how creator roles, tasks and skills will evolve over time, and who are the skilled people needed
		Roles/occupations					
		Skills					
	Workforce changes – INNOVATORS	Task changes	How does work change as a result of new industry capabilities (tasks, roles, occupations, skills)? (and at what scale?)				Innovators (WHAT & WHO?) Evolving narrative of how innovator roles, tasks and skills will evolve over time, and who are the skilled people needed
		Roles/occupations					
		Skills	Who are the skilled people needed to deliver this?				
	Workforce changes – IMPLEMENTERS	Task changes					Implementers (WHAT & WHO?) Evolving narrative of how implementer roles, tasks and skills will evolve over time, and who are the skilled people needed
		Roles/occupations					
		Skills					
How?	Skills provision	• HE Alignment • FE / Technical Education • Apprenticeships • Vendor / OEM training • CPD / In-work Learning • Other	How must skills provision evolve to support capability development and deployment?				Skills provision needs (HOW?) Evolving narrative of how skills provision needs to evolve

- Tech & skills leads complete
- Tasks-**Growing, new, declining, obsolete**
- **Enablers identified**, e.g., leadership, procurement, standards & regulations
- Consider **Scale** where possible

Tasks generated by four technology case studies

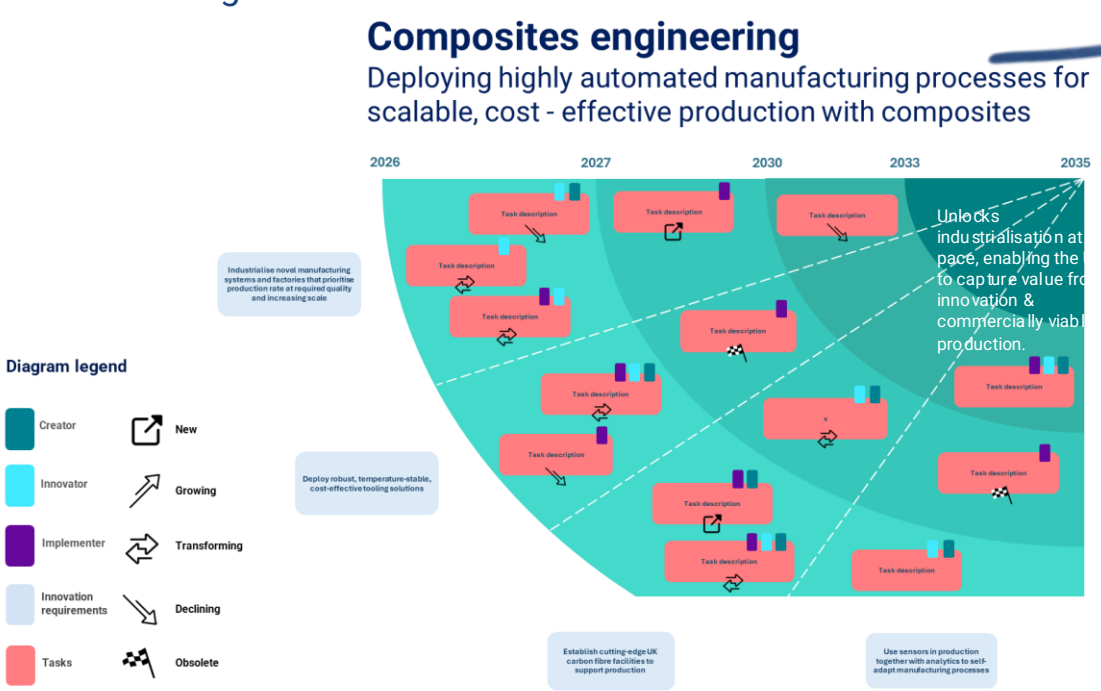
Piloting generated 76 task-level changes from 81 workshop entries

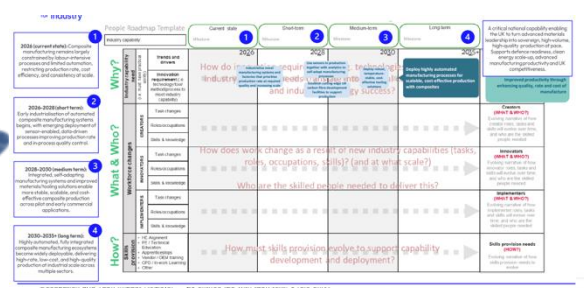
Composites Engineering: ***Deploy highly automated manufacturing processes for scalable, cost-effective production***	
28 indicative task changes were mapped across the Creator, Innovator, Implementor taxonomy. **Innovator** perspective most straightforward as reflects HVMC role	• Operate model-led qualification with AI-assisted in-process sensor analysis • Integrate automated systems into existing factory environments • Develop and implement new composite material formulations • Monitor and maintain digital twin systems for process qualification • Developing closed-loop processes • Commission robotic cells • Integrate automated manufacturing processes with digital business systems • Apply digital augmentation to manual lay-up • Using and managing swarm robots
The case study exposed indicative task changes and suggests the likely direction of change — with automated, digital and integration tasks **growing**; existing manual and engineering tasks **transforming**; and some labour-intensive manual activity likely **reducing**. It does not yet provide a fully validated classification of each task as growing, transforming or decreasing.	
Related Roles	• Automation engineers, manufacturing engineers, research engineers, digital engineers, integration engineers, composites technicians, operative-level technicians
Time horizons & coding to SSC	• Technologies & tasks expected in 2035, such as using and managing swarm robots, were not matched to any recognised standards-as expected, given the genuinely cutting-edge nature of this technology
Note: Trying to capture too many variables in one workshop reduced the depth of discussion. A full roadmap exercise would need a dedicated session with process experts, followed by structured follow-on work on roles, knowledge and scale. I*n all cases, pilot outputs require expert and skills-system validation before use as formal signals*	

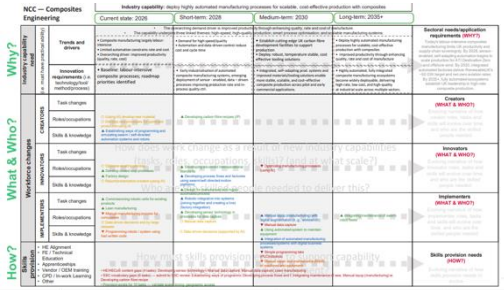
Composites engineering case study

Priority Industrial Capability- Deploy highly automated manufacturing processes for scalable, cost-effective production with composites

This is a critical enabler of the UK's broader ambition to strengthen productivity, global competitiveness, and leadership in high - value manufacturing.







A. Workforce role	B. Task description (verbatim from workshop)	C. Direction of change	D. SOC 2020 code	E. SOC occupation title	F. SSC task code	G. SSC task label (matched)	H. Time horizon	I. Confidence	J. Match relationship	K. Apprenticeship coverage (X/3)	L. HE coverage (X/3)	M. Cluster	N. Roles (verbatim)
★ CROSS-CUTTING: Materials development and characterisation (1 entry from NCC — also present in CPI, NMIS)													
Creators	Developing carbon fibre recipes (IP)	Growing	[EMERGING]	[Not yet classified]	No close SSC task match	No close SSC task match — SSC v1.0 has no task for composite material formulation or carbon fibre recipe development	2028	Low	Same-meaning	3/3	3/3	Materials development and characterisation	
★ CROSS-CUTTING: Process design, scale-up and lean operations (4 entries from NCC — also present in NMIS)													
Implementers	Lean manufacturing	Growing	1121/00	Production managers and directors in manufacturing	T.01199	Apply lean tools to identify and eliminate waste in processes.	2026	Medium	Same-meaning	2/3	0/3	Process design, scale-up and lean operations	Manufacturing engineer
Innovators	Factory design	Growing	1121/00	Production managers and directors in manufacturing	T.21156	Use CAD/CAM software to design plant layouts and build 3D models.	2026	High	Same-meaning	3/3	3/3	Process design, scale-up and lean operations	Manufacturing engineers; operations engineers
Innovators	Optimise existing process	Transforming	5223/01	Automation maintenance technicians	T.13074	Modify existing products and processes to optimise manufacturing operations.	2026	Medium	Same-meaning	3/3	3/3	Process design, scale-up and lean operations	Automation engineers; manufacturing engineers; material scientists; research engineers
Innovators	Design for manufacture with highly automated process	Growing	[EMERGING]	[Not yet classified]	T.05915	Design new systems and processes to optimise manufacturing efficiency.	2028	High	Same-meaning	2/3	2/3	Process design, scale-up and lean operations	
★ CROSS-CUTTING: Robotics, automation and integrated factory systems (9 entries from NCC — also present in CPI)													
Creators	Establishing ways of programming and simulating swarm / self-directed automation systems and robots	New	[EMERGING]	[Not yet classified]	T.06894	Develop three-dimensional simulations of automation systems.	2026	Medium	Same-meaning	2/3	3/3	Robotics, automation and integrated factory systems	
Implementers	Commissioning robotic cells for existing products	Growing	5231/01	Auto electricians	T.11070	Investigate the functionality of existing products.	2026	High	Same-meaning	3/3	2/3	Robotics, automation and integrated factory systems	Auto engineer (Level 5)
Implementers	Programming robots / system using had written code	Declining	5223/01	Automation maintenance technicians	T.20708	Train robots using artificial intelligence software to perform tasks.	2026	High	Successor	3/3	3/3	Robotics, automation and integrated factory systems	Automation engineer, equipment specialist engineer

Task changes mapped against relevant innovation requirements across time horizons, detailing their change – i.e., new, growing, transforming, declining and obsolete.

Tasks mapped & matched to roles & skills (SSC & SOC). Review of skills provision to assess if future fit.

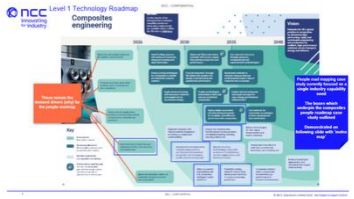
Future workforce impact

For the workforce and skills system, this translates into a significant transition: from labour - intensive fabrication toward roles in robotics, digital manufacturing, and data - driven process control.

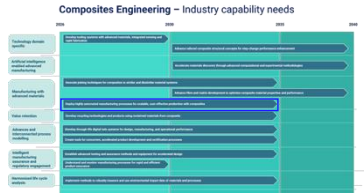
Communication to stakeholders- policy makers, Skills England, skills system, Industry

- *Briefing- describes impacts, trends & cross-cutting skills*
- *Occupation & task register*
- *Provision gap matrix*

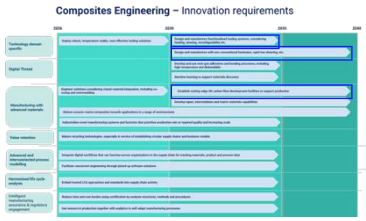
Interface between HVM Catapult technology capability roadmaps and people roadmaps



HVM Catapult Composite Engineering L1 technology transformation roadmap



HVM Catapult Composite Engineering L2 industrial capability need technology capability roadmap



HVM Catapult Composite Engineering L2 innovation requirements technology capability roadmap

HVM Catapult Composite Engineering *'Deploying highly automated manufacturing processes for scalable, cost-effective production'* occupation task register

L1 Technology transformation map

Mid-level Overview mapping priority technology vision, connecting industry challenges to long-term innovation goals for strategic direction and collaboration

The industry capability need is selected from the priorities in the L1 technology transformation map

What: Industry capability needs

The practical abilities industry must have to remain competitive in the future and the priorities for HVM Catapult

The industry capability needs inform the innovation requirements

How: Innovation requirements

The specific technologies, tools, processes, data, skills or system enablers that must be developed, improved or integrated to meet future capability needs.

The innovation requirements inform the changes to work tasks and roles

Work task changes and roles

They map and detail how technology changes will shift workforce skills and clarify center roles to scale innovation

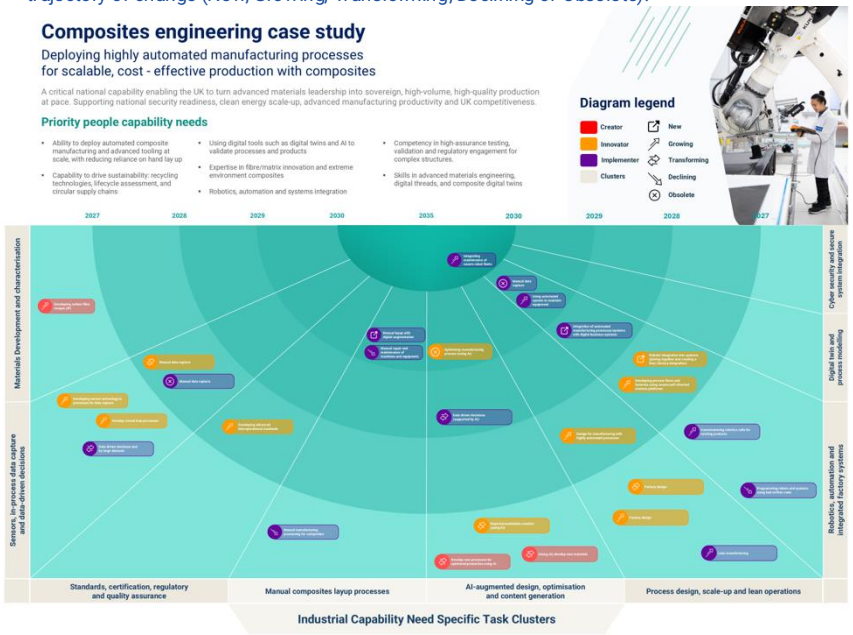
The occupation task register informs the people transformation map

People Roadmap (L0)

Top-level overview communicating demand drivers, people capability needs, enablers and skills provisions and interventions to engage government, public, and executive audiences.

Workforce transformation map (L1)

This transformation map provides a visual representation of **a single priority composites industry capability** and underpinning innovation requirements. It maps task according to workforce taxonomy (Creator, Innovator or Implementer), time horizon, and the expected trajectory of change (New, Growing, Transforming, Declining or Obsolete).



Composites engineering case study- Priority Industrial Capability

Deploying highly automated manufacturing processes for scalable, cost - effective production with composites

A critical national capability enabling the UK to turn advanced materials leadership into sovereign, high-volume, high-quality production at pace. Supporting national security readiness, clean energy scale-up, advanced manufacturing productivity and UK competitiveness.

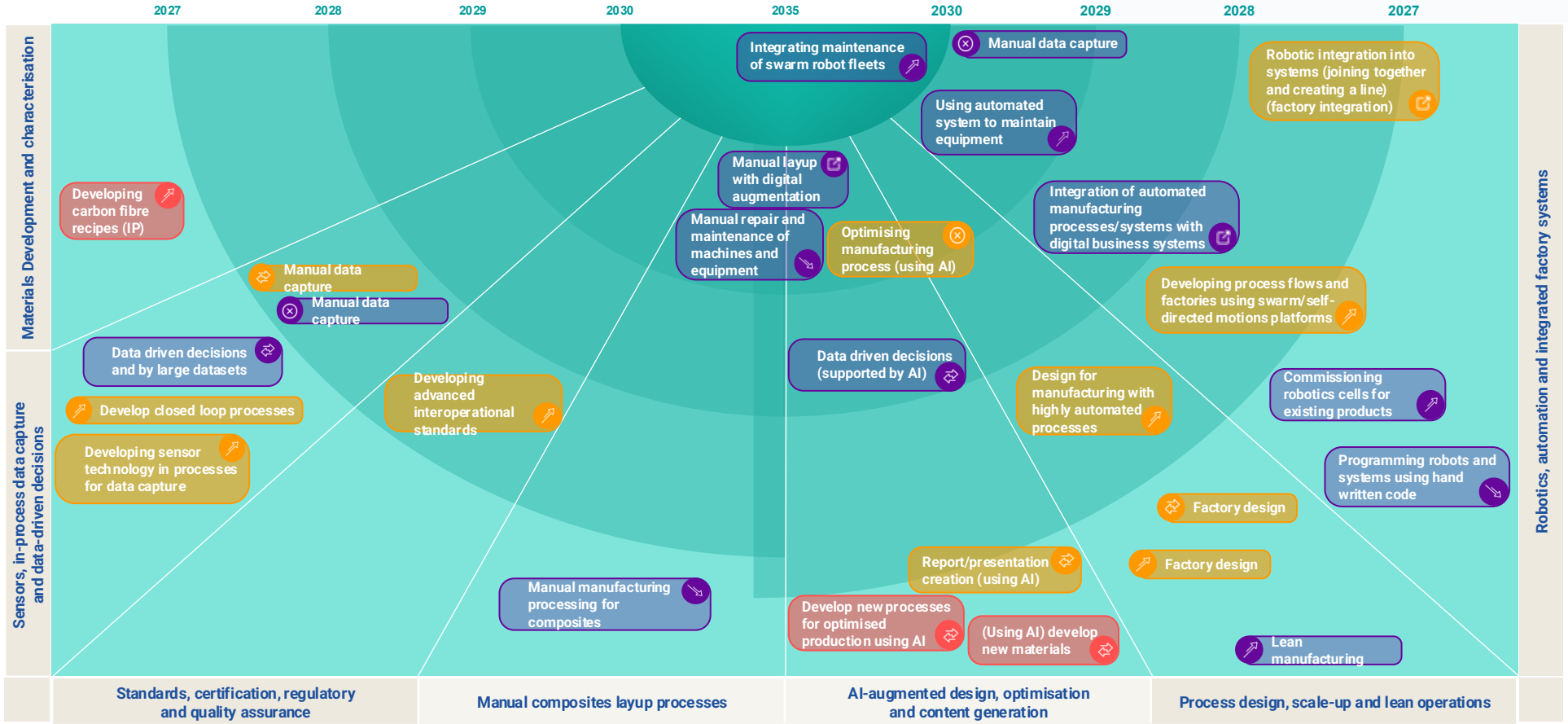
Priority people capability needs

- Ability to deploy automated composite manufacturing and advanced tooling at scale, with reducing reliance on hand lay up
- Capability to drive sustainability: recycling technologies, lifecycle assessment, and circular supply chains
- Using digital tools such as digital twins and AI to validate processes and products
- Expertise in fibre/matrix innovation and extreme environment composites
- Robotics, automation and systems integration
- Competency in high-assurance testing, validation and regulatory engagement for complex structures.
- Skills in advanced materials engineering, digital threads, and composite digital twins

Diagram legend

Creator
Innovator
Implementer
Clusters

New
Growing
Transforming
Declining
Obsolete



Composites Engineering People Roadmap Narrative

The future of composites manufacturing is automated, integrated, and data driven. But it only works if the workforce evolves at the same pace

If you look at where composites manufacturing is heading, the direction is clear: highly automated, data-driven, scalable production. The ambition is big – faster, cheaper, more consistent manufacturing at industrial scale.

But the roadmap makes one thing clear: this isn't just a technology challenge — **it's a people challenge.**

Currently, much of the industry is still relatively labour-intensive. Automation is there, but it's limited. Fast forward to 2035+, and the technology roadmap and vision will be here – **fully integrated, highly automated manufacturing ecosystems.**

That's a massive shift, but you don't get there just by buying new technology, you get there by building a workforce that can design, run, and evolve it – this is why people and technology roadmaps matter.

The composites automation roadmap shows a clear progression: moving from manual processes

→to sensor-enabled systems→ to AI-driven optimisation→ to self-adapting, integrated factories

At every step, the work changes, and the workforce changes. **Progressing from manual layup and basic programming to integrating robotic systems, analysing data**, designing whole production lines throughout the timeline.

Who is going to run this? What skills do they need? When do we need them by? Is provision able to meet need?

People Roadmapping Insights

There is a clear strategic gap. HVM Catapult technology capability roadmaps provide a strong view of future industrial capability, but they do not yet consistently translate that insight into task change, workforce implications or skills-system signals.

Opportunity to strengthen & systematize joint working of HVM Catapult technology and skills communities-Early project discussions showed that skills and technology leads understood common terms such as ‘skills’, ‘skills solutions’, ‘industrial capability requirements’ and ‘workforce implications’ differently.

Technology roadmap insights are not routinely used to inform the HVM Catapult network’s workforce development, learning and development priorities. This means the network does not yet have a clear learning and development strategy aligned to the time horizons and capability requirements set out in technology roadmaps.

People roadmaps are best understood as a translation layer. Their value is in converting validated technology-roadmap evidence into structured workforce insight for employers, providers, funders, policymakers and HVM Catapult’s own capability planning.

The methodology is credible but needs further operational design. The pilots produced useful insight, but future use will need clearer templates, common terminology, minimum outputs, quality standards, validation gateways and realistic resourcing.

The strongest signals are task-led and often cross-cutting. Starting with changing tasks helped avoid generic skills-gap language. Repeated themes around digital, data, modelling, assurance, interoperability and systems thinking may be significant, but need further expert and stakeholder validation.

The further out the horizon, the less reliable workforce impact identification becomes; people roadmaps can still surface useful directional signals, but these should be treated as assumptions to test and update, not definitive forecasts. Project recognised the transformational impacts of AI on technologies but analysis was not in scope.

AI is both an opportunity and a governance issue. AI-supported coding can improve speed and consistency, but should be treated as a governed translation aid, not as a substitute for expert judgement. Outputs should remain provisional until reviewed by technology experts, skills specialists and relevant system partners.

Skills-system stakeholders are essential to validation and use. People roadmap outputs need to be legible across England and the devolved nations, aligned where relevant with recognised classifications and tested with Skills England, employers, providers, funders, professional bodies and relevant devolved-nation partners before use.

People Roadmap Project Recommendations

1. **Workforce insight is embedded in the core HVM Catapult mission**
   - Establish technology-led workforce insight as a core part of its mission and future value proposition to funders and government.
   - Position people roadmaps as a mechanism through which HVM Catapult can help government, funders, employers and the skills system understand the workforce implications of emerging industrial capability earlier and more systematically.

2. **Embed People Roadmapping into future technology roadmapping**
   - Future HVM Catapult technology roadmaps should include a structured workforce insight component **from the outset**
   - Use validated technology roadmap material as the starting point, & focus on translating technology trajectory into changing tasks, affected workforce groups, internal capability needs and external skills-system signals.

3. **Operationalise the people roadmaps framework for repeatable, proportionate use**
   - Retain the co-developed people roadmap framework and turn it into a practical operating model for repeatable, proportionate use- common templates, a shared lexicon, quality standards for task statements and coding, and minimum viable standardised outputs

4. **Build the people roadmaps delivery model and internal HVM Catapult capability**
   - Implementation should be treated as a capability-building exercise, not as an already available network function. Future delivery will benefit from pooling of specialist support & facilitation to enable efficiencies and avoid duplication.

5. **Establish validation, AI governance and skills system use routes**
   - People roadmap outputs should not be treated as final evidence until they have been reviewed by relevant expert stakeholders. HVM Catapult should establish a structured validation route with Skills England, employers, providers, professional bodies, and funders.
   - Validation routes must test how outputs translate across the different skills systems of England, Scotland, Wales and Northern Ireland-include distinction between classifications, standards and institutional routes

Questions

- Do you agree that understanding workforce impacts of technology should be a core role for HVM Catapult, the catapult network and other research and technology organisations?
- What do you need to know to support delivery of your strategic priorities?
- What insights and outputs are most useful?
- What time horizons should we be working to? What is realistic?
- Who should be involved in technology roadmapping?

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High Value Manufacturing

UKRI Innovate UK

hvm.catapult.org.uk

Lunch

Innovate UK

From data to decisions: Building skills for emerging technologies

Danielle Portsmouth
Future Skills Lead
Offshore Renewable Energy Catapult

CATAPULT
Offshore Renewable Energy

Operationalising Workforce Foresighting Data

- 5 workforce foresighting studies
- 50+ workshops and QA sessions
- Over 60 participants from 46 organisations

- 720 capability statements
- 77 future occupational profiles.

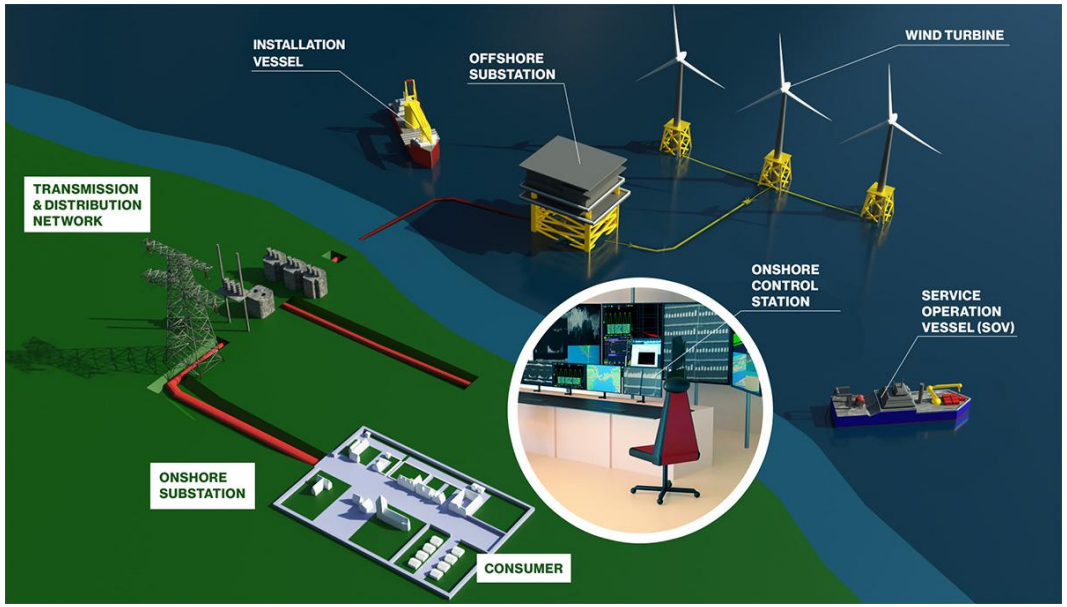
A lot of data… how to help make this actionable?

- A way to categorise.
- Make more digestible.
- Help people to identify new skills to develop.
- Communicate industry capability needs
- Usable by educators, trainers, course managers.

We have some thoughts…

EMERGING THEMES

ROLE ARCHETYPES



… and we are here to help.

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Cross-Cycle Emergent Themes

		WF1	WF2	WF3	WF4	WF5	
Digital, data analytics, simulation	Simulation, digital twins for design / analysis / operation, analytics, machine learning, model and predict system behaviour.	3	5	6	8	6	28
Industrial automation	Design-for-automation, handling, develop automation systems, factory layout, operate automated lines, manage workforce transitions.	-	-	3	9	3	15
Sustainability & Circularity	Sustainable production and operations, materials, recyclability, design for end-of-life, reduce waste	-	1	2	7	3	13

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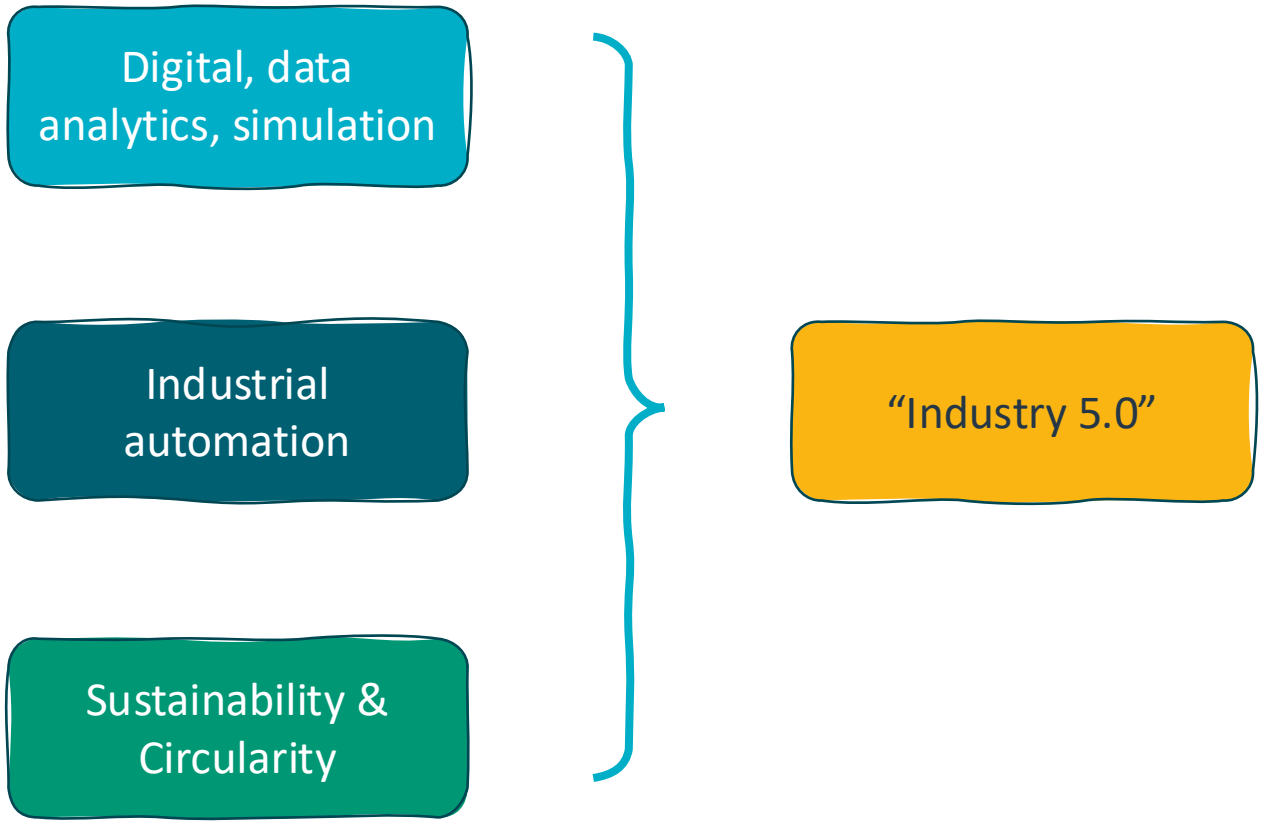
Cross-Cycle Emergent Themes



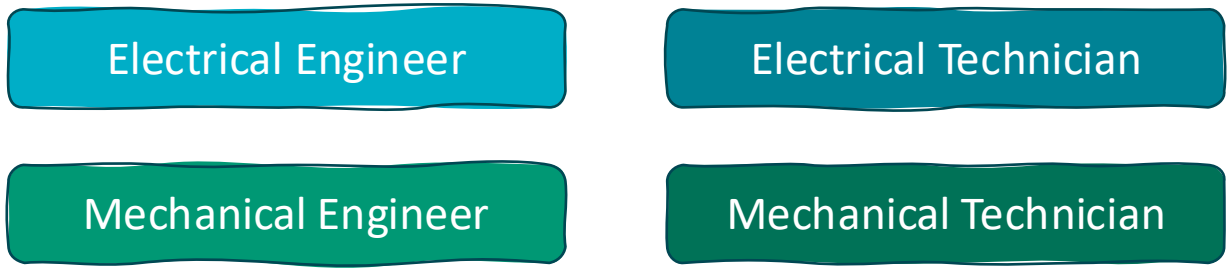
Industry 5.0 … builds on the technological advancements of Industry 4.0 (e.g. automation, 'big data' analytics, integration of cyber- and physical systems, IoT, AI)

and adds concepts including human-centricity, sustainability, resilience and human-machine collaboration.

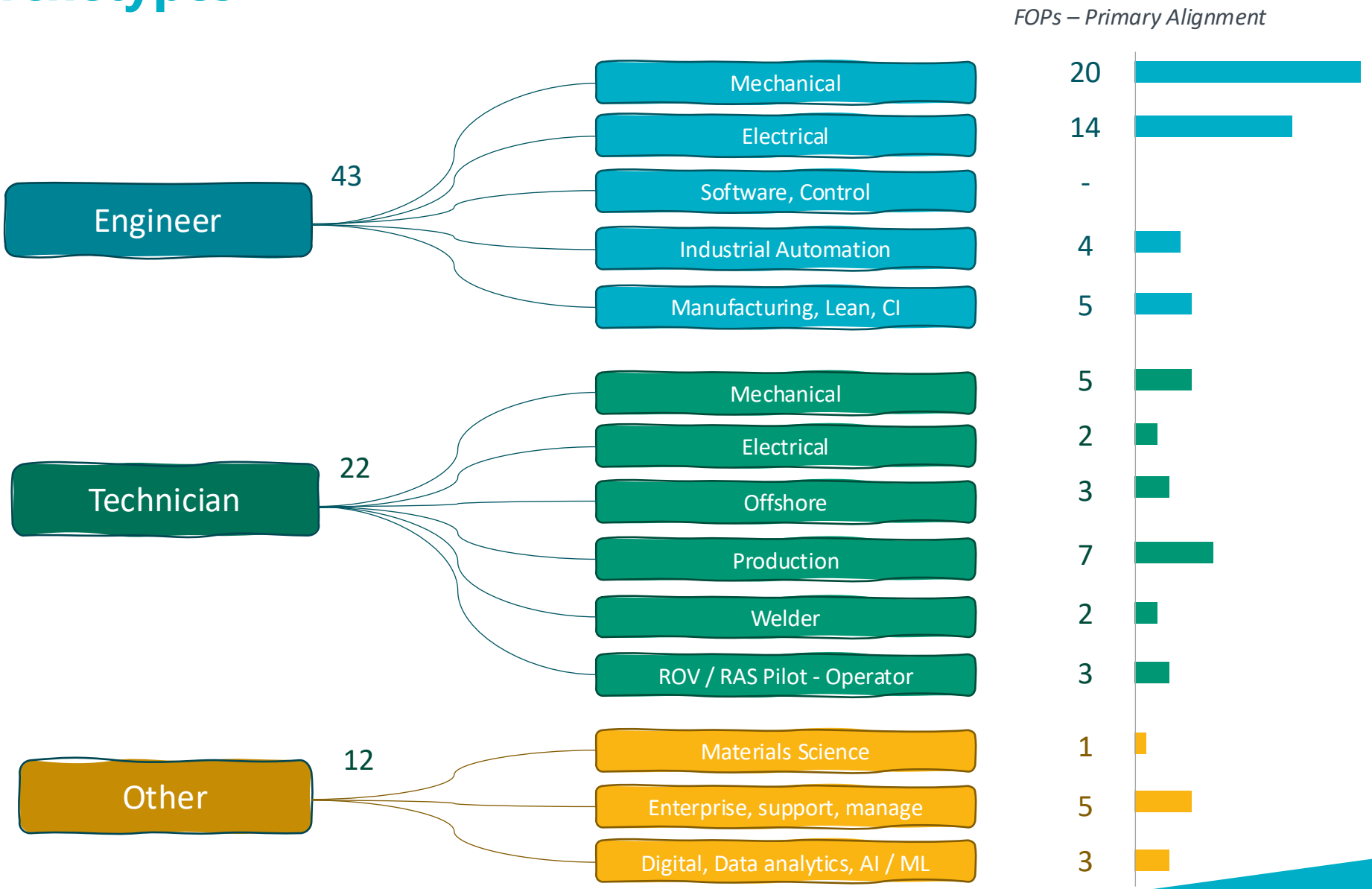
See https://research-and-innovation.ec.europa.eu/research-area/industrial-research-and-innovation/industry-50_en

Role Archetypes

- Develop a taxonomy for the FOPs
- Categorise: *As few as possible, as many as needed*
- Qualitative analysis: Bottom-up coding to develop, top-down coding to apply.



Role Archetypes



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Leveraging Emerging Capabilities

- Many emerging capabilities are cross-sectoral, enabling application across diverse industries;
- Supports alignment between educational pathways and labour market strategies;
- Flexible, industry-relevant education ensures regions can respond to local economic needs;
- Embedding these capabilities across all education levels builds a skilled, adaptable and resilient workforce
- Clear, flexible progression routes empower individuals to enter, advance and transition across sectors with confidence
- Cross-sector skills insight enables a smarter, more adaptable workforce ready for a fast-changing energy economy. De-risking investment, boosting employability and strengthens the UK's global position.

Operationalising the Data

This project will help employers and educators understand how workers can transition into emerging and future roles identified through workforce foresighting.

It will enable organisations to:

- Identify how workers can move between evolving job roles
- Understand how existing qualifications and in-house training can support these transitions
- Highlight current and future skills gaps to inform education and curriculum development
- Help make sense of the data we have developed to ensure we have the right skills, in the right place at the right time
- Focused on Offshore Renewables sector currently but transferable across other sectors.

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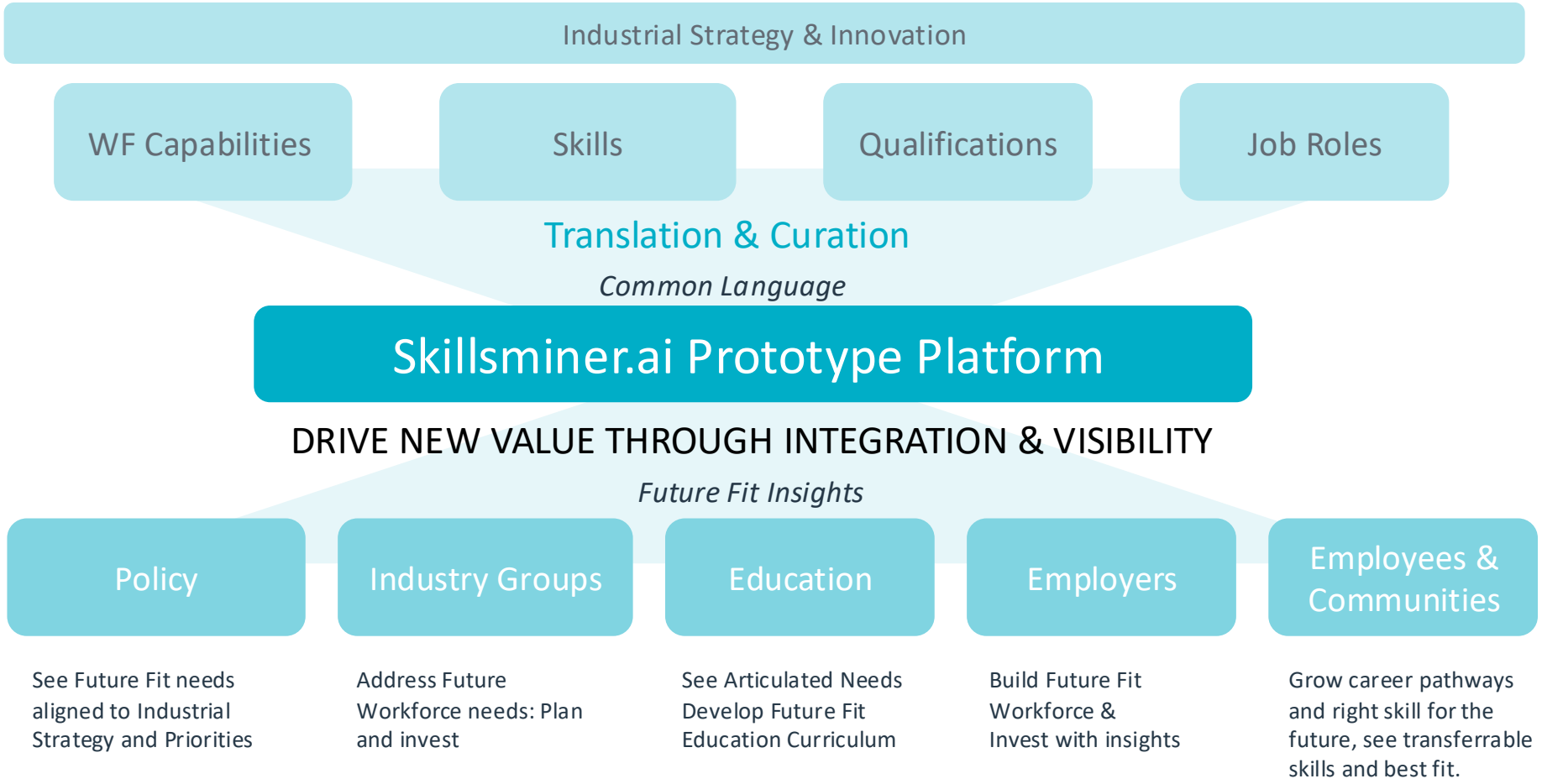
A system approach to operationalising Workforce Foresighting data



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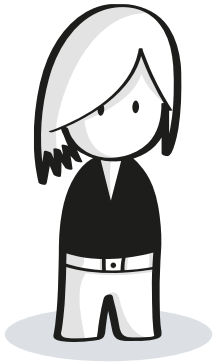
Project Hypothesis

We believe this project has operationalised WF data and improved uptake and value by;

- Increasing visibility of skills for industry and education
- Increase clarity of skills and capability in existence
- Show Stakeholders the value and ease of Workforce Planning
- Show investors the skills profile and workforce capability for strategic decision making.

Use case 1 – Employer

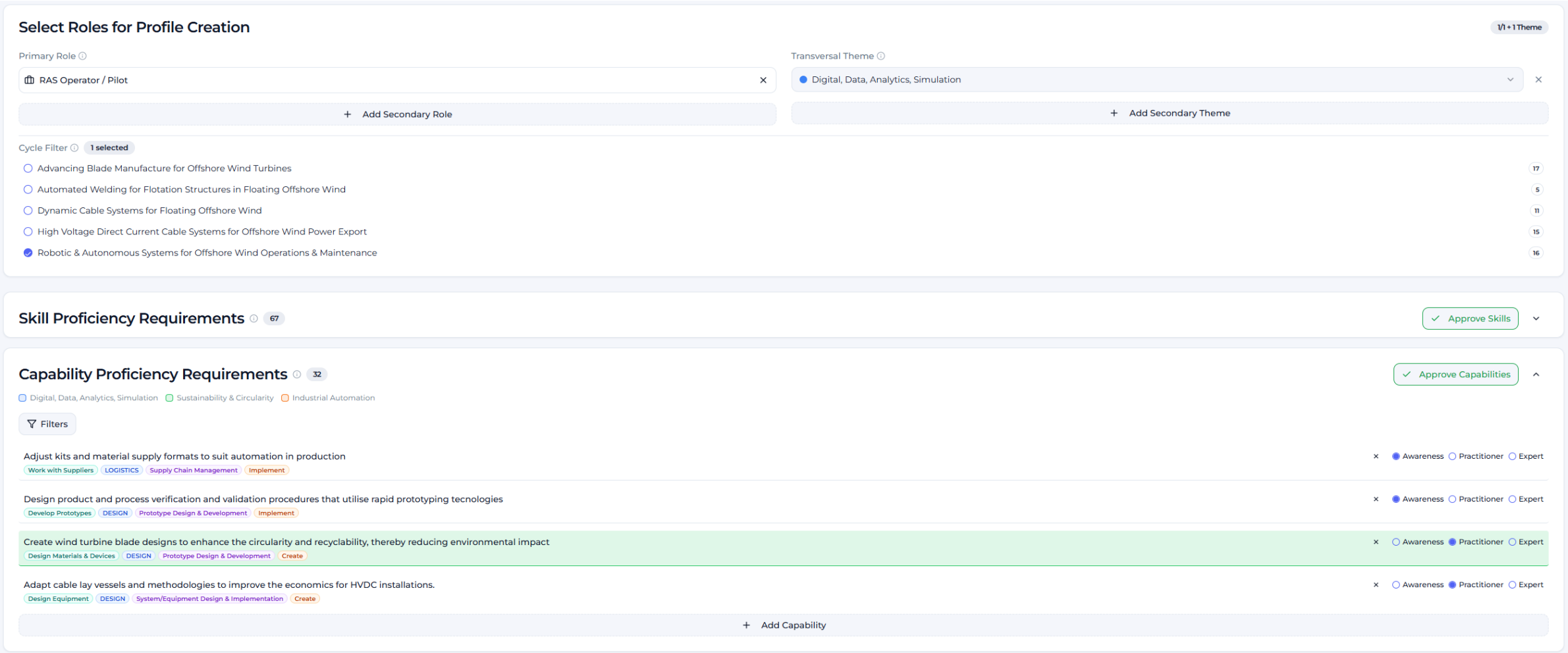


- Claire knows that new tech & innovation is coming *in future offshore wind*
- She wants to improve productivity and reduce risk.
- Her job is to secure a future-fit workforce to deliver these changes.

Pains and Concerns ***'You Said'***	**Gains from Skillsminer + WF Data** ***'We Did'***
No platform or tool exists to help them see the future needs and how workforce fits into their strategic delivery. Cannot see how they move from now to the future.	Prototype solution connects WF Data combined with educator provision and current state. Helps investment decisions: get a view of how easy/difficult to develop required skills / whether to target a project.
Not able to see or act on data grounded in research.	Forward looking and future proof: skills needs are identified to adopt new tech or innovations.
Focus is 'Here + now' - inability to see a future fit.	Be innovative / drive advantage in the UK.
Cannot see how to enable skills transition (i.e. move to changing or new roles).	Signpost to education providers/solutions.

Prototype Demo: Creating Future Roles

Use case 1 – Employer



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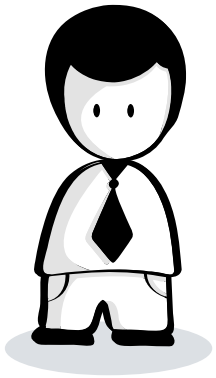
Use case 2 – Education Curriculum Lead



- Jon is responsible for engineering curriculum development.
- He wants to ensure courses are relevant for industry – and develop economic return for his college.

Pains and Concerns	Gains from Skillsminer + WF Data
Historically, can't develop offering until after demand arrives (lagging).	Want to see industry demand (numbers [LMI] **and** need).
Unclear if educational provision matches industry need → number of learners → content of course.	Identify skills gaps and explain the process to move from now → future
Course content has been static or slow to adapt.	Foresight of demand aids education to develop courses in line with technology advancement and innovation.
Know changes needed (e.g. AI) but don't know how/when to change e.g. adapt/create courses	*Themes* show when to create best fit education solutions, e.g. modules, that deliver shared benefit.
Unclear link between educational outcomes + career pathways	Clear link to career pathways for each course

Prototype Demo: Education Provision based on gaps

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Use case 2 – Education Curriculum Lead

121 **industrial quality manager**
19 capabilities required

Feeder | 17/19 89% | 2 missing | L6 | Well Provisioned

Qualification → Capability Matrix ⓘ

1 Awareness 2 Practitioner 3 Expert

Best Route

Qualification	Level	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Total
Proficiency Requirement		2	3	3	2	1	3	2	2	2	1	1	2	3	3	3	2	3	3	3	
Estimated GLH ⓘ		54.3	94.6	30.3	80.6	81.6	67.7	35.3	56.7	57.6	70.3	62.7	72.9	80.3	57.7	77.9	47.1	74	86.1	86	1273.7
Electrical power networks engineer (level 4)	L4	—	—	3	3	3	—	—	3	3	—	—	—	—	—	—	3	—	3	3	8 (42%)
Associate Project Manager (Level 4)	L4	—	—	—	—	—	—	—	3	—	3	—	3	3	—	—	—	—	3	3	6 (32%)
Mechatronics Maintenance Technician (Level 3)	L3	—	—	1	—	3	—	—	2	2	—	—	2	—	1	—	—	—	—	—	6 (32%)
Electrical and Electronic Engineer (degree)	L6	—	—	3	—	1	—	—	—	—	—	—	—	—	3	3	2	—	—	3	6 (32%)
Manufacturing Engineer (level 6)	L6	2	—	3	—	—	—	—	—	—	—	—	—	—	3	3	2	—	—	3	6 (32%)
Electro-mechanical Engineer (level 6)	L6	—	—	3	—	—	3	—	—	—	—	—	—	—	—	—	—	—	—	3	3 (16%)
Engineering Maintenance Technician - dual discipline (level 3)	L3	—	—	1	—	—	—	2	—	—	—	—	—	—	—	—	2	—	—	—	3 (16%)
Automation and controls engineering technician (Level 4)	L4	—	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1 (5%)
Coverage Count		7	1	11	1	3	1	2	10	7	4	0	3	3	4	4	9	0	5	12	
Provision Required + Create Provision Content		—	—	—	—	—	—	—	—	—	—		—	—	—	—	—		—	—	2

Capability Legend

1. Solve internal and external materials production problems utilising experiential or innovative solutions.
2. Design and write software for control systems to an industry approved standard
3. Ensure compliance with relevant national and industry health and safety standards throughout all design activities.
4. Prepare specifications for purchases of materials or equipment.
5. Prepare technical drawings, specifications of electrical systems, or topographical maps to ensure that installation and operations conform to standards and customer requirements.
6. Verify that software processes and procedures comply with standards throughout the life cycle. These include local, national and international regulatory, legislative, customer and company standards. For example, cyber security, development, environmental, anti-bribery and corruption. Official Secrets Act, export control, safety standards.
7. Quality assure raw materials.
8. Create and implement inspection and testing criteria or procedures.
9. Implement data quality checks and data validation processes
10. Monitor performance of quality control systems to ensure effectiveness and efficiency.
11. Monitor testing procedures to ensure that all tests are performed according to established item specifications, standard test methods, or protocols.
12. Review and update standard operating procedures or quality assurance manuals.
13. Prepare budget or cost estimates for equipment, construction, or installation projects or control expenditures.
14. Complete documentation at the relevant stages of the marine electrical and electronic work operations in accordance with organisational policy, procedures and any other relevant information and guidance.
15. Inspect completed installations and observe operations to ensure conformance to design and equipment specifications and compliance with operational, safety, or environmental standards.
16. Monitor operations to ensure that health and safety standards are met.
17. Research and evaluate suppliers, based on price, quality, selection, service, support, availability, reliability, production and distribution capabilities and the supplier's reputation and history.
18. Effectively manage performance and lead projects through project management
19. Manage projects by creating objectives, developing project plans, and monitoring progress

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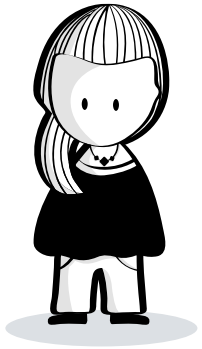
Use case 3 – Policy Leader / Industry Leaders

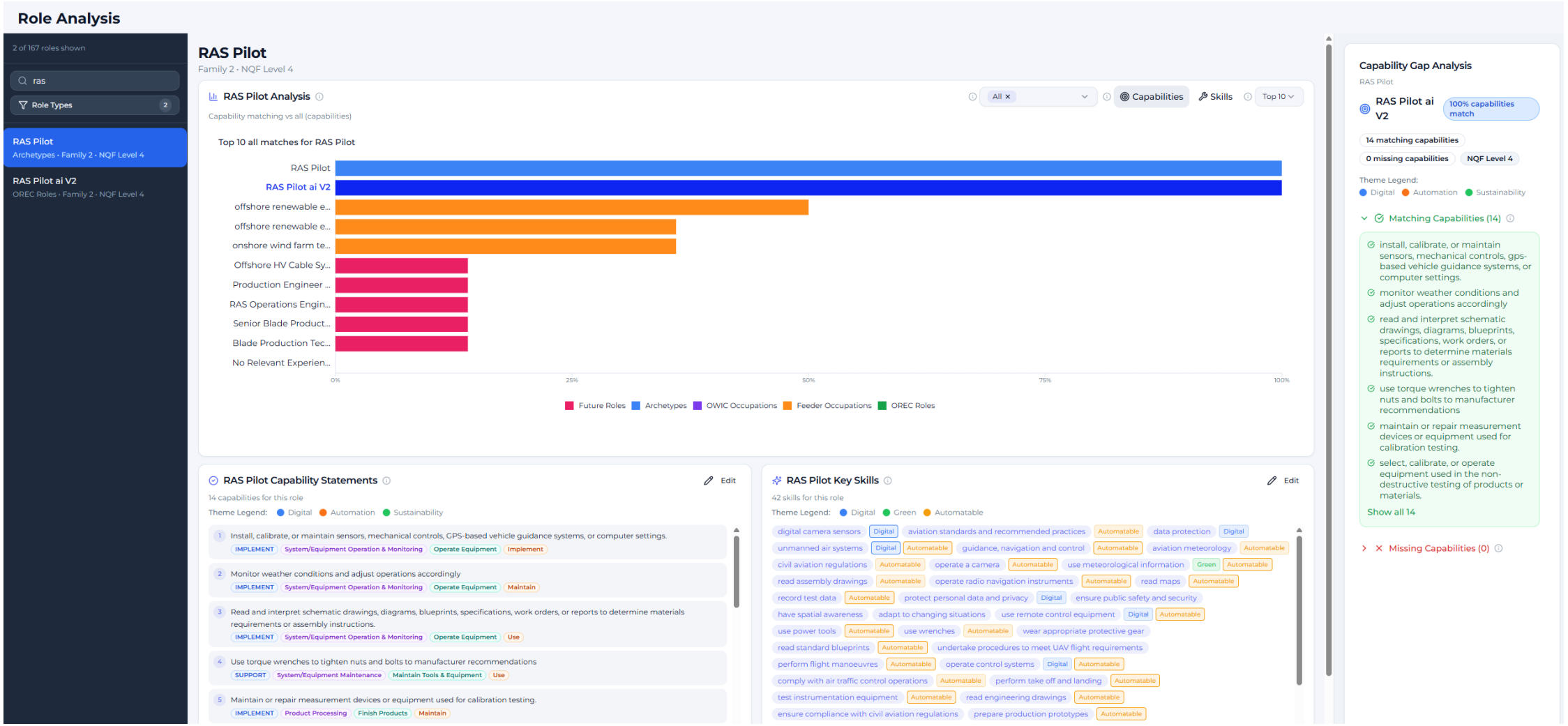


- Helen works for a local authority and is responsible for the LSIP (Local Skills Improvement Plan).
- She needs this to integrate with Skills England for the national picture, but it must also reflect local requirements and future industry needs.

Pains and Concerns	Gains from Skillsminer + WF Data
Skills strategy & delivery doesn't match with UK productivity needs.	Early signalling helps skills intelligence and supports the future industry needs.
Funding currently flows to who shouts loudest / good at writing applications - not data driven. "X funding is available, where should it be invested?"	Visibility allows better investment decision making, using a data / evidence-based process. Alignment can drive the Productivity Gap Priorities and Industrial Strategy priorities.
Attention focusses on the here and now, not future proofing / future needs	Ability to see skills provision gaps against future needs and how to address these.
Policy makers don't see detail of what industry needs in the future, nationally or regionally.	National perspective and also regional picture (based on local employer requirements).
Limited data and focus, not seeing transversal skills views so limits ability to forecast and plan.	Ability to start / identify strategic investment and development of provision before requirement hits, including transferability.

Prototype Demo: Provision Gaps, Investment

Use case 3 – Policy Leader / Industry Leaders



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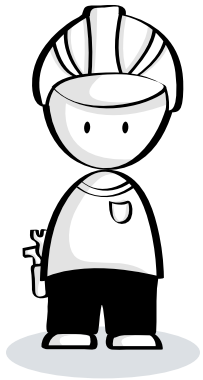
Use case 4 – Employee *or* Cross Sector Mover

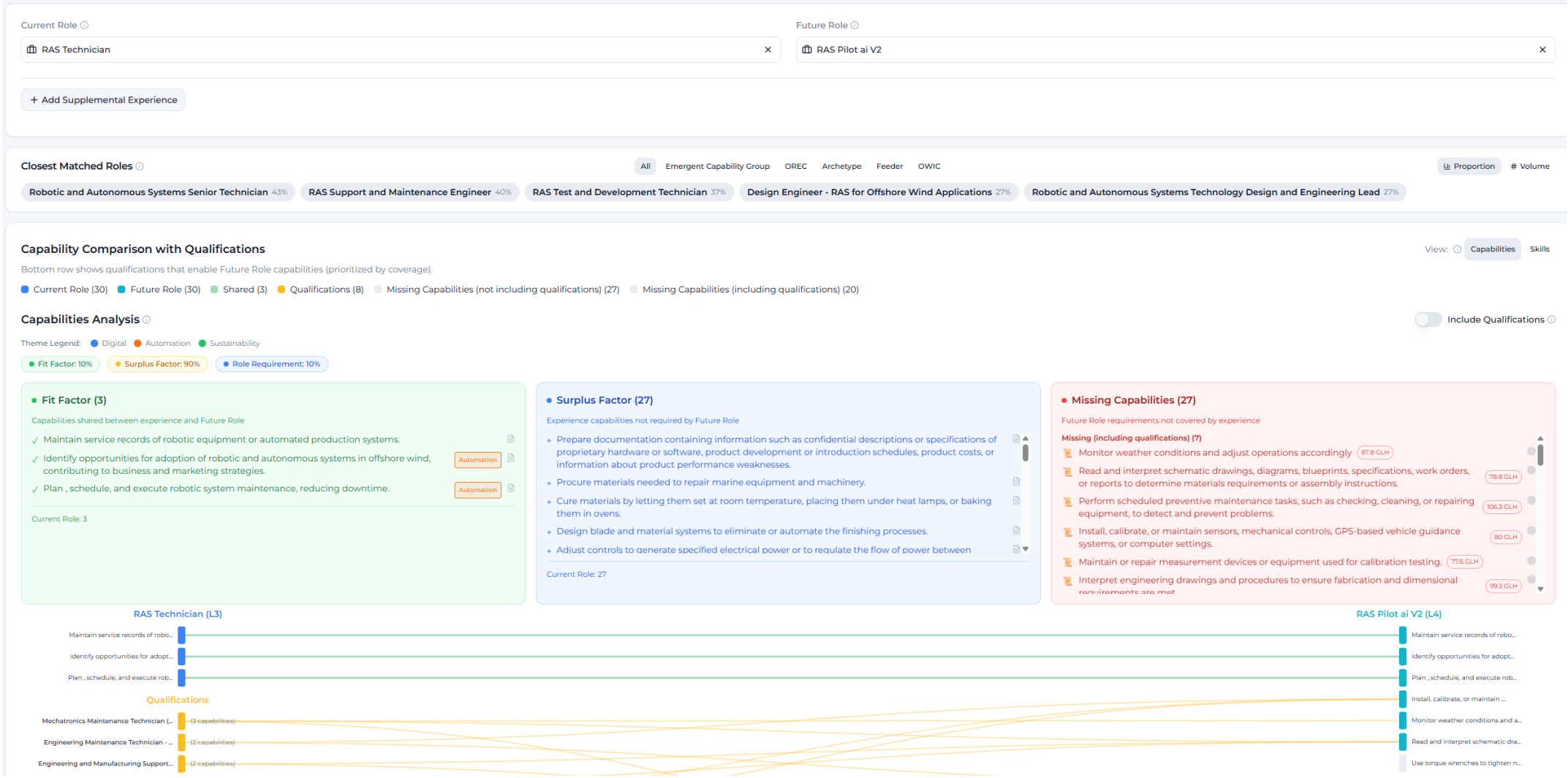


- Jack is currently employed in the legacy energy sector.
- He would like to move into offshore wind.

Pains and Concerns	Gains from Skillsminer + WF Data
Today's Picture only What paths are open to me? What skills / learning do I need?	View career pathways with a future lens. Build a personalised journey *Point people to key shortage areas*
Where is the best fit education provided?	See provision of new future fit capabilities and skills.
I don't know the best course for me to take for widest application?	See the best education offer for the most adaptable and applicable skills, e.g. Themes.
I don't know enough about new roles.	See future roles and what skills needs are.

Prototype Demo: Role Comparison & Pathway

Use case 4 – Employee *or* Cross Sector Mover



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Key Results

- Increased access and usability of WF Data
- Manage Insights for inwards investment
- Improve time to hire
- Increase speed to identify Skills & Capability gaps for education
- Improve skills pathway visibility for industry across roles.

Feedback…

- *We can really see how this tool will be useful for a sector that's at the forefront of innovation, we would love to be an early adopter to provide data led evidence about how we support investment into adapted apprenticeships and new training provision to support the scarce and critical roles we have already identified. We have found it difficult to understand the data even as the sponsor but this would help us action the information provided. I would love us to be an early adopter of this approach* James Young, Skills & Social Value Lead RUK

- *The cross-cutting themes are really helpful as then we can start embedding these into curriculum, if we can see how these influence other key sectors it would be even more impactful* – Skills England

- Employers are struggling to tell us what their skills gaps are now never mind in 3 years time so this would support how we move forward as the North East LSIP as it gives a model to allow the employers to understand how their workforce is going to have to adapt. It would help understand what the specialist skills are for the region and how we can support the population more widely due to the cross cutting analysis – North East Automotive Alliance

- We need to show that we have the skills in place before an investor arrives, innovation and scalability within a region is key to do this, this helps manage the risk across a region to allow for clusters to become more sustainable and realise the opportunities. It is critical that we have a joined up approach to foresighting and prioritisation of skills demand of new technologies that will catalyse growth- Chair of Energi Coast

Summary & close

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