

D4.1 Customised Training Pathways and Career Support Services

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Abstract

This deliverable defines the INSIGHT training pathways and career support services developed under Task 4.1. Drawing on surveys, workshops, structured consultations, semi-structured interviews and cross-source synthesis, it translates identified needs into a European Competence Framework for Researchers (ResearchComp) aligned training and support offer for early-stage researchers in automotive, manufacturing, robotics, green energy, artificial intelligence and related deep-tech contexts. The deliverable specifies three pathways: Technology acceptance and human-centred design; Research commercialisation, innovation and intellectual property; and Professional readiness for cross-sectoral careers. It also defines the module catalogue, mentoring framework, industry-facing support model, implementation roadmap linked to the WP5 sprint events at M25 and M30, and the evaluation framework feeding into T4.3.

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Abbreviations

Abbreviation	Description
AI	Artificial Intelligence
ANNT	Asocijacija za napredak nauke i tehnologije
CTAG	Centro Tecnológico de Automoción de Galicia
CV	Curriculum Vitae
ERA	European Research Area
EU	European Union
EuroSPI	European System, Software & Services Process Improvement and Innovation
GDPR	General Data Protection Regulation
HCI	Human-Computer Interaction
HR	Human Resources
ICCS	Institute of Communication and Computer Systems of the National Technical University of Athens
INSIGHT	INSIGHT project
IP	Intellectual Property
IPR	Intellectual Property Rights
ISPIM	The International Society for Professional Innovation Management
LCA	Life Cycle Assessment
MOOC	Massive Open Online Course
RTO	Research and Technology Organization
ResearchComp	European Competence Framework for Researchers
TAM	Technology Acceptance Model
TPB	Theory of Planned Behavior
TRA	Theory of Reasoned Action
TUG	Technical University of Graz
UNITE	University Network for Innovation, Technology and Engineering
UTAUT	Unified Theory of Acceptance and Use of Technology
UX	User Experience

1 Executive summary

This deliverable defines the INSIGHT framework for customised training pathways and career support services under Task 4.1. Its purpose is to translate the needs identified across surveys, workshops, structured consultations and semi-structured interviews into a practical training and support offer for early-stage researchers working in automotive, manufacturing, robotics, green energy, artificial intelligence and related deep-tech contexts.

The needs analysis shows that early-stage researchers do not only need stronger technical expertise. They also need support in applying research in industrial and cross-sectoral environments, communicating value beyond academia, understanding technology acceptance, navigating commercialisation and intellectual property, and positioning themselves for careers that may move across academia, industry, public-sector organisations and innovation ecosystems.

On this basis, D4.1 defines three connected training pathways. Pathway 1, Technology acceptance and human-centred design, addresses the human and organisational factors that influence whether new technologies are trusted, adopted, resisted or rejected. Pathway 2, Research commercialisation, innovation and intellectual property, helps researchers move from research results to value propositions, exploitation routes and basic IP awareness. Pathway 3, Professional readiness for cross-sectoral careers, supports researchers in communicating their value, working across project cultures, building networks and preparing for non-linear career pathways.

The pathways are aligned with ResearchComp and are designed as a blended learning offer combining short online preparation, applied workshops, mentoring and industry-facing sprint activities. The broader training group receives access to the online components, while the pilot cohort follows a more intensive journey linked to the WP5 sprint events at M25 in Spain and M30 in Greece.

The deliverable also defines the module catalogue, mentoring framework, industry connection model, implementation roadmap and evaluation framework. Together, these elements provide the operational basis for T4.2 training delivery and T4.3 evaluation, ensuring that the INSIGHT training offer is evidence-based, targeted and directly connected to the project's ambition of strengthening researcher readiness for cross-sector application and impact.

2 Introduction

Researchers are increasingly expected to move knowledge across institutional and sectoral boundaries, yet academic training does not always provide structured opportunities to practise that translation. Doctoral and postdoctoral researchers may have strong analytical, methodological and technical capabilities while having less exposure to industrial decision-making, customer and user needs, intellectual-property questions, business models, cross-sector project environments or non-academic career routes. INSIGHT addresses this as both a competency-development and a career-support challenge. Researchers need support not only to produce robust knowledge, but also to explain its relevance, apply it with external partners and make informed choices about careers within and beyond academia.

The project situates this challenge within the digital and green transitions and the growing importance of deep-tech capability. Automotive and manufacturing provide the principal pilot setting, where the relationship between technological development, human factors, technology acceptance and industrial implementation can be examined through practical challenges. Artificial intelligence, robotics, green energy and related technology fields provide additional contexts for the training design. Although these domains differ technically, they place similar demands on researchers: connecting specialist knowledge with user requirements, communicating across professional boundaries, working within organisational and delivery constraints, and identifying credible routes

from research to implementation and impact. This reflects the broader INSIGHT objective of improving researcher employability and career interoperability in sectors connected to digital transformation, deep tech and the Green Deal.

Within this wider project framework, Work Package 4 focuses on the development of an integrated model for researcher training and career support. It combines structured learning with mentoring, professional networking, industry engagement and opportunities to apply research competences in practical settings. The intention is to help researchers understand how expectations, working cultures and definitions of value differ across academia, industry, the public sector and innovation environments.

T4.1 establishes the design baseline by defining the target groups, competency priorities, three customised training pathways and supporting career-development arrangements. T4.2 puts this model into practice through training, mentoring and career support, including coordination with the WP5 pilot and engagement with academic and industrial stakeholders. T4.3 evaluates how the model functions in practice, supports its refinement and translates the resulting evidence into guidelines for wider organisational use.

The remainder of this deliverable presents the needs-analysis methodology and learner profile, identifies and prioritises relevant competencies, explains their alignment with ResearchComp, specifies the pathways and module catalogue, and outlines the associated mentoring, industry-engagement, implementation and evaluation arrangements.

Task 4.1 runs from M5 to M12, incorporating earlier stakeholder and organisational evidence before implementation begins under T4.2 in M13. Evaluation and guideline development continue under T4.3 from M25 to M36.

3 Needs Analysis

This section provides the empirical and analytical foundation for the training pathways defined in Sections 4–7. It first explains the methodology used for the needs analysis, then presents the findings from each data source and consolidates them into implications for the proposed training pathways and mentoring offer.

3.1 Methodology

The needs analysis for D4.1 was based on a mixed data-collection approach combining surveys, event-based workshops, structured consultations and semi-structured interviews. This approach was selected because the training pathways under T4.1 need to reflect both the needs expressed by early-stage researchers and the expectations of organisations working at the interface between research, industry and innovation.

The data collection covered researchers at different career stages, experienced academics, industry and policy stakeholders, research support staff, HR-related actors and technically experienced industrial professionals. Inputs were gathered through structured survey questions, focused discussions during project-related and conference-based workshops, targeted consultation activities, and semi-structured interviews allowing more detailed reflection on researcher skills, career needs, professional positioning, learning preferences and collaboration barriers. The sources used for the needs analysis are summarised in Table 1.

Table 1. Data sources for needs analysis

Source	Date / period	Participants	Focus
EuroSPI conference consultation, Riga, Latvia	16 Sept 2025	1 early-stage researcher, 2 scientific experts and 4 industry experts	Skills, support needs and career pathways for early-stage researchers entering or cooperating with industry, with emphasis on communication, systems thinking, practical tools, domain knowledge, industry standards and applied research pathways.
UNITE online conference	12 March 2026	8 experienced academics	Skills needed for newly trained researchers to enter industrial environments and become effective after formal training.
Executive MBA Advanced Digital Technologies kick-off, TU Graz	26 April 2026	29 Executive MBA participants, predominantly industrial professionals with technical backgrounds in the semiconductor sector; Slido responses from 13–15 participants per question	Industry-oriented view on skills needed for digital and green transformation, including business understanding, leadership, change management, systems engineering, AI, human-centred digitalisation, preferred training formats and long-term success factors in semiconductor-related industrial contexts.
Southeast Europe AI Summit workshop, Novi Sad, Serbia	29 May 2026	Around 80 participants from industry, academia and policy	AI in South-East Europe, EU funding, research infrastructure and barriers preventing research results from becoming useful collaboration, innovation or societal impact.
ISPIM doctoral session, Granada	7 June 2026	22 doctoral students, 8 recent PhD graduates and 12 experienced researchers	Academia-industry gap, key researcher skills, barriers and training options.
ISPIM World Café session, Granada, Spain	8 June 2026	12-15 experienced researchers from academia and industry	Need for R&D leaders and preparation of PhD graduates for leadership-oriented industry roles.
WP3 T3.1 online survey	January - March 2026	173 respondents, including research staff, research support	Importance of ResearchComp-related skills for researcher success.

		staff and HR-related stakeholders	
WP4-specific online survey	June-July 2026	103 respondents across career stages, primarily research students, experienced post-PhD researchers, and non-PhD researchers or industry professionals.	Current researcher skills, career-development needs and preferred forms of training and mentoring.
WP2 academia–industry collaboration workshop, online	16 July 2026	60 participants from universities, research organisations, early-stage researchers, SMEs and industry, innovation organisations, public authorities and research-support organisations	Non-academic career pathways, academia–industry expectations, practical exposure to non-academic working environments, structured mentoring, networking and career guidance.
Semi-structured interviews	March-July 2026	15 interviewees focusing on experienced researchers and cross-sector experts	Qualitative exploration of survey topics, researcher career development, academic–industry mobility, collaboration barriers, professional positioning, learning preferences and the practical conditions for bridging research and industry.
WP3 MENTORE questionnaire	May-June 2026	65 respondents across three stakeholder groups, 42 corporate mentees (employees in training), 18 academic mentees (PhD researchers, postdocs, students) and 5 mentors (team leads with supervisory responsibility)	Training practices, learning resources, career-development needs and design requirements for an AI-based mentoring tool.

Inputs were coded and reviewed for recurring needs, then compared across sources and against the relevant ResearchComp domains and WP4 objectives. Detailed survey wording, coding decisions, statistical procedures, tables and figures are provided in Appendix A. Fuller records of the workshops, consultations, WP3 input and interviews are provided in Appendix B.

The synthesis was used to define the learner profile, competency priorities, three training pathways, preferred delivery formats, mentoring offer and career-support measures. Quantitative findings were treated as descriptive evidence for the participating sample, and qualitative findings were used to clarify context and practical implications rather than to claim statistical representativeness.

3.2 Scope and limitations of the evidence

The diversity of the evidence base is an intentional feature of the training-design approach. Researchers, academics, industry and policy participants, research managers, HR and support actors, and experienced

industrial professionals contributed different but relevant views of cross-sector readiness. Comparing these perspectives made it possible to identify needs that recur across settings and to distinguish learner priorities from organisational expectations.

The survey evidence has the usual limitations associated with self-reported data. Responses on current skill levels, perceived importance and concept familiarity depend on participants' own judgement and may be influenced by differences in confidence, interpretation of scale points, disciplinary background or prior exposure to industry-facing work. The survey sample is also best understood as a project-relevant convenience sample rather than a random sample. It provides useful descriptive evidence about the respondents who took part, but it does not support strong claims of generalisability across all institutions, disciplines or national contexts represented in the wider European research landscape.

Finally, the evidence base is cross-sectional and context dependent. The surveys, workshops and interviews capture perceptions, needs and expectations at a specific stage of the INSIGHT project and within the professional environments accessed through project partners and related events. Skill needs, preferred formats and career concerns may evolve over time as institutional conditions, labour-market expectations and researchers' own experience change. For that reason, the methodology is best understood as providing a grounded basis for the design of D4.1 at this stage of the project, not as a final or exhaustive statement on researcher development needs in every context. At the same time, the use of multiple evidence sources strengthens the analysis by allowing recurring themes to be checked across different settings and stakeholder perspectives.

3.3 Key findings at a glance

The evidence collected across surveys, workshops, consultations and interviews points to three closely connected development needs for early-stage researchers. First, researchers need to understand and navigate the different expectations of academic and applied environments, including differences in timelines, outputs, decision-making and definitions of value. Second, they need to communicate and collaborate across disciplinary, organisational and sectoral boundaries. Third, they require stronger preparation for translating research into practical, commercial, societal or operational value.

The WP4 survey reinforces these findings. The clearest self-reported gaps concerned starting a business, intellectual-property protection and familiarity with Technology acceptance models, while communication and deadline management were reported as comparatively stronger. This suggests that the training should not treat all competencies as equally underdeveloped. Instead, it should build on researchers' existing strengths while providing targeted foundations in technology acceptance, research commercialisation, intellectual property and the communication of applied value.

3.4 Findings from individual evidence sources

This section presents the main findings needed to justify the training pathway design. The detailed survey analysis and source-specific evidence records are provided in Appendices A and B.

3.4.1 EuroSPI conference consultation, Riga, Latvia

The September 2025 consultation in Riga brought together one early-stage researcher, two scientific experts and four industry experts to discuss employer expectations, researcher strengths and gaps, recognition and career pathways.

The EuroSPI consultation supports the need for training that prepares early-stage researchers for the practical and organisational conditions of industry-facing research. The main implications are the importance of industry-relevant communication, systems thinking, awareness of domain standards, model-based and complex-system

methods, practical project behaviour, and the ability to translate research expertise into useful industrial contribution. The consultation also supports the inclusion of career-recognition elements, such as professional certificates, applied artefacts and visible outputs linked to pilot or industry-facing work.

3.4.2 UNITE online workshop

The March 2026 UNITE workshop drew on experienced academics involved in doctoral training, industrial doctorates and university–industry collaboration. Discussion focused on the different expectations, timescales and languages researchers encounter across academic and industrial settings.

The UNITE consultation supports the need for INSIGHT training pathways that prepare early-stage researchers for the practical realities of cross-sectoral work. The main implication is that the training should not focus only on general transferable skills, but on the specific points where academic and industrial expectations diverge like communication of research value, cooperation across disciplines and sectors, commercialisation and exploitation awareness, and the ability to work within applied problem-solving contexts. The consultation also supports the use of interactive workshops, applied cases and bootcamp-style activities as preferred formats for parts of the WP4 training offer.

3.4.3 Executive MBA Advanced digital technologies kick-off, TU Graz, Austria

The April 2026 Executive MBA consultation gathered an industry-oriented perspective from technically experienced professionals, predominantly from the semiconductor sector. It examined capabilities needed to connect digital and green transformation with organisational change.

The Executive MBA input supports a training design that connects research skills with industrial transformation needs. The key implication is that early-stage researchers need support not only in communicating research, but also in understanding business context, change processes, systems thinking, leadership, trustworthy and human-centred digitalisation, and the link between technology and organisational value. The session also supports the use of applied, interactive and problem-based learning formats, especially case studies, real-life examples, hands-on tasks and mixed formats combining preparation, reflection and discussion.

3.4.4 Southeast Europe AI Summit workshop, Novi Sad, Serbia

The May 2026 workshop at the Southeast Europe AI Summit involved around 80 participants from industry, academia and policy. It explored barriers to research–industry collaboration and the conditions under which research becomes useful in applied settings.

The SEE AI Workshop supports the inclusion of training elements focused on networking, industry-facing communication, project management, value proposition development and commercialisation pathways. The main implication is that researchers need structured support in moving from research outputs to externally understandable value: who the work is for, which problem it addresses, why it matters, and what form of uptake is realistic.

3.4.5 ISPIM doctoral session, Granada, Spain

The June 2026 ISPIM doctoral session included doctoral students, recent PhD graduates and experienced researchers. It examined the academia–industry gap, barriers to impact and the skills needed to work across different professional settings.

The ISPIM doctoral session identified tensions between publications and commercial orientation, long-term inquiry and short delivery cycles, and theoretical and product-focused work. The main implication is that early-stage researchers need practical preparation for working across different goals, timelines and output expectations.

3.4.6 ISPIM World Café session, Granada, Spain

The June ISPIM World Café brought together experienced academic and industry participants to consider how PhD graduates can prepare for leadership-oriented roles in research and development.

The discussion in the ISPIM World Café session stressed the importance of responsibility, decision-making, people leadership, communication and understanding how research operates in factories and other applied environments. The main implication is that the training pathways should include practical exposure to industry contexts, communication in large and distributed teams, decision-making awareness, leadership-oriented reflection and career planning beyond the academic track.

3.4.7 WP3 survey regarding researcher skills for career success

The WP3 survey contributed a broader institutional view from 173 research staff, support staff and HR-related stakeholders on the competencies associated with researcher success within and beyond academia.

Its priorities included communication, interdisciplinary collaboration, career navigation, project delivery, intellectual property, innovation and translating research into practical applications. The survey results support the need for training pathways that address a broad researcher competence profile rather than focusing only on technical or disciplinary expertise. The most relevant implication is that all the skills are highly valued without huge favourites which implies that support and HR staff, companies and others want researchers to be “well rounded” employees not good at only one thing.

3.4.8 WP4-specific online survey

The WP4-specific online survey collected 103 responses on current skill levels, career relevance, concept familiarity, preferred training formats, beneficial skills and barriers to academia–industry mobility. Deadline management and communication were the strongest self-reported skills; starting a business and IP protection were the weakest. Open-text responses most often identified communication, research methods and project/time management as beneficial skills, while cultural and expectation differences and limited industry exposure were the most frequently coded barriers. Technology acceptance models also had very low named-category familiarity score among the concepts assessed.

For WP4, the findings support targeted foundations in technology acceptance and research commercialisation, combined with applied workshops, short preparatory content and mentoring. The full instrument, coding notes, statistical results, tables, figures and online-survey limitations are presented in Appendix A.

3.4.9 WP2 academia–industry collaboration workshop, online

The July 2026 workshop involved 60 participants from universities, research organisations, the early-stage researcher community, industry, innovation organisations, public authorities and research-support structures. It examined barriers to academia–industry cooperation, non-academic career pathways and practical formats for supporting researchers’ career development.

The workshop highlighted limited visibility of non-academic careers, differences between academic and industrial expectations, insufficient practical exposure, and the need for structured mentoring and career guidance. Participants proposed company visits, job shadowing, placements, applied case studies, mentoring, matchmaking, short research residencies and joint projects. The main implication for WP4 is the need to combine cross-sectoral career preparation with practical exposure, structured networking and two-way cooperation between academia and industry. As academic and research participants were most strongly represented, the findings should be treated as exploratory input for further sectoral validation.

3.4.10 WP3 MENTORE questionnaire

The MENTORE questionnaire, carried out within RE:LAB's work on the design of an AI-based adaptive training and mentoring system, gathered responses from mentors and from corporate and academic mentees between May and June 2026. Being strongly AI-oriented, it focused less on which competencies are needed and more on how learning happens today and how end users perceive, trust and would accept AI support in their development.

The MENTORE questionnaire supports a training design in which AI is used to accelerate access to foundational, systematisable knowledge, while human mentoring is reserved for applied, contextual and relational learning. Respondents saw clear value in AI-supported tools but expressed more cautious trust, favouring AI-generated suggestions that remain open to human review rather than fully automated ones. The main implication is that early-stage researchers benefit from a "suggested-but-editable" model that combines AI-driven guidance and personalisation with a consistent human-in-the-loop for practical problem-solving, tacit-knowledge transfer, the interpretation of complex real-world contexts and the interpersonal dimensions of learning

3.5 Cross-source synthesis

The analysed sources point to a set of recurring needs that are directly relevant for the design of WP4 training pathways. The synthesis below does not treat the sources as identical. Each theme is linked to the specific consultation, survey or workshop where it appeared.

3.5.1 Different expectations between academia and industry

A first recurring finding concerns the difference between academic and industrial expectations. In the UNITE consultation, this appeared in the discussion on industrial PhD students, where participants noted that universities require publications, doctoral regulations and formal academic outputs, while companies often expect practical deliverables and problem-solving. The same source also noted that industry and academia use different language: academia focuses on method, data and publications, while industry focuses on the problem and the solution.

The ISPIIM doctoral session expressed a similar issue through the contrast between “publications vs commercial orientation”, “quick objective vs long-term project”, “application vs theorising” and “product vs paper”. These were identified as barriers for researchers working with industry and creating real-world impact.

The EuroSPI consultation reinforced this finding from an industry and scientific expert perspective. Participants described early-stage researchers as valuable when they bring fresh research knowledge and specialised technical expertise, but also noted gaps in practical experience, customer needs, company-specific domain knowledge, standards, time-pressure skills and teamwork. The Executive MBA input added a further industry-oriented perspective, with participants identifying business understanding, change management, leadership, systems engineering and the connection between business and technology as important gaps for stronger industry positioning.

The ISPIIM World Café discussion developed this point further in relation to PhD graduates entering industry. Participants argued that academia often produces researchers with strong technical depth, while industry expects people who can work with applied tasks, decision contexts and market-oriented constraints. One statement in the notes summarised this as “research for factories must come ahead of research for libraries.”

The semi-structured interviews added an individual career perspective to this finding. Interviewees noted that companies may expect researchers to understand specific tools, workflows, standards and customer contexts, while researchers may struggle to express the broader value of doctoral-level capabilities in business or financial terms. This reinforces the need to help early-stage researchers translate academic expertise into forms of value that are recognisable in industrial environments.

For WP4, this means that the training should help early-stage researchers understand both systems. The relevant need is not only to make researchers “more practical”, but to help them recognise different expectations, translate between them, and position their research in ways that are credible in both academic and non-academic settings.

3.5.2 Cross-sector communication and collaboration

The analysed sources show that communication is a practical requirement for cross-sector work. Researchers need to explain their work clearly to non-academic partners, but they also need to cooperate with people from different organisations, disciplines and professional cultures. This is especially important in academia-industry collaboration, where partners often work with different timelines, expectations and definitions of success.

In the UNITE workshop, communication was discussed mainly in relation to cooperation. Participants noted that soft skills are central for industrial PhD and industry-facing research contexts, especially the ability to cooperate with different sides, understand expectations and work flexibly across academic and industrial environments. The same consultation also identified multidisciplinary and multicultural communication and cooperation as a potential module that would be useful in doctoral training, preferably through project-based or bootcamp-style activities.

The Novi Sad workshop responses show the outward-facing side of the same need. When asked which skill would most improve academia-industry collaboration, respondents listed networking, communication, project management, communication skills and promoting research to companies. When asked what would help translate research into commercial, societal or operational value, respondents pointed to concrete use cases, numbers, sales and marketing skills, and alignment between research topics and real-world industry needs.

The EuroSPI consultation also highlighted communication as a recurring requirement. The early-stage researcher response identified communication and presentation as strengths, while scientific and industry experts emphasised the ability to speak across technical, managerial and generational boundaries, explain complex topics in simple words and engage directly with people through appropriate channels. The Executive MBA responses similarly valued communication, empathy, bridge-building, customer-centricity and the combination of technical and people skills as important strengths in industrial technology environments.

The semi-structured interviews further emphasised that researchers need to explain not only their technical work, but also their value, relevance and contribution to people working under different organisational, managerial and commercial assumptions.

The ISPIM doctoral session also supports this interpretation. Participants identified communication, social skills, knowledge transformation skills and language adaptation as important for researchers working with industry. They also referred to networks, intermediaries, mediators and a translation function as support mechanisms for bridging the academia-industry gap.

The WP3 survey provides broader support for this theme. In the researcher skills section, 88.5% of respondents rated collaboration, networking and communication in diverse research environments as highly important for career success. In addition, 86.8% rated dissemination, translation into impact and engagement with non-academic audiences and innovation ecosystems as highly important.

For WP4, this means that communication should be treated as a cross-sector working competence. The training should help early-stage researchers explain research in non-academic language, but also cooperate in mixed teams, build trust, understand stakeholder expectations and translate between academic, industrial and societal perspectives. This supports training elements related to professional networking, stakeholder communication, applied teamwork, peer learning, mentoring and industry-facing presentation of research value.

3.5.3 Commercialisation, exploitation and applied value

Several sources point to the difficulty of turning research into applied value. In the UNITE consultation, one participant explicitly described converting research into money, or exploitation, as a friction point. The same discussion also referred to industrial partners complaining that researchers lack practical skills.

In the Novi Sad workshop responses, participants were asked what would help translate research into commercial, societal or operational value. Responses included the need for concrete use cases, numbers, funding, stronger spin-off support, incentives, communication, policies, sales and marketing skills, and better alignment between research topics and real-world industry needs.

The EuroSPI consultation adds a more concrete industrial layer to this finding. Industry experts stressed customer needs, domain standards, company-specific knowledge, complete system development and output orientation. Scientific experts also noted that shorter innovation cycles and the rising cost of fundamental research make it increasingly important for early-stage researchers to understand higher-TRL environments and how research connects to industrial development. The Executive MBA input further supports this direction through repeated references to business understanding, strategic thinking, transformation capability, cashflow, cost control, innovation, adaptability and strategic independence.

The WP3 survey also supports this direction, although from the perspective of perceived importance rather than actual skill gaps. Respondents rated dissemination, translation into impact and engagement with non-academic audiences and innovation ecosystems as highly important, and also rated digital tools, IP and open science or open-source practices as important for researcher careers.

The semi-structured interviews added that researchers may also need support in interpreting the value of their own work in financial, organisational or business terms. This includes understanding what their expertise is worth, where it creates value, and how to communicate that value without reducing research to short-term commercial output.

For WP4, this supports a training focus on value proposition development, exploitation routes, intellectual property awareness and communication of applied value. The training should help researchers explain what problem their research addresses, who could use it, and which route to uptake is realistic.

3.5.4 Project culture, delivery constraints and decision-making

The ISPIIM doctoral session directly addressed what researchers should learn from industry project culture. The answers included prioritisation, milestones and efficiency. In the same session, barriers included different goals, administrative boundaries, timeline differences and the tension between quick objectives and long-term projects.

The ISPIIM World Café discussion connected this to leadership and decision-making. Participants argued that PhD students often learn how to conduct research, but not necessarily how to lead, make decisions, or work in industrial decision contexts. The discussion also suggested that industry exposure, collaborative PhDs and mentor preparation could help address this gap.

The EuroSPI consultation produced similar signals. Industry experts identified time-pressure skills, practical expertise, teamwork, flexibility, communication, integrity and output orientation as relevant for early-stage researchers entering industry. The Executive MBA participants also valued reliability, self-sufficiency, responsibility, constructive challenge, operational ability, resilience, speed and adaptability as traits linked to effective work in industrial technology contexts.

The semi-structured interviews also pointed to strategic self-management as part of industry-facing readiness. Interviewees stressed the need to prioritise, say no when necessary, protect time for creative and strategic thinking, and avoid working continuously under conditions that undermine the quality of problem-solving.

For WP4, this means that early-stage researchers need some preparation for how applied R&D work is organised. This does not require turning the training into general management education. It does mean that researchers should understand deadlines, priorities, resource limits, stakeholder expectations and decision-making under practical constraints.

3.5.5 Preferred training formats

The sources also give indications about suitable training formats. In the UNITE consultation, online workshops were seen as useful for reaching more people, while bootcamps were considered more effective when participants need to meet, cooperate and produce something. In the WP4 survey, intensive two-to-three-day in-person bootcamps were selected by 31% of respondents, short micro-learning videos by 29%, half-day online workshops by 20.4%, self-paced MOOCs by 17.5%, and other formats by 2%.

The Executive MBA input supports this blended and applied orientation. Participants preferred case studies, real-life examples, interactive formats, hands-on experience, problem-solving, application-based learning and mixed formats combining reading, short videos and group or buddy reflection. This strengthens the case for training designs that combine concise preparatory material with applied, interactive and problem-based learning.

The semi-structured interviews suggest that training format should be selected according to purpose and audience. Micro-learning can help establish a common baseline or fill specific knowledge gaps, while smaller workshops and mentoring are better suited to translating concepts into daily work, project situations and individual career decisions. Relevance to practical tasks was seen as essential: if participants cannot connect the training to their own work, they are unlikely to engage deeply.

The MENTORE questionnaire adds a further dimension concerning how training could be delivered, particularly the role of AI support. Respondents saw clear value in AI-supported tools for accelerating access to foundational, systematisable knowledge, but expressed more cautious trust in fully automated outputs, favouring solutions that offer AI-generated suggestions which remain open to human review. Human mentoring was consistently reserved for applied, contextual and relational learning, including practical problem-solving, tacit-knowledge transfer, the interpretation of complex real-world contexts and interpersonal dimensions. This points to a "suggested-but-editable" model, in which AI handles preparatory, diagnostic and personalisation components while workshops and mentoring cover the hands-on, interpretive and interpersonal aspects.

For WP4, this supports a blended training model. Online components can be used for preparation, basic concepts and wider access, while workshops, bootcamps, applied cases and mentoring are more suitable for developing communication, collaboration, value translation and industry-facing problem-solving skills.

3.5.6 Implication for the training pathways

The analysed sources support three connected training needs. First, early-stage researchers need to communicate and position their research beyond academia, including in technical, managerial, customer-facing and policy-facing contexts. Second, they need to understand how research can be translated into practical, commercial, societal or operational value, including through use cases, value propositions, IP awareness, standards, customer needs and system-level thinking. Third, they need support in navigating careers and collaborations across academic and non-academic environments, including different timelines, incentives, decision cultures, leadership expectations and industrial project constraints.

The interview evidence also adds a fourth cross-cutting requirement: researchers need strategic professional self-management, including the ability to prioritise, protect time for high-quality work, build networks, recognise emerging opportunities and position their expertise in relation to changing industrial and societal needs.

These findings led to three pathway areas: human-centred technology deployment, research-to-value translation, and professional readiness for cross-sectoral careers.

3.6 Consolidation of findings into training pathways

This section explains how the findings from the needs analysis were consolidated into the training pathway structure used in D4.1. Related findings were grouped into coherent training responses that reflect the scope of T4.1 and the specific purpose of WP4, i.e. preparing early-stage researchers for cross-sector application, career development and collaboration beyond purely academic settings.

3.6.1 Design rationale

The needs analysis produced several connected findings. For example, the evidence on communication was closely linked to cooperation, networking, career transition and working across different expectations. Similarly, the evidence on commercialisation was linked to use cases, exploitation, business orientation and the ability to explain research value to non-academic actors. For this reason, the pathway design groups related needs into broader training areas.

The pathway structure was also shaped by the formal scope of T4.1. The task explicitly refers to customised training pathways and career support services that address the gap between academic capability and cross-sector application. It also identifies human-centred design and technology acceptance, translating research findings into marketable products or services, business development, innovation management and IPR as areas relevant for WP4.

3.6.2 Training pathways

The consolidation resulted in three training pathways. Each pathway responds to a different type of need. The first pathway is primarily anchored in the formal T4.1 task scope, while the second and third pathways combine task requirements with findings from the needs analysis.

Pathway 1: Technology acceptance and human-centred design

This pathway is primarily anchored in the T4.1 task scope, which explicitly identifies human-centred design and technology acceptance as part of the customised training pathway work. The WP4 survey provides empirical evidence that the focus on technology acceptance is well placed. Technology acceptance models had the lowest familiarity of all eight concepts surveyed (mean 0.542 on a 0–2 scale), and 54.2% of the respondents who answered that item reported that they had never heard of it. This confirms that technology acceptance remains a genuine knowledge gap among the target group.

The pathway is designed around applied technology contexts where technical performance alone is not sufficient for successful implementation. It focuses on how users, organisations and stakeholders accept, resist, trust, adapt to or reject new technologies. Its purpose is not to provide general UX training or technical instruction in AI, robotics or manufacturing systems, but to help researchers understand the human and organisational factors that affect technology deployment.

Pathway 2: Research commercialisation, innovation and intellectual property

This pathway responds to the synthesis finding on commercialisation, exploitation and applied value. The needs analysis showed that early-stage researchers require support in moving from research results toward practical,

commercial, societal or operational value. The WP4 survey confirms this gap quantitatively. IP Protection and Starting a Business both have medians of 0 on a 0–4 experience scale, with the three quarters of respondents having never applied them. This includes understanding use cases, value propositions, exploitation routes, innovation pathways and basic IP or knowledge-transfer decisions.

The pathway also incorporates the cross-sector communication finding, but only where communication supports research-to-value translation. Researchers need to explain what problem their research addresses, who could use it, and what form of uptake may be realistic. This pathway is therefore connected to business development, innovation management and IPR, as reflected in the T4.1 scope. It is not intended to function as a full start-up accelerator or business incubation programme.

Pathway 3: Professional readiness for cross-sectoral careers

This pathway responds to the synthesis findings on different expectations between academia and industry, cross-sector communication and collaboration, and project culture, delivery constraints and decision-making. These findings point to a need for researchers who can operate across academic, industrial, public-sector and innovation environments, where timelines, outputs, working cultures and definitions of success may differ.

The pathway focuses on professional positioning, communication with non-academic stakeholders, networking, cooperation in mixed teams, and preparation for career pathways beyond a purely academic trajectory. It also includes awareness of applied project environments, including prioritisation, milestones, resource constraints and decision-making under practical conditions. The pathway is not generic soft-skills training or standard doctoral career counselling. Its purpose is to support professional readiness for cross-sectoral careers.

The semi-structured interviews further indicate that professional readiness should include strategic self-management: the ability to prioritise, say no where necessary, protect time for high-quality work, build useful networks, and articulate the value of one's expertise in academic and non-academic contexts.

3.6.3 Role of mentoring in achieving the learning goals

Mentoring is a planned component of the INSIGHT project. It complements the three training pathways by helping pilot cohort researchers apply their learning to their own research, career goals and professional contexts. While the training modules provide common concepts, methods and practical exercises, mentoring provides an individual setting in which each researcher can interpret that learning, identify its relevance and decide how to act on it.

The purpose of mentoring is to support the transfer of learning into professional practice. Through structured conversations with an experienced mentor, researchers examine their current competencies, clarify their development priorities, reflect on opportunities within and beyond academia and identify concrete actions to pursue during the pilot period. Mentoring also provides a recurring opportunity to review progress, discuss obstacles, receive contextual feedback and revise plans as the researcher's experience develops.

Mentoring supports one connected learning journey across the three pathways. Before the first sprint event, mentors help researchers check their understanding of the prerequisite Pathway 1 and Pathway 2 modules and prepare an initial challenge or research idea. Between the first and second sprint events, mentors help researchers apply feedback from the workshops, complete the remaining online modules, and refine their solution, value proposition, exploitation route and stakeholder pitch. After the second sprint event, mentors help researchers interpret stakeholder feedback and convert the pilot experience into an actionable Career and Professional Development Plan.

Across the pilot period, mentoring is intended to enable each researcher to:

- identify individual learning and career-development priorities;
- connect training content with their own research and professional context;
- reflect on feedback and experience gained through the training pathways and sprint events;
- formulate and review concrete development actions;
- improve their ability to communicate their competencies and professional goals;
- identify relevant people, organisations and specialist support resources; and
- produce a realistic plan for continued development beyond the pilot period.

Mentoring is not an additional training pathway or a substitute for specialist advice. Mentors are not expected to act as patent attorneys, business consultants or recruitment professionals. Their role is to support reflection, contextualisation, decision-making and follow-through, while directing researchers to appropriate specialist support when necessary. The operational model, including mentor selection, matching, programme phases, session structure and evaluation, is described in Section 7 (Career support services).

3.6.4 Scope clarification

Some findings do not become standalone teaching goals. Project culture, delivery pressure and decision-making are integrated into the professional readiness and commercialisation pathways because they support cross-sector work, but they do not require a separate pathway. Generic doctoral skills are also not treated as a separate INSIGHT pathway, since they are usually addressed through existing institutional or doctoral training offers.

3.6.5 ResearchComp alignment

The three training pathways were also checked against the ResearchComp structure to ensure that the pathway design remains connected to recognised researcher competence areas. The alignment is not intended to cover all ResearchComp areas equally. D4.1 focuses on the competence areas most relevant to cross-sector application, research-to-value translation and professional readiness beyond a purely academic trajectory. Table 2 shows how these priorities map onto the ResearchComp domains most relevant to applied, cross-sectoral researcher development.

Table 2. ResearchComp domain to pathway mapping

ResearchComp domain	Pathway 1 TAM/HCD	Pathway 2 Commercialisation	Pathway 3 Career Nav.	Status
1. Research thinking	—	—	—	Out of scope
2. Research design	Partial	—	—	Partial
3. Research implementation	Core	—	—	In scope
4. Communication	—	Partial	Core	In scope
5. Managing research	—	Core	Partial	In scope
6. Open science	—	—	—	Out of scope
7. Engaging with society	Core	Partial	Core	In scope
8. Research tools	—	—	—	Out of scope

This alignment shows that D4.1 mainly addresses ResearchComp areas linked to applied research implementation, communication, managing research, and engagement with society. These are the areas most closely connected to the needs identified in the analysis and to the WP4 task scope. Areas such as research thinking, open science and domain-specific research tools are not treated as separate training priorities in this deliverable, because they are either already covered through standard doctoral and institutional training or require specialised provision outside the common WP4 pathway structure.

4 Participant framework and selection

4.1 Learner profile

The primary target population is defined by the WP5 pilot structure. Research organisations each contribute four early-stage researchers, giving a core cohort of approximately 30 researchers from the consortium organisations. The operational learner characteristics used for selection and support are summarized in Table 3.

Table 3. Learner characteristics

Learner characteristic	Description
Career stage	Early-stage researchers: PhD students, postdoctoral researchers, and researchers within 7 years of full-time research experience
Disciplinary backgrounds	Engineering, computer science, human-computer interaction, psychology, sociology, and interdisciplinary fields
Sector context	Working in or transitioning toward automotive, manufacturing, or digital technology; most without prior industry experience
Preferred formats	Mixed preference for workshops (hands-on) and short online modules; low appetite for long lecture-format content

4.2 Definition of early-stage researcher

For this deliverable and the INSIGHT project, an early-stage researcher is defined as:

- A researcher currently enrolled in a PhD programme; or
- A researcher within seven years of the date of their PhD award or equivalent doctoral qualification.

Career breaks, parental leave, and other documented interruptions may be excluded from the seven-year calculation in line with ERA best practice and the Charter for Researchers. This definition applies to both the broader training population and the pilot cohort.

4.3 Two-population model

Two populations are served by the activities of WP4 and WP5. They differ in the intensity of support received and in the selection mechanism that determines participation. The distinction between the broader training group and the pilot cohort is consolidated in Table 4.

Table 4. Broader training group vs pilot cohort

	Broader training group	Pilot cohort
Target size	50+ researchers	30 researchers

Who they are	Early-stage researchers from partner institutions and organisations engaged through WP2 stakeholder activities	Early-stage researchers nominated by consortium organisations,
Selection	Open eligibility based on early-stage definition; institutional nomination or self-referral through WP2 channels	Decided by each partner organisation internally; only requirement is that nominated researchers meet the early-stage definition
Training pathways	Access to the online components of all three pathways; in-person sprint workshops are reserved for the pilot cohort or adapted separately where feasible.	Full access to all 12 modules, sequenced as one connected preparation–first sprint event–refinement–second sprint event journey
Individual mentoring	Not included	Included with one dedicated mentor per researcher from M19 to M33
Sprint event participation	Not included as participants;	Full participation in Sprint 1 (Spain, M25) and Sprint 2 (Greece, M30)
Peer learning	Included	Included

4.4 Selection for the broader training group

Participation in the broader training group is open to any early-stage researcher who meets the definition in Section 4.2 and is affiliated with a partner institution or an organisation engaged through WP2 stakeholder activities. There is no competitive selection. Researchers may be nominated by their institution or may express interest directly through the project's communication channels established in WP6.

Recruitment for the broader training group begins at M16 and runs continuously through M33. The target of at least 50 participants is tracked as a project KPI. T4.2 lead (TUG) maintains the participant register and reports on participation through the WP1 monitoring process.

4.5 Selection for the pilot cohort

Each research organisation contributing to the pilot nominates researchers after organizing and an internal selection process. The decision about which researchers to nominate is made internally by each organisation after. The only condition defined by INSIGHT is that nominated researchers must meet the early-stage definition in Section 4.2.

Organisations are encouraged, though not required, to consider disciplinary diversity and gender balance in their nominations, in line with the project's broader commitment to inclusivity under WP6 (T6.4). Nominations should be confirmed to the T4.2 lead (TUG) by M16, allowing the mentorship matching process and pre-sprint preparation to begin at M17–M18.

4.6 What the pilot cohort receives beyond the training pathways

In addition to the full training pathways available to all participants, pilot cohort members receive:

- Individual mentoring from M19 to M33, structured around preparation before the first sprint event, application and refinement between the first and second sprint events, and consolidation after the second sprint event as described in Section 7.1;
- Full participation in both WP5 sprint events, including working directly on the automotive and manufacturing challenges provided by CTAG Site visit at CTAG facilities in Spain during Sprint 1 (M25);
- Site visit at ICCS facilities in Greece during Sprint 2;
- Post-sprint structured evaluation activities feeding into T4.3 (M25–M35).

5 Training pathway descriptions

The needs analysis identified three broad areas where early-stage researchers need structured support: understanding Technology acceptance and human-centred design, translating research into commercial and societal value, and preparing for careers that cross sector boundaries. These findings, together with the scope defined in T4.1, led to the three training pathways described below. All pathways remain available to the broader training group as modular learning offers. For the pilot cohort, the same content is organised as one connected journey that begins with preparation for the first sprint event, continues through applied work and mentoring between the first and second sprint events, and culminates in the second sprint event.

The pathways use a blended format combining short online preparation, in-person workshops, mentoring and applied sprint activities. Pilot cohort members complete the prerequisite Pathway 1 and Pathway 2 content before the first sprint event, attend two full workshop days during the first sprint event in Spain, complete the remaining Pathway 2 and cross-cutting Pathway 3 content between the first and second sprint events, and apply the combined learning in an integrated capstone and stakeholder presentation during the second sprint event in Greece. Broader-group delivery is scheduled separately and does not depend on participation in the sprint events.

5.1 Pathway 1: Technology acceptance and human-centred design

This pathway addresses a straightforward gap. The survey showed that Technology acceptance models, the frameworks used to evaluate how users adopt, trust, or resist new technology, are largely unknown among researchers. Pilot cohort members complete Modules 1–3 before the first sprint event and apply them during a full-day workshop at CTAG as part of the first sprint event, where teams diagnose a real or simulated technology-acceptance problem, design an intervention and produce the initial solution that they will develop through the rest of the pilot journey. Beyond technology acceptance itself, the pathway is grounded in a human-centred design perspective. Rather than treating acceptance, trust and resistance as attitudes to be measured after a technology is built, it frames them as design concerns to be anticipated across the full development cycle, from understanding users and their context, through iterative design and testing, to longitudinal evaluation after deployment. This reflects the core human factors principle that human oversight and calibrated trust are design requirements rather than optional safeguards, particularly in the safety-critical automotive, manufacturing and robotics contexts the pathway targets. Tables 5 and 6 translate this pathway into a concrete sequence and a field-level delivery design.

Table 5. Pathway 1 description

Field	Description
Target audience	Early-stage researchers in automotive, manufacturing, robotics, green energy, and AI systems contexts.

Prerequisites	No specific technical prerequisites. Basic familiarity with research methods assumed.
Total duration	Approximately 10 hours: 3 hours of online preparation with micro-learning videos and a short exercise, followed by a 7-hour in-person workshop.
Format	Three prerequisite micro-learning modules completed before the first sprint event, followed by one full-day applied workshop during the first sprint event at CTAG (M25). Broader-group delivery is scheduled separately.
ResearchComp	Making an impact, Working with others

Upon completing Pathway 1, researchers will be able to:

- Explain core Technology acceptance models (TRA, TPB, TAM, UTAUT) and apply them as diagnostic frameworks to real-world cases in sector specific contexts;
- Distinguish between acceptance, adoption, use, continuance, and resistance, and explain why each calls for a different research and design approach;
- Diagnose a technology acceptance problem using a structured user-centred diagnosis, identifying whether the root cause is a trust gap, a fit gap, a power problem, an ethics concern, or a skill gap;
- Situate acceptance and trust within a human-centred design cycle, recognising how user research, iterative design and post-deployment evaluation each contribute evidence about how a technology will be adopted in practice;
- Identify appropriate intervention types like redesign, explain, train, govern, or phase for a given acceptance failure;
- Apply trust calibration concepts to detect automation bias, under-trust, and contestation patterns in automated and AI-assisted systems;
- Approach AI acceptance differently depending on whether the AI acts as a tool, an advisor, or an autonomous decision-maker, and identify the design requirements that each mode demands.

Table 6. Pathway 1: Module sequence

#	Module title	Duration	Format	When
1	Technology acceptance models	~1 h	Micro-learning videos	Before the first sprint event (M19–M24)
2	User-centred diagnosis	~1.5 h	Micro-learning videos	Before the first sprint event (M19–M24)
3	Trust calibration and resistance patterns	~40 min	Micro-learning videos	Before the first sprint event (M19–M24)
4	Applied workshop	~7 h	In-person workshop	First sprint event, Spain (M25)

5.2 Pathway 2: Research commercialisation, innovation and intellectual property

The survey made clear that commercialisation-related skills are the weakest in the sample. Over half of respondents had never worked with IP protection, and three-quarters had never started a business. Pilot cohort members complete the value-proposition and IP foundations before the first sprint event, then practise

communicating an initial solution during a full-day pitching workshop. Between the first and second sprint events they complete the exploitation-routes module and refine the preliminary pitch into a credible stakeholder presentation. Pathway 2 therefore provides the pitching method used in the final presentation during the second sprint event in Greece. Tables 7 and 8 translate these priorities into the pathway sequence and the field-level delivery design.

Table 7. Pathway 2 description

Field	Description
Target audience	Early-stage researchers interested in translating research into products, services, or policy impact. Most relevant for those working in EV technology, smart manufacturing, AI systems, and green energy.
Prerequisites	No prior entrepreneurship or business experience required. Participants should bring a research idea, technology concept, method, dataset, prototype, or applied challenge that could be explored for potential value creation, though this is encouraged, not mandatory.
Total duration	Approximately 11.5 hours: 4.5 hours of online preparation with micro-learning videos and exercises, followed by a 7-hour in-person workshop.
Format	Modules 5–6 are completed before the first sprint event, followed by the full-day Module 8 pitching workshop during the first sprint event. Module 7 and mentor-supported pitch refinement take place between the first and second sprint events before the final stakeholder presentation during the second sprint event in Greece.

Upon completing Pathway 2, researchers will be able to:

- Explain the main pathways through which research can generate value beyond academia like products, services, process improvements, policy applications, spin-offs, licensing, and collaborative innovation;
- Distinguish between scientific novelty, technological feasibility, user need, market relevance, and societal value;
- Identify potential users, beneficiaries, customers, adopters, and stakeholders for a research-based solution;
- Develop a value proposition for a research result, showing what problem it addresses, for whom, and why the proposed solution is preferable to existing alternatives;
- Explain basic intellectual property and knowledge transfer concepts: background knowledge, foreground results, ownership, confidentiality, patents, copyright, licensing, and trade secrets;
- Assess possible exploitation routes for a research result like industry collaboration, licensing, spin-off creation, policy uptake, open-access dissemination, or integration into existing organisational processes;
- Communicate the applied value of a research idea to non-academic stakeholders using concise, evidence-based, audience-appropriate language, and deliver a structured pitch;
- Identify common risks in research commercialisation: unclear ownership, weak user validation, regulatory constraints, lack of market fit, premature solutionism, and overclaiming impact.

Table 8. Pathway 2: Module sequence

#	Module title	Duration	Format	When
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5	From research results to value proposition	~2 h	Micro-learning videos	Before the first sprint event (M19–M24)
6	Intellectual property and knowledge transfer basics	~1 h	Micro-learning videos	Before the first sprint event (M19–M24)
7	Innovation pathways, business models, partnerships, and exploitation routes	~1.5 h	Micro-learning videos	Between the first and second sprint events (M26–M29)
8	Pitching research value to industry and ecosystem stakeholders	~7 h	In-person workshop	First sprint event, Spain (M25)

5.3 Pathway 3: Professional readiness for cross-sectoral careers

This pathway prepares early-stage researchers to work credibly across academic, industrial, public-sector and innovation environments. It responds to the identified need for researchers who can understand different sector expectations, translate research value for non-academic audiences, collaborate in mixed teams, and position themselves for career pathways that may move across or beyond academia.

The pathway focuses on cross-sector career mapping, professional positioning, stakeholder communication, applied project cultures, collaboration across organisational and disciplinary boundaries, and structured networking. It is not generic soft-skills training or standard doctoral career counselling. Its purpose is to help researchers recognise where their research competences can create value, understand how different sectors organise work, and practise communicating and collaborating under realistic cross-sector conditions.

Pathway 3 is cross-cutting across the pilot journey. Its competencies support teamwork, cross-sector communication, professional positioning, and stakeholder engagement rather than forming a disconnected final block. Participants complete Modules 9–11 between the first and second sprint events while refining their solution and pitch with mentor support, then apply these competencies in the integrated Module 12 capstone, stakeholder presentation and networking activity during the second sprint event in Greece. Tables 9 and 10 show how cross-cutting logic is organized into a sequence and a field-level delivery design.

Table 9. Pathway 3 descriptions

Field	Description
Target audience	Early-stage researchers who want to explore, prepare for, or move between career opportunities in academia, industry, the public sector, and innovation ecosystems. Particularly suited to researchers in automotive, manufacturing, robotics, green energy, AI systems, digital technologies, and deep tech.
Prerequisites	No specific prerequisites. Participants should be willing to reflect on their career goals, current competencies, professional identity, and potential career pathways within and beyond academia.

Total duration	Approximately 12 hours: 6 hours of online preparation with micro-learning videos and exercises, followed by a 6-hour in-person workshop.
Format	Cross-cutting pathway delivered through Modules 9-11 online between the first and second sprint events, mentor-supported application throughout the pilot, and an integrated Module 12 capstone, stakeholder presentation and networking day during the second sprint event in Greece.

Upon completing Pathway 3, researchers will be able to:

- Translate research experience, technical expertise, and transferable skills into language that is understandable and relevant to non-academic employers and stakeholders;
- Recognise differences between academic and non-academic research cultures, in expectations around timelines, collaboration, outputs, impact, confidentiality, and decision-making;
- Navigate project environments with different constraints across academia and industry, including milestone-driven delivery, resource limits, and stakeholder accountability;
- Collaborate effectively across disciplines: recognise different methodological norms, terminology, and success criteria, and apply strategies for cross-disciplinary communication and integration;
- Identify and compare possible career pathways across academia, industry, the public sector, start-ups, research and technology organisations, and innovation intermediaries;
- Map their current competency profile against potential career pathways and develop a personal career development plan covering short-term objectives, skills gaps, networking priorities, and next steps;
- Communicate their research profile and career interests through a concise professional narrative, a short-written biography, and a verbal introduction;
- Prepare for career conversations with mentors, industry stakeholders, and potential employers: formulate relevant questions, present their value clearly, and identify follow-up actions;
- Design a targeted networking strategy for engaging academic, industry, policy, and public-sector stakeholders, and apply it in structured networking settings;
- Use feedback from mentors, peers, and industry stakeholders to refine career goals and professional positioning.

Table 10. Pathway 3: Module sequence

#	Module title	Duration	Format	When
9	Mapping cross-sector career pathways and researcher positioning	~2 h	Micro-learning videos	Between the first and second sprint events (M26–M29)
10	Translating research value for employers and stakeholders	~2 h	Micro-learning videos	Between the first and second sprint events (M26–M29)
11	Working across project cultures and boundary-spanning teams	~2 h	Micro-learning videos	Between the first and second sprint events (M26–M29)

12	Cross-sector simulation and structured networking lab	~6 h	In-person workshop	Second sprint event, Greece (M30)
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6 Module Catalogue

This section describes the twelve modules that make up the three training pathways. Their full learning materials will be developed in T4.2. The formats and durations follow the blended model established in Section 5.

6.1 Module 1: Technology acceptance models

Module 1 introduces the core Technology acceptance models (TRA, TPB, TAM, UTAUT) and the relationships between them. The module treats these models as a family tree where each one emerged to address a limitation in the one before it. Table 11 summarizes the module structure, delivery mode, and expected outputs.

Table 11. Module 1: Technology acceptance models

Field	Description
Pathway	Pathway 1: Technology acceptance and human-centred design
Duration	~1 hour
Format	Three micro-learning videos (15–20 minutes each)
Target audience	All early-stage researchers with no prior background in technology acceptance research
ResearchComp	Making an impact

The goal is to help learners recognise which model works for a given type of acceptance problem. In automotive and manufacturing contexts, for example, TAM is often sufficient for simple tool adoption but breaks down when the technology affects roles, status, or trust. That is where UTAUT adds useful constructs. Each video uses one applied case to show the model in action. Each video is followed by a short self-check quiz.

Learning objectives

- Explain the four core models (TRA, TPB, TAM, UTAUT) and what each adds to the one before it;
- Describe why no single model works for everything: what each model handles well and where it falls short;
- Choose an appropriate model for a technology acceptance problem in automotive, manufacturing, robotics, or green energy.

6.2 Module 2: User-centred diagnosis

Module 2 moves from knowing the models to using them. Researchers learn to diagnose why a user or stakeholder resists, distrusts, or rejects a given technology. The module introduces a diagnostic framework that classifies root causes into five types: a trust gap where users do not believe the system is reliable, a fit gap where the technology does not match the context or task, a power problem where the technology threatens autonomy or authority, an ethics concern where the technology violates values or norms, and a skill gap where users lack the capacity to use it effectively. This diagnostic step builds on user research. Understanding who the users are, what they are trying to accomplish and the context in which they work, through interviews, contextual enquiry or focus groups, so that the root-cause classification is grounded in observed user needs rather than assumption. Table 12 captures the module structure and the practical diagnosis workflow used in delivery.

Table 12. Module 2: User-centred diagnosis

Field	Description
Pathway	Pathway 1: Technology acceptance and human-centred design
Duration	~1.5 hours
Format	Two micro-learning videos (15–20 minutes each) with a possible online training platform provided by partner RE:LAB.
Target audience	All early-stage researchers, ideally after completing Module 1
ResearchComp	Making an impact; Working with others

Each type requires a different intervention approach. The exercise asks researchers to apply this diagnosis to a short case from their own domain, identifying the likely root cause type and explaining their reasoning.

Learning objectives

- Distinguish five root cause types for technology resistance;
- Apply the diagnostic framework to a real or simulated case;
- Explain why a correct diagnosis matters for choosing the right intervention;
- Ground a diagnosis in evidence about users and their context, rather than in assumptions about why resistance occurs.

6.3 Module 3: Trust calibration and resistance patterns

Module 3 covers the two ends of the trust calibration problem. At one end is automation bias, where users trust a system more than it deserves. At the other is under-trust, where users reject a reliable system for non-technical reasons. The module also introduces contestation patterns: situations where users actively work around or subvert a technology rather than accepting or rejecting it. The module also connects calibration to design: calibrated trust depends on the system making its reasoning legible so that users can rely on it for the right reasons and override it when appropriate. It also introduces the accuracy–trust paradox, whereby users demand high accuracy yet distrust automated assessments of their own competence, which has direct consequences for any system that evaluates a person. Table 13 summarizes how these trust and resistance concepts are organised for delivery and applied practice.

Table 13. Module 3: Trust calibration and resistance patterns

Field	Description
Pathway	Pathway 1: Technology acceptance and human-centred design
Duration	~40 minutes
Format	Two micro-learning videos (15–20 minutes each)
Target audience	All early-stage researchers, ideally after completing Module 1
ResearchComp	Making an impact

These concepts are applied to scenarios specialized for each of the sectors, i.e. automotive industry, manufacturing, robotics, green energy and artificial intelligence.

Learning objectives

- Define automation bias and under-trust as opposite sides of a calibration problem;
- Identify contestation as a form of resistance that is neither acceptance nor rejection;

- Apply trust calibration analysis to cases from automotive, manufacturing, and robotics;
- Explain how transparency and explainability support calibrated trust, and why systems that assess a person must keep a human in the loop

6.4 Module 4: Applied workshop

This full-day workshop is delivered during the first sprint event in Spain and brings together the concepts from Modules 1 through 3. Participants work in small groups on a CTAG technology-acceptance challenge, diagnose the root cause using the five-type framework from Module 2, select an appropriate intervention lever and stress-test the proposed intervention. Table 14 brings together the workshop structure, timing, and outputs expected from this sprint-based format.

Table 14. Module 4: Applied workshop

Field	Description
Pathway	Pathway 1: Technology acceptance and human-centred design
Duration	~7 hours (full day)
Format	In-person workshop with case packs, small-group work, and structured templates
Target audience	Early-stage researchers who have completed Modules 1–3
ResearchComp	Making an impact; Working with others

Teams present an initial diagnosis and solution, receive feedback and carry the resulting work into the Pathway 2 pitching workshop and the refinement period between the first and second sprint events.

Learning objectives

- Diagnose a technology acceptance problem using the five-type framework;
- Map a resistant stakeholder's experience from initial exposure to current state of resistance;
- Select and justify an appropriate intervention lever for a given case;
- Stress-test an intervention by identifying probable failure modes six months after deployment.

6.5 Module 5: From Research results to value proposition

Module 5 introduces the concept of a value proposition and shows researchers how to build one from a research result. The module distinguishes between scientific novelty, technological feasibility, user need, and market relevance. Table 15 sets out the module structure used to turn that logic into an applied value-proposition exercise.

Table 15. Module 5: From Research results to value proposition

Field	Description
Pathway	Pathway 2: Research commercialisation, innovation and intellectual property
Duration	~2 hours
Format	Three micro-learning videos (15–20 minutes each) with a structured workbook exercise
Target audience	All early-stage researchers, with no prior business or entrepreneurship experience required

ResearchComp	Making an impact
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Researchers learn to identify what problem their work addresses, for whom, and why their proposed solution is preferable to existing alternatives. The workbook exercise guides them through building their own value proposition step by step.

Learning objectives

- Identify the core value of a research result;
- Distinguish between scientific novelty and market relevance;
- Articulate a value proposition using a structured format.

6.6 Module 6: Intellectual property and knowledge transfer basics

Module 6 covers the fundamentals of intellectual property and knowledge transfer. It explains the difference between background and foreground IP, when patent, copyright, or trade secret protection applies, and the basics of confidentiality, ownership, and licensing. The module aims to give researchers enough literacy to recognise when IP issues arise and to know when to involve a professional. Table 16 summarizes the structure through which these IP and knowledge-transfer basics are delivered.

Table 16. Module 6: Intellectual property and knowledge transfer basics

Field	Description
Pathway	Pathway 2: Research commercialisation, innovation and intellectual property
Duration	~1 hour
Format	Three micro-learning videos (15–20 minutes each) with a short quiz
Target audience	All early-stage researchers with no prior IP knowledge
ResearchComp	Managing research tools; Making an impact

Learning objectives

- Explain the difference between background and foreground IP;
- Recognise when patent, copyright, or trade secret protection applies;
- Understand confidentiality, ownership, and licensing basics.

6.7 Module 7: Innovation pathways, business models, partnerships, and exploitation routes

Module 7 is completed between the first and second sprint events. It helps participants strengthen the preliminary solution and pitch developed during the first sprint event in Spain by examining the routes through which research can be taken up outside academia. Table 17 condenses that progression into the module structure, learning tasks, and outputs used between sprint events.

Table 17. Module 7: Innovation pathways, business models, partnerships, and exploitation routes

Field	Description
Pathway	Pathway 2: Research commercialisation, innovation and intellectual property
Duration	~1.5 hours

Format	Two micro-learning videos (15–20 minutes each) with a case study analysis
Target audience	All early-stage researchers, ideally after completing Module 5
ResearchComp	Making an impact; Managing research

It covers licensing, spin-offs, industry collaboration, policy uptake and integration into existing products or processes, together with relevant business-model and partnership choices. The case exercise asks each team to identify a realistic exploitation route and incorporate it into the final stakeholder pitch.

Learning objectives

- Compare exploitation routes including spin-offs, licensing, industry collaboration, and policy uptake;
- Understand how business models differ across sectors;
- Assess which route fits a given research context.

6.8 Module 8: Pitching research value to industry and ecosystem stakeholders

This full-day workshop is delivered during the first sprint event in Spain and introduces the method participants will use for the final stakeholder presentation during the second sprint event in Greece. Teams turn the initial solution from Module 4 into a structured pitch using the value proposition developed in Module 5. Table 18 sets out the workshop structure that supports the progression from solution idea to stakeholder-facing pitch.

Table 18. Module 8: Pitching research value to industry and ecosystem stakeholders

Field	Description
Pathway	Pathway 2: Research commercialisation, innovation and intellectual property
Duration	~7 hours (full day)
Format	In-person workshop
Target audience	Early-stage researchers who have completed Modules 5–7
ResearchComp	Making an impact

They practise presenting, receive feedback, revise the pitch and practise again in a supportive setting. Between the first and second sprint events, they use Module 7 and mentor feedback to strengthen the exploitation logic, market relevance, feasibility and risk arguments before the final presentation.

Learning objectives

- Deliver a structured pitch to a non-academic audience;
- Respond to questions about market fit, feasibility, and risk;
- Refine the pitch based on feedback from peers and facilitators.

Module 9: Mapping cross-sector career pathways and researcher positioning

Module 9 introduces cross-sector career readiness as a process of mapping possible destinations, understanding sector expectations, and recognising how research experience can create value in different environments. The module starts before CV or profile writing because researchers first need to understand which sectors, roles, stakeholders and forms of value they are positioning themselves for. Table 19 summarizes the structure used to translate that exploration into a concrete positioning exercise.

Table 19. Module 9: Mapping cross-sector career pathways and researcher positioning

Field	Description
Pathway	Pathway 3: Professional readiness for cross-sectoral careers
Duration	~2 hours
Format	Three micro-learning videos (15–20 minutes each) with a guided mapping exercise
Target audience	All early-stage researchers, no prior experience required
ResearchComp	Making an impact; Self-management

Participants compare possible career and collaboration contexts, including academic research, industrial R&D, public-sector innovation, start-ups, RTOs, innovation intermediaries and policy-facing roles. They identify the kinds of problems, outputs, timelines, stakeholders and evidence that matter in each context. The exercise asks them to prepare a one-page cross-sector career map linking their research background, competences and interests to two or three possible career or collaboration pathways.

Learning objectives

- Identify possible cross-sector career pathways relevant to their research profile;
- Recognise how expectations, outputs and definitions of success differ across sectors;
- Map their current research experience and competences against possible cross-sector pathways.

6.9 Module 10: Translating research value for employers and stakeholders

Module 10 helps researchers translate research competence into language that is meaningful to non-academic employers, collaborators and stakeholders. It moves beyond standard CV advice by focusing on research value: what problem the researcher can help address, what evidence or expertise they bring, and why these matters in a specific sector or organisational context. Table 20 translates that goal into the module structure and outputs used in delivery.

Table 20. Module 10: Translating research value for employers and stakeholders

Field	Description
Pathway	Pathway 3: Professional readiness for cross-sectoral careers
Duration	~2 hours
Format	Two micro-learning videos (15–20 minutes each) with a writing and communication exercise
Target audience	All early-stage researchers, ideally after completing Module 9
ResearchComp	Working with others; Self-management

The module covers how to describe research skills, technical expertise, problem-solving ability, project experience, collaboration, data work, stakeholder engagement and analytical judgement without relying only on academic categories such as publications, thesis topics or disciplinary labels. Participants prepare an industry-facing profile paragraph and a short stakeholder value brief that explains the relevance of their research to a non-academic audience.

Learning objectives

- Translate research experience into language understood by non-academic employers and stakeholders;
- Identify transferable competences that may not be visible in a standard academic CV;

- Produce concise written material that can be reused in a CV, profile, project introduction or networking context.

6.10 Module 11: Working across project cultures and boundary-spanning teams

Module 11 prepares researchers to work across different project cultures and team environments. It combines the original themes of academia–industry differences and interdisciplinary collaboration into one broader module on boundary-spanning work. The module addresses the practical tensions that arise when researchers collaborate with partners who use different timelines, terminology, evidence standards, decision processes, confidentiality rules and definitions of success. Table 21 summarizes the module structure used to practise this boundary-spanning work.

Table 21. Module 11: Working across project cultures and boundary-spanning teams

Field	Description
Pathway	Pathway 3: Professional readiness for cross-sectoral careers
Duration	~1 hour
Format	Two micro-learning videos (15–20 minutes each) with a case-based exercise
Target audience	All early-stage researchers
ResearchComp	Working with others

Participants examine a case in which an academic research team, an industrial or public-sector partner, and a technical expert group need to work together under applied project conditions. They identify possible misunderstandings before they occur and prepare a collaboration expectation map. This map is then used as preparation for the in-person simulation in Module 12.

Learning objectives

- Recognise differences between academic, industrial, public-sector and innovation project cultures;
- Identify common tensions in interdisciplinary and cross-sector collaboration;
- Apply strategies for clarifying expectations in mixed teams.

6.11 Module 12: Cross-sector simulation, career positioning, and structured networking

Module 12 is the integrated capstone delivered during the second sprint event in Greece. Participants bring together the solution developed through Pathway 1, the value proposition and pitching method from Pathway 2, and the cross-sector working competencies developed through Modules 9–11. Mixed teams work under practical constraints including fixed milestones, incomplete information, confidentiality considerations and competing stakeholder expectations before preparing their final presentation. Table 22 brings together the capstone structure, delivery mode, and outputs expected from this integration point.

Table 22. Module 12: Cross-sector simulation, career positioning, and structured networking

Field	Description
Pathway	Pathway 3: Cross-Sector Simulation and Structured Networking Lab
Duration	~7 hours (full day)
Format	In-person workshop

Target audience	Early-stage researchers who have completed Modules 9–11
ResearchComp	Making an impact; Working with others; Self management

The capstone during the second sprint event in Greece combines a cross-sector simulation, final pitch rehearsal, stakeholder presentations, feedback and structured networking. Teams present their refined solution and value proposition to non-academic stakeholders, respond to questions and document how the feedback changes their proposed approach. A structured debrief and career-positioning exercise then connect the experience to each researcher's longer-term professional development.

Learning objectives

- Collaborate in a mixed team with different roles, priorities and evidence standards;
- Make decisions under practical conditions involving time, stakeholder and confidentiality constraints;
- Communicate research value to a non-academic stakeholder.

7 Career support services

The training pathway modules are supported by a career support infrastructure. The mentoring programme and industry exposure are available exclusively to the pilot cohort.

7.1 Mentoring programme

Each of the 30 pilot cohort researchers is assigned one dedicated mentor from M19 to M33. The relationship begins after matching is completed and before the first sprint event, allowing the mentor to support prerequisite understanding and preparation for the workshops in Spain.

The mentoring programme follows the same three-stage journey as the pilot curriculum: orientation and preparation before the first sprint event, application and refinement between the first and second sprint events, and consolidation after the second sprint event. Each phase has a defined goal and output while leaving room to respond to the individual researcher's context. The staged structure in Table 23 mirrors that journey and clarifies what mentors and researchers are expected to do at each phase.

Table 23. Mentoring programme structure

Phase	Period	Goal	Connection to curriculum
Phase 1: Orientation	M19–M24	Establish development priorities, check understanding of the prerequisite modules and prepare an initial challenge or research idea for the first sprint event.	Preparation for Modules 1-6 and the workshops during the first sprint event in Spain; output is an individual readiness and development plan linked to an initial challenge or research idea.
Phase 2: Application	M25–M29	Debrief the first sprint event, support Modules 7 and 9–11, and refine the team's solution, value proposition, exploitation route and final stakeholder pitch.	Application of feedback from the first sprint event and modules completed between the first and second sprint events; output is a refined solution, value proposition,

			exploitation approach and draft final pitch.
Phase 3: Consolidation	M30–M33	Interpret stakeholder feedback from the second sprint event, review progress across the pilot journey and define realistic post-pilot development actions.	Consolidation of pathway, sprint and mentoring outcomes; output is a final Career and Professional Development Plan with actions, networking priorities and specialist-support needs.

Table 24 summarizes the mentor pool, matching logic, and coordination points that connect the mentoring offer to industry-facing support.

Table 24. Industry connection and applied context

Field	Description
Mentor pool	Industry professionals from CTAG and partner networks; senior researchers from TUG, Fraunhofer, ICCS, 28 Digital and ANNT contacts.
Matching criteria	Sector alignment; complementary expertise; career trajectory relevance; expressed researcher preference; the mentor and mentee must be
Matching timeline	Completed by M18, allowing Phase 1 preparation to continue through M24 before the first sprint event in Spain.
Minimum sessions	3 structured sessions, one per phase; additional informal contact encouraged.
Session format	60-minute structured conversation following a prepare–discuss–apply–agree actions–follow-up cycle; each session records the working output, agreed actions and any specialist referral required.
Coordination	T4.2 lead (TUG) coordinates matching, scheduling, and session records for T4.3 evaluation.

7.2 Industry connection and applied context

Researchers in the pilot cohort encounter industrial contexts at three planned points: the sprint event in Spain, the stakeholder presentations in Greece, and regular conversations with their mentor. None of these is an immersion programme or a work placement. Each one offers a direct encounter with an industry-relevant problem, audience or setting, together with a short-written reflection that turns the experience into usable learning.

During Sprint 1 at CTAG in Spain, researchers work in multidisciplinary teams on real technology-acceptance challenges. They apply the diagnostic framework from Module 2 and the intervention-design method from Module 4, visit CTAG facilities, and produce two workshop outputs: an initial diagnosis with a proposed intervention, and

a preliminary stakeholder pitch. A mentor-supported action notes documents how the solution and pitch will be refined before the second sprint event.

During Sprint 2 at ICCS in Greece, researchers present the refined solution and value proposition to non-academic stakeholders, respond to questions and document one resulting change to their approach in a portfolio entry. The feedback is real, and researchers are expected to integrate it rather than defend against it.

Mentoring provides a third channel. When researchers are matched with a mentor, they may express a preference for someone with industry experience. Placement depends on the availability of suitable mentors in the pool, so an industry-based mentor is not guaranteed. Even when the mentor comes from academia, the regular mentoring sessions give each researcher a setting to discuss what they observed at CTAG, practise communicating their work in non-academic terms and identify where their skills might transfer. The three mentoring phases described in Section 7.1 structure this work: the researcher reviews progress against their development priorities at each phase and adjusts the plan as their experience grows.

These activities also provide part of the evidence base for reporting cross-sectoral mobility or exposure opportunities under the relevant project KPIs.

8 Implementation roadmap

8.1 Teaching material development timeline

Teaching materials for the online modules are developed in T4.2 ahead of their release dates. The first release window is M19 to M24, covering the online micro-learning video modules that participants complete before Sprint 1: Modules 1, 2, and 3 for Pathway 1, and Modules 5 and 6 for Pathway 2. All these need to be ready by M19 at the latest.

The two in-person workshops held during Sprint 1 at M25, Module 4 (Applied workshop) and Module 8 (Pitching Research Value), require the most preparation. Their facilitator guides, slide decks, case packs, exercise templates, and assessment rubrics are developed through M13 to M18 so that facilitators have time to rehearse before the sprint event.

The second release window is M26 to M29, covering Modules 7, 9, 10, and 11 for delivery between the two sprint events. Module 12, the cross-sector simulation workshop for Sprint 2 at M30, is developed in parallel.

Material review follows a two-step process: internal review by the module lead, then peer review by at least one other partner. Review criteria cover factual accuracy, alignment with ResearchComp, and consistency with the blended format.

8.2 Mentor recruitment, selection, and matching

The mentoring programme assigns each of the 30 pilot cohort researchers to a dedicated mentor from M19 to M33. That requires a mentor pool of at least 30 people to be in place by M16.

Mentors are drawn from three sources: the INSIGHT consortium partners, the project's wider network of industry and research contacts identified through stakeholder mapping (T2.1), and open calls circulated through partner channels. Candidates should have substantial experience in at least one of the following: supervising doctoral or postdoctoral researchers, working in industry-facing R&D, managing cross-sector collaborations, or supporting career transitions for researchers. Mentors receive a briefing pack covering the three training pathways, the pilot cohort profile, the sprint event calendar, and the boundaries of the mentoring role.

Matching begins after the pilot cohort is selected, during M17 to M18. Researchers complete a brief profile covering their research domain, career stage, development interests, and any preference for an academic or industry mentor. The coordinating team matches each researcher to a mentor whose experience aligns with the researcher's stated priorities. Matching is confirmed by M18 so that the first mentoring conversation takes place before the Sprint 1 preparation materials are released.

8.3 Participant recruitment and onboarding

Participant recruitment follows the two-population model defined in the Participant Framework and Selection section. The broader training group is recruited through an open call distributed across partner networks from M16. Enrolment remains open throughout the pilot period. These participants receive access to the online micro-learning videos as they are released.

The pilot cohort of 30 early-stage researchers is selected through a structured application process running from M13 to M16 by each of the organisations contributing. Selection criteria reflect the learner profile: early-stage researchers working in automotive, manufacturing, robotics, green energy, AI or related fields with a demonstrated interest in cross-sector career development. Gender balance and geographical diversity are considered alongside research fit when making the final selection by each of the organisations.

Onboarding for the pilot cohort takes place in M17 to M18. It includes an orientation session covering the three pathways, the mentoring programme, sprint event preparation, and the evaluation framework. Each researcher completes a baseline self-assessment mapped to the ResearchComp domains, which feeds into both mentor matching and the T4.3 evaluation baseline. The implementation phases consolidated in Table 25 bring these recruitment, onboarding, sprint, and follow-up steps into one operational timeline.

Table 25. Implementation phases

Period	Milestone
M12	D4.1 submitted
M13 to M16	Pilot cohort selected; mentor candidates identified
M13 to M18	Workshop materials developed for Sprint 1 (Modules 4 and 8)
M16	Broader training group enrollment opens
M17 to M18	Mentor matching confirmed; pilot cohort onboarding begins
M19	Mentoring programme starts
M19 to M24	Online modules released: Modules 1, 2, 3 (Pathway 1) and Modules 5, 6 (Pathway 2)
M25	Sprint 1: Module 4 and Module 8 in-person workshops
M26 to M29	Online modules released: Modules 7, 9, 10, 11

M30	Sprint 2: Module 12 in-person workshop
M33	Mentoring programme concludes; T4.2 material development completes
M25 to M35	T4.3 evaluation activities

Note: the timeline is indicative and will be refined in the Pilot Implementation Plan (D5.1, M24). The sprint-related elements, including event dates, duration and workshop format, are working assumptions to be confirmed in D5.1.

9 Evaluation framework

The evaluation of training pathway effectiveness is the responsibility of T4.3 (M25–M35). D4.1 defines what is measured, when, and for whom so that T4.3 can design assessment instruments before delivery begins. Assessment follows three stages which are baseline, formative, and summative, and distinguishes between the pilot cohort, who receive the full programme including mentoring and both sprint events, and the broader training group, who access the online modules only.

Baseline assessment takes place during onboarding (M15–M18). Each pilot cohort researcher completes the European Commission’s ResearchComp Self-Assessment Tool, which generates a competence profile mapped to the same ResearchComp domains that structure the training pathways. Results feed mentor matching and establish the T4.3 evaluation baseline. Broader-group participants complete the same tool on enrollment for aggregate reporting. Table 26 brings these baseline, formative, and summative checkpoints together as one evaluation logic.

Formative assessment runs from M24 through M30. At M24, both populations complete a readiness check covering core concepts from the pre-sprint modules. After Sprint 1 at M25, the pilot cohort’s workshop outputs are scored against a rubric, and each researcher writes a short individual reflection on what they learned and what they intend to change. Between sprints, mentoring sessions include a structured checkpoint: researcher and mentor review progress against the development priorities set at onboarding. After Sprint 2 at M30, the final team pitch and stakeholder Q&A are assessed with a presentation rubric.

Summative assessment has two points. At M30, a structured debrief for the pilot cohort covers cross-sector teamwork, pitch quality, use of stakeholder feedback, and professional communication. At M35, pilot cohort researchers complete a structured interview, a mentoring review, and their final Career and Professional Development Plan. The interview addresses learning transfer, progress against development priorities, intended career actions, networking priorities, and remaining specialist-support needs. The broader group completes a final online survey at M35 covering the same ResearchComp domains as the baseline, plus module completion and self-reported skill change.

Table 26. Evaluation framework

Assessment point	Population	Instrument	What is measured
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Onboarding (M15–M18)	Pilot cohort and broader group	ResearchComp Self-Assessment Tool; prerequisite knowledge check	Baseline competencies mapped to ResearchComp domains; readiness for Pathways 1 and 2
After Sprint 1 (M25)	Pilot cohort	Workshop output rubric; individual reflection note	Application of technology- acceptance concepts; quality of proposed intervention; initial value proposition
Post-Sprint 2 (M30)	Pilot cohort	Presentation rubric; stakeholder feedback; structured debrief	Cross-sector teamwork; final- pitch quality; response to stakeholder questions; professional communication
End of pilot (M35)	Broader group	ResearchComp Self-Assessment Tool; module completion survey	Competency re-assessment; module completion rate; self- reported skill change
End of pilot (M35)	Pilot cohort	Structured interview; mentoring review; Career and Professional Development Plan	Learning transfer; progress against development priorities; intended career actions; networking priorities; remaining support needs

9.1 Relevant key performance indicators

In addition to the baseline, formative and summative assessment activities described above, progress will also be monitored against the project-level key performance indicators related to the development and delivery of the training pathways, participation in career-support activities, cross-sectoral mobility and reported competence development. The relevant KPIs are:

- **Number of training pathways developed and implemented:** 3 training pathways, customised to different sectors, by M12.
- **Participation of early-stage researchers in career-support services:** at least 50 researchers.
- **Number of cross-sectoral mobility opportunities facilitated:** at least 15 opportunities.
- **Number of early-stage researchers reporting improved skills and competencies:** at least 75% of participants.
- **Number of early-stage researchers participating in the pilot talent ecosystem:** at least 30 researchers engaged throughout the project duration.

These indicators will complement the individual-level evaluation presented in Table 26 by providing evidence of the overall reach, implementation and uptake of the training and career-support activities. The KPI monitoring therefore combines three evidence levels: participation and delivery records, individual learning and reflection evidence, and longer-term follow-up evidence where required by the Grant Agreement.

10 Appendix A: Survey instrument and detailed results

10.1 Survey instrument

INSIGHT Survey on Researcher Skills and Industry Readiness

This questionnaire aims to better understand researchers' current skills, career-development needs and preferred forms of training. The results will help the INSIGHT project design relevant learning and mentoring activities that support researchers in strengthening their industry-relevant competences and exploring career opportunities within and beyond academia.

The questionnaire should take approximately 6–8 minutes to complete, and responses will be analysed in aggregated form.

* Required

Section 1 — The Transversal Skills

1. The current level of your skills?

Required to answer. Likert matrix.

	I have never applied this in practice	I have applied this under supervision	I have applied this independently	I have led projects using this skill	I have trained others in this area
I identify patentable results and understand the basics of filing for IP protection	☐	☐	☐	☐	☐
I translate research findings into business opportunities	☐	☐	☐	☐	☐
I manage research data while respecting industrial confidentiality (FAIR principles)	☐	☐	☐	☐	☐
I started a business based on my research results	☐	☐	☐	☐	☐
I plan, prioritise and manage research tasks with strict deadlines	☐	☐	☐	☐	☐
I identify and apply for funding outside of traditional academic grants	☐	☐	☐	☐	☐
I regularly communicate complex technical concepts to non-experts	☐	☐	☐	☐	☐
I work in agile environments	☐	☐	☐	☐	☐

2. The research career relevance of those skills?					
Required to answer. Likert matrix.					
	Not important	Somewhat important	Neutral	Quite important	Critical
IP protection	☐	☐	☐	☐	☐
Translate research into business	☐	☐	☐	☐	☐
Responsibly manage research data	☐	☐	☐	☐	☐
Kick off an own business	☐	☐	☐	☐	☐
Adhere to strict deadlines	☐	☐	☐	☐	☐
Source alternative funding sources	☐	☐	☐	☐	☐
Communicate complex technical concepts to non-experts	☐	☐	☐	☐	☐
Work in agile environments	☐	☐	☐	☐	☐

3. How familiar are you with the following concepts?

Required to answer. Likert matrix.

	I have never heard of this		Neutral		I can teach this
Human-Computer Interaction (HCI) principles and User Experience (UX) design methodologies	☐	☐	☐	☐	☐
Psychophysiological Measurement tools (e.g., Eye-tracking, EEG, Skin Conductance) for assessing human stress or cognitive load	☐	☐	☐	☐	☐
Understanding of Technology acceptance models (TAM) and how to evaluate user trust	☐	☐	☐	☐	☐
Seeking relevant data sources and interpreting analytics outputs for decision making (e.g, finding simple business use cases for ML or managing data)	☐	☐	☐	☐	☐
Digitalisation concepts and simulations	☐	☐	☐	☐	☐
Handling human subject data in compliance with GDPR and ethical standards	☐	☐	☐	☐	☐
Life Cycle Assessment (LCA) - conduct or interpret	☐	☐	☐	☐	☐
Circular Economy principles (reduce, reuse, recycle) applied to research or design	☐	☐	☐	☐	☐

Section 3 — Learning Preferences

4. Which training format do you find most effective for your schedule?

Required to answer. Single choice.

- ☐ Short "Micro-learning" videos (15-30 mins)
- ☐ Half-day online workshops
- ☐ Intensive 2-3 day in-person bootcamps (e.g., concurrent with Pilot events)
- ☐ Self-paced Massive Open Online Courses (MOOCs)
- ☐ Other – please specify

5. If "other", please specify the training format you prefer

Required to answer. Single line text.

Enter your answer

Section 4 — Open questions

6. If you are currently at an early career stage, which skills would benefit you most now? If you are more experienced, which skills would have benefited you most when you were starting your research career?

Optional. Single line text.

Enter your answer

7. What are, or would have been, the three biggest barriers to moving from academia to industry at the start of your research career?

Optional. Single line text.

Enter your answer

Section 5 — Your career

8. At what research career stage are you right now?

Required to answer. Single choice.

- ☐ Research student
- ☐ Up to 3 years after completing my PhD

☐ 3–5 years after completing my PhD

☐ 5–10 years after completing my PhD

☐ More than 10 years after completing my PhD

☐ Other – please specify

9. If "other", please briefly describe your current research career stage.

Optional. Single line text.

Enter your answer

Section 6 — Where are you based?

10. In which country are you currently based or primarily conducting your research?

Optional. Single line text.

Enter your answer

11. Thank you for taking the time to complete this questionnaire. Your responses will help the INSIGHT project shape training and mentoring activities that better reflect researchers' needs and support their professional development and engagement with industry. Feel free to leave any feedback if you wish to do so. For further details, you can find us at: <https://insighthorizon.eu/>

Optional. Single line text.

Enter your answer

10.2 Survey transcription log

Item	HTML source text	Word display text	Reason
Q10	[leading line break] In which country are you currently based or primarily conducting your research? Single line text. [plus separate type label: Single line text.]	In which country are you currently based or primarily conducting your research? [one response-type note: Single line text.]	Removed the leading blank line and the duplicated embedded response-type phrase; respondent meaning is unchanged.

10.3 Survey processing and analysis

The WP4 survey focused more directly on the design of the INSIGHT training and mentoring activities. It collected information on researchers' current skills, perceived development needs and preferred learning formats. These

inputs were used to inform both the thematic scope of the training pathways and the choice of delivery formats, including online, workshop-based and mentoring-based elements.

All Likert-type survey responses were converted to numeric ordinal scales to enable quantitative statistical analysis. Section A, which assessed respondents' current level of each of eight professional skills, used a five-point scale ranging from 0 ("I have never applied this in practice") through 1 ("I have applied this under supervision"), 2 ("I have applied this independently"), and 3 ("I have led projects using this skill") to 4 ("I have trained others in this area"). Section B, which captured how important respondents perceive each skill to be for a research career, was encoded on the same 0–4 numeric range, with anchors of 0 ("Not important"), 1 ("Somewhat important"), 2 ("Neutral"), 3 ("Quite important"), and 4 ("Critical"). Section C, which assessed familiarity with eight specialized concepts from HCI/UX to circular economy, employed a narrower three-point scale: 0 ("I have never heard of this"), 1 ("Neutral"), and 2 ("I can teach this"). This three-point encoding reflects the coarser granularity of the concept familiarity section, which respondents were also more likely to skip.

Of the 103 respondents, 23 (22.3%) had originally selected "Other – please specify" when asked about their career stage. Each of these responses included a free-text description in a separate field. These descriptions were manually reviewed to determine whether respondents could be reassigned to an existing category or whether they represented a genuinely distinct group. The review showed that 15 of the 23 described experienced professionals without a PhD, including MSc-level researchers, industry research managers, corporate trainers, and engineers with substantial applied experience. These 15 were recategorized into the meaningful subgroup "Non-PhD researcher / Industry professional." Two respondents wrote "3-5 years after failing my PhD" and were retained under "PhD not completed." One respondent described a PhD-candidate stage and was reassigned to "Research student," while one senior academic free-text response was aligned with "More than 10 years after completing my PhD." The remaining 4 respondents provided no usable free-text description or gave an ambiguous response and were left as "Other/unspecified."

All correlation analyses employed Spearman's rank correlation coefficient (ρ), a non-parametric measure suited to ordinal Likert-type data that does not assume normally distributed variables or equal psychological distance between scale points. Significance levels are reported using the conventional notation: * for $p < 0.05$, ** for $p < 0.01$, and *** for $p < 0.001$; "ns" denotes non-significant results. Chi-square (χ^2) tests of independence were attempted for Career Stage $\times$ Skill Level contingency tables after binning skill scores into Low (0–1), Medium (2), and High (3–4) categories.

10.4 Detailed WP4 online survey results

10.4.1 Career stage

The normalized career-stage distribution is summarised in Table 27. Research students are now the largest group (38; 36.9%), followed by respondents more than 10 years after their PhD (22; 21.4%), non-PhD researchers or industry professionals (15; 14.6%), and respondents 5–10 years after their PhD (12; 11.7%). The remaining categories contain eight or fewer respondents. The profile is therefore broad but uneven and is especially weighted toward research students.

Table 27. Career stage distribution after normalization

Career stage	Count	%
Research student	38	36.9%

More than 10 years after completing my PhD	22	21.4%
Non-PhD researcher / Industry professional	15	14.6%
5–10 years after completing my PhD	12	11.7%
Up to 3 years after completing my PhD	8	7.8%
Other/unspecified	4	3.9%
PhD not completed	2	1.9%
3–5 years after completing my PhD	2	1.9%

10.4.2 Country

The sample spans 27 country categories. Greece contributes 19 respondents, Austria 14, Germany 9 and “Not specified” 8; the Netherlands contributes 5, while all other categories contain 4 or fewer respondents. Greece and Austria together account for 33 respondents (32.0%). The geographic spread is useful for a needs assessment, but the sparse and uneven country counts do not support country-level inference.

10.4.3 Current skill levels (Section A)

Respondents rated their current proficiency in eight professional skills on a 0–4 ordinal scale. Table 28 reports means and standard deviations for continuity, alongside medians and ranges. Deadline management ranks highest (mean 2.534; median 3), followed by Communication (2.340; median 2) and Agile (2.107; median 2). Data Management has a mean of 1.553 and median of 2.

At the lower end, Business Translation and Funding both have medians of 1, while IP Protection (mean 0.757) and Starting a Business (0.515) both have medians of 0. These distributions identify limited direct experience with commercialisation-adjacent skills. The overall profile therefore still combines relatively strong project-execution skills with much weaker commercialization exposure.

Table 28. Descriptive statistics for current skill levels

Skill	Median [Q1–Q3]	Mean	Standard deviation
Deadlines	3 [2–3]	2.534	0.861
Communication	2 [2–3]	2.340	1.053
Agile	2 [1–3]	2.107	1.066
Data Management	2 [1–2]	1.553	1.152

Business Translation	1 [0–2]	1.379	1.253
Funding	1 [0–2]	1.311	1.291
IP Protection	0 [0–1]	0.757	1.080
Starting a Business	0 [0–0.5]	0.515	0.989

The sample reports more experience with deadline management, communication and agile work than with IP protection or venture creation. This mismatch between strong soft/project-management skills and weak commercialization skills is a central theme that recurs throughout the analysis.

10.4.4 Perceived career relevance - importance ratings (Section B)

The second section asked respondents to rate the importance of the same eight skills for a research career. Table 29 presents the refreshed descriptive statistics; medians and response distributions remain the primary ordinal summaries.

Perceived importance is moderate to high across most items. Deadline management ranks first (mean 3.194), followed closely by Data Management (3.146) and Communication (3.136); all three have a median of 3. Agile, Business Translation, Funding and IP Protection also have medians of 3, although their means are lower.

Starting a Business is the lowest-rated importance item (mean 1.854; median 2), indicating that respondents do not view venture creation as equally relevant to every research career. The pattern supports differentiated learning pathways: broadly applicable project and data skills, with more specialized IP, funding, business-translation and entrepreneurship options.

Table 29. Descriptive statistics for perceived importance ratings

Skill Area	Median [Q1–Q3]	Mean	Standard deviation
Deadlines	3 [3–4]	3.194	0.852
Data Management	3 [3–4]	3.146	0.890
Communication	3 [3–4]	3.136	0.875
Agile	3 [2–3]	2.660	1.116
Business Translation	3 [2–3]	2.621	1.095
Funding	3 [2–3]	2.621	1.030
IP Protection	3 [2–3]	2.330	1.124

Starting a Business	2 [1–3]	1.854	1.167
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10.4.5 Skill level vs. perceived importance - correlation analysis

Spearman correlations were calculated between each skill-level item and its matching importance rating. Table 30 reports ρ , deterministic bootstrap 95% confidence intervals, raw p-values and BH-adjusted q-values for all 103 respondents.

Five of the eight same-skill associations remain statistically significant after BH adjustment. Communication is strongest ($\rho = 0.359$, 95% CI [0.181, 0.536], $q = 0.0016$). Starting a Business ($\rho = 0.282$), Funding (0.277), IP Protection (0.271) and Deadlines (0.238) are also positive with $q < 0.05$.

The adjusted associations are modest and describe alignment within this sample, not causal effects. They indicate that higher self-reported proficiency in a particular skill tends to accompany higher perceived importance for that same skill, especially for communication and selected commercialisation-related items.

Agile ($\rho = 0.194$; $q = 0.066$), Data Management ($\rho = 0.181$; $q = 0.075$) and Business Translation ($\rho = 0.176$; $q = 0.075$) do not meet the adjusted 0.05 threshold. Their positive point estimates should therefore be described as inconclusive rather than as established associations.

Table 30. Spearman correlations: skill level vs. perceived importance

Skill	Spearman ρ (95% CI)	p-value	BH q-value
Communication	+0.359 [+0.181, +0.536]	0.000195	0.001557
Starting a Business	+0.282 [+0.096, +0.452]	0.003853	0.01144
Funding	+0.277 [+0.076, +0.464]	0.004623	0.01144
IP Protection	+0.271 [+0.087, +0.437]	0.00572	0.01144
Deadlines	+0.237 [+0.050, +0.403]	0.015726	0.025161
Agile	+0.194 [-0.020, +0.406]	0.049466	0.065955
Data Management	+0.181 [-0.006, +0.364]	0.067971	0.075361
Biz Translation	+0.176 [-0.025, +0.367]	0.075361	0.075361

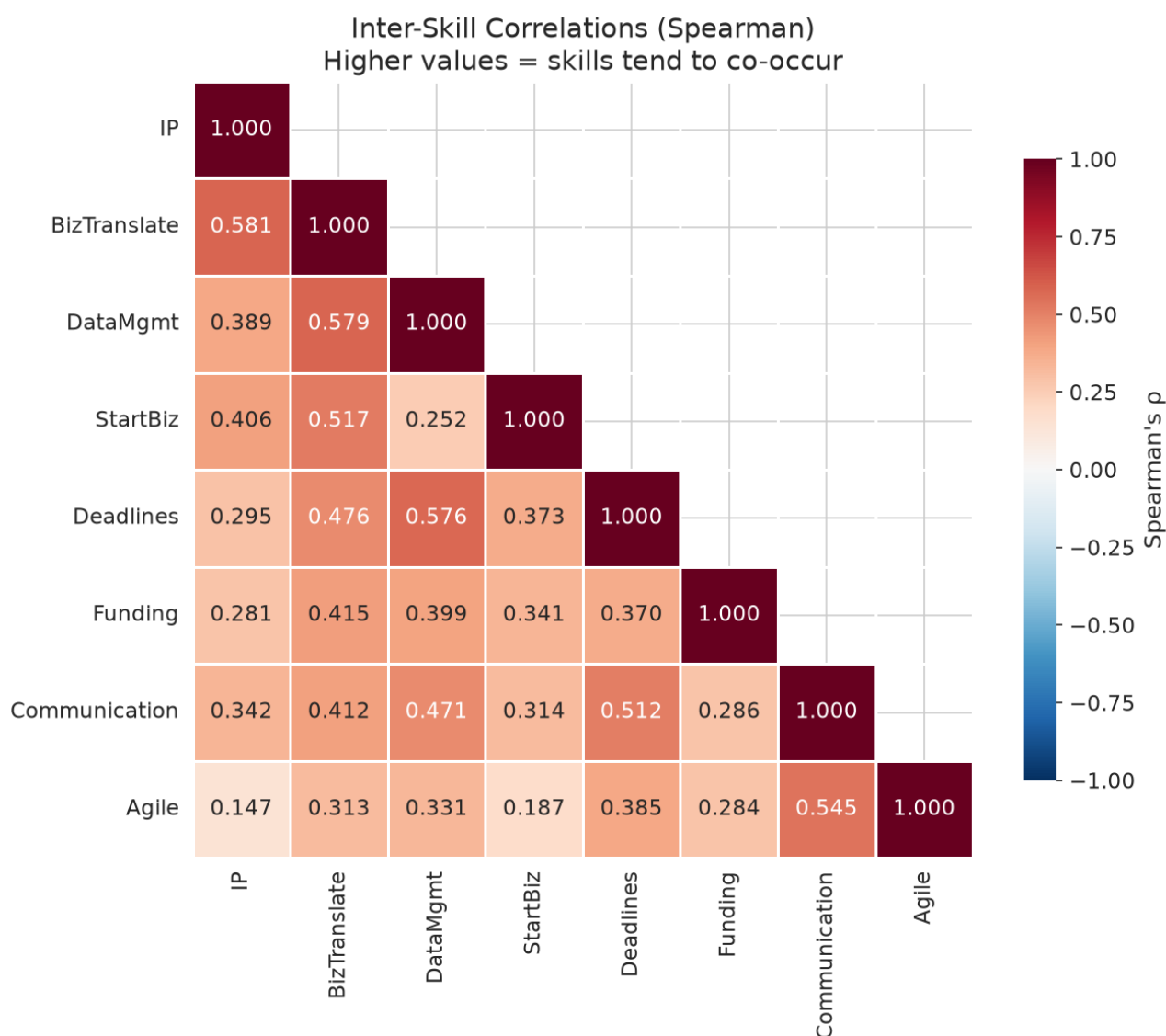
10.4.6 Skill clusters

The inter-skill correlation matrix (Figure 1) shows overlapping rather than fully distinct competency groupings. IP Protection aligns most strongly with Business Translation ($\rho = 0.581$), while Business Translation also aligns with Data Management (0.579) and Starting a Business (0.517). These relationships are consistent with a commercialisation-and-translation grouping, but the matrix does not justify treating it as a fixed latent scale.

Project-execution relationships are also visible. Data Management correlates with Deadlines ($p = 0.576$), Communication with Agile (0.545), and Deadlines with Communication (0.512). Business Translation connects across these groupings through its association with Deadlines (0.476), suggesting that the practical competencies overlap.

The weakest pairing is IP Protection with Agile ($p = 0.147$). This contrast supports offering related competencies in coherent learning blocks while avoiding the assumption that strength in one project or commercialisation skill implies strength in all others.

Figure 1. Inter-skill correlation heatmap



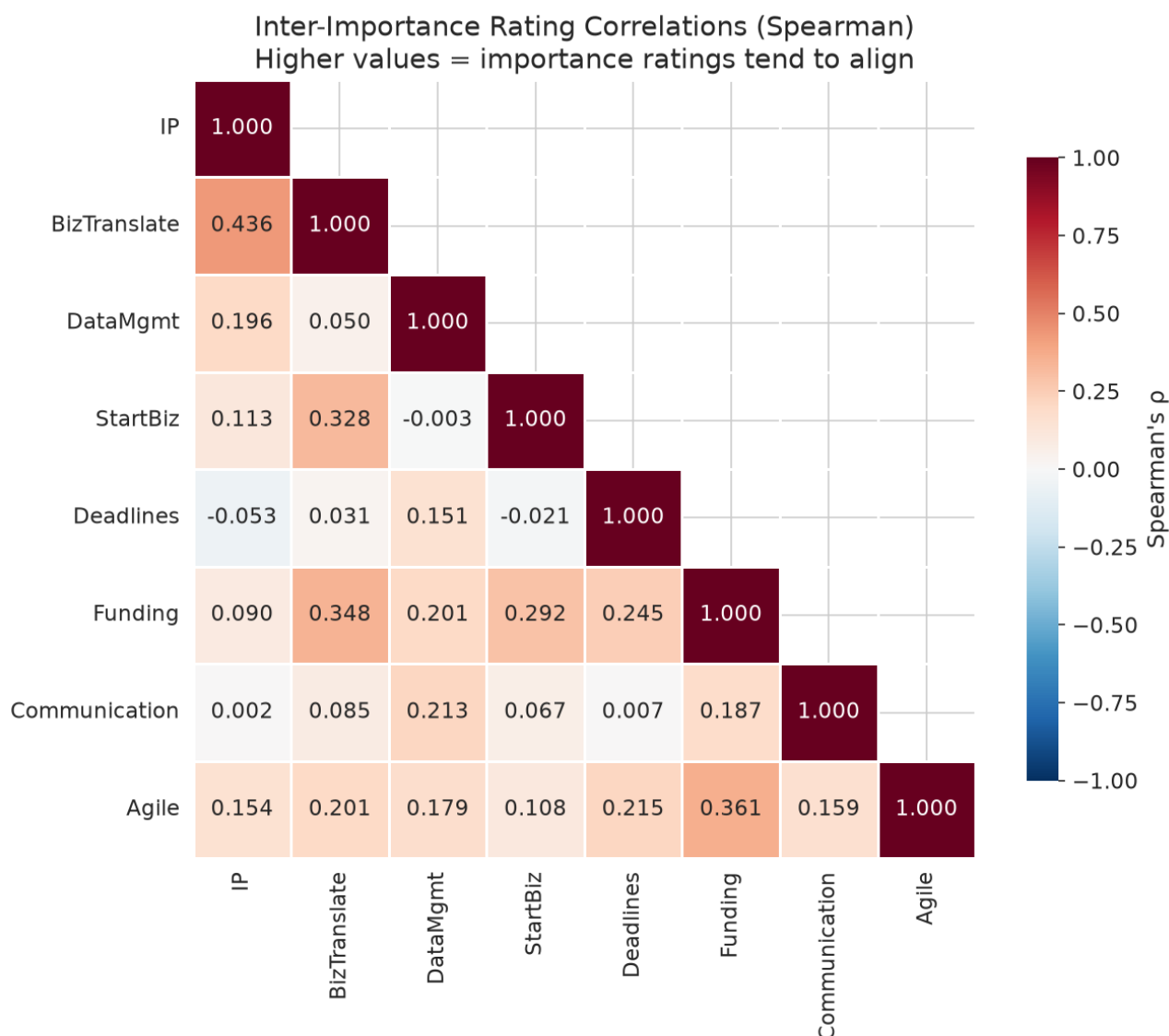
10.4.7 Importance rating alignment

The inter-importance correlation matrix (Figure 2) is less structured than the skill matrix. The strongest pairing is IP Protection with Business Translation ($p = 0.436$), followed by Funding with Agile (0.361), Business Translation with Funding (0.348), and Business Translation with Starting a Business (0.328).

Several importance pairings are near zero, including Communication with IP Protection ($p = 0.002$), Communication with Deadlines (0.007), and Data Management with Starting a Business (-0.003). Respondents

therefore appear to combine priorities in different ways, supporting modular rather than uniform training packages.

Figure 2. Inter-importance correlation heatmap



10.4.8 Concept familiarity (Section C)

The third survey section assessed familiarity with eight specialized concepts on a 0–2 ordinal scale. Valid N varies from 54 to 72 because missing responses were not imputed. Table 31 reports response counts and means; medians and distributions remain the primary basis for interpretation.

Digitalisation has the highest mean familiarity (1.288; $n = 59$), followed by Data Analytics (1.185; $n = 54$) and HCI / UX (1.121; $n = 58$). The modal response for every concept is the middle category. Digitalisation also has the largest 'Can teach' group (20 respondents), although item non-response limits direct comparisons.

TAM has the lowest mean familiarity (0.542; $n = 72$) and a median of 0: 39 respondents (54.2% of valid responses) had never heard of it, 27 selected the middle category and 6 reported that they could teach it. Life Cycle Assessment is the next-lowest item (mean 0.730; $n = 63$), with 21 respondents reporting no prior familiarity.

Concept response rates range from 52.4% to 69.9% of the full sample. The dominance of the middle response may indicate partial familiarity, but the substantial item non-response means the results should not be generalised to all 103 respondents without qualification.

Inter-concept correlations suggest two loose groupings. GDPR and Ethics aligns with Life Cycle Assessment ($\rho = 0.515$), which aligns with Circular Economy (0.504). TAM aligns with Digitalisation (0.497), Life Cycle Assessment (0.466) and Data Analytics (0.462), while HCI / UX aligns with Data Analytics (0.437). These are descriptive pairings based on varying pairwise N, not evidence of fixed constructs.

Table 31. Concept familiarity: response counts and means

Concept	n	Median [Q1–Q3]	Mean	Standard deviation	Never heard	Neutral	Can teach
Digitalisation	59	1 [1–2]	1.288	0.559	3	36	20
Data Analytics	54	1 [1–2]	1.185	0.585	5	34	15
HCI / UX	58	1 [1–1]	1.121	0.498	4	43	11
Circular Economy	62	1 [1–1]	1.016	0.558	9	43	10
GDPR & Ethics	62	1 [1–1]	1.016	0.587	10	41	11
Psychophysiology	62	1 [1–1]	0.919	0.552	12	43	7
Life Cycle Assessment	63	1 [0–1]	0.730	0.574	21	38	4
Tech Acceptance (TAM)	72	0 [0–1]	0.542	0.649	39	27	6

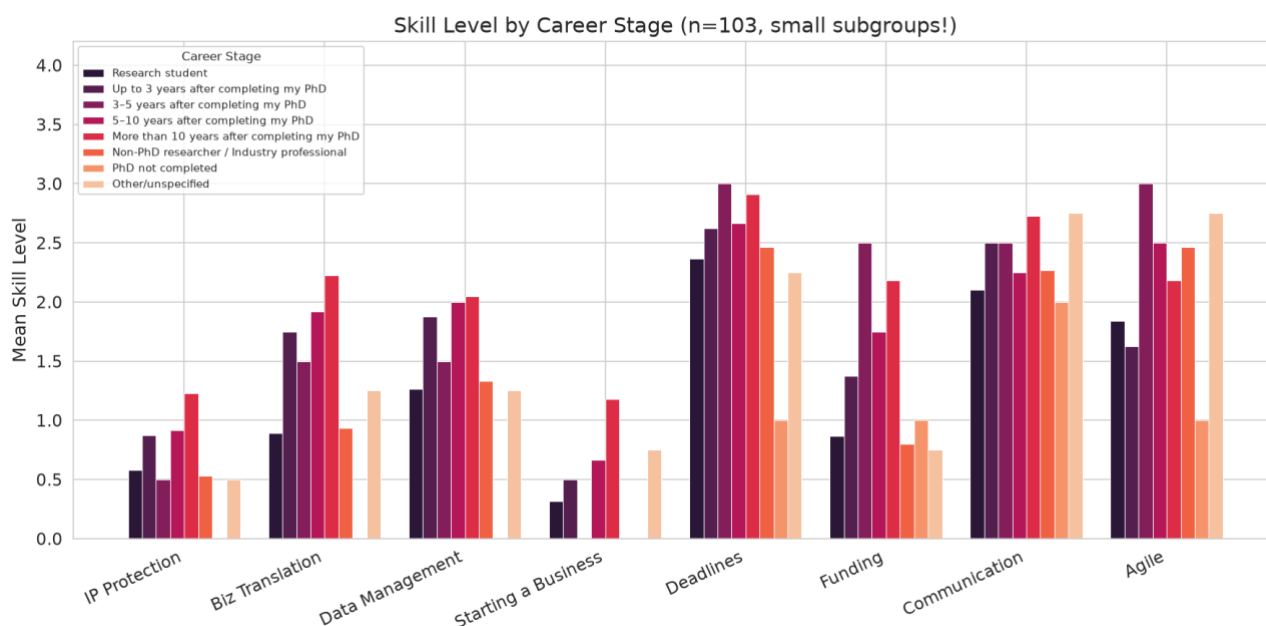
10.4.9 Skill level by career stage

Disaggregating skill levels by career stage (Figure 3) provides descriptive context only. Respondents more than 10 years after their PhD ($n = 22$) report the highest mean IP Protection (1.227), Business Translation (2.227), Data Management (2.045) and Starting a Business (1.182) scores among the larger groups, while their Deadlines mean is 2.909.

The Non-PhD researcher / Industry professional group ($n = 15$) reports means of 2.467 for Deadlines and Agile and 2.267 for Communication, but 0.533 for IP Protection and 0.000 for Starting a Business. Industry-facing status should therefore not be treated as automatic evidence of commercialisation experience.

Research students ($n = 38$) report means of 2.368 for Deadlines, 2.105 for Communication and 1.842 for Agile. Their means are lower for Business Translation (0.895), Funding (0.868), IP Protection (0.579) and Starting a Business (0.316). This group now forms 36.9% of the sample and strongly influences the pooled profile.

The smallest categories remain unsuitable for inference: 3–5 years after PhD and PhD not completed each contain 2 respondents, Other/unspecified contains 4, and Up to 3 years contains 8. All eight career-stage chi-square tables fail expected-cell assumptions, so no significance claims are made from them.

Figure 3. Skill level by career stage

10.4.10 Mean skill vs. mean importance per respondent

At respondent level, the average of the eight skill ratings has only a weak, non-significant association with the average importance rating (Spearman $\rho = 0.139$, $p = 0.161$, $n = 103$). Respondents who report higher proficiency overall therefore do not necessarily rate all professional skills as more important overall.

Together with the five adjusted item-specific associations, this result indicates that skill–importance alignment is item-specific rather than a general respondent-level pattern. Training design should therefore respond to the profile of each skill instead of assuming one overall readiness dimension.

10.4.11 Preferred training formats

Intensive two-to-three-day in-person bootcamps were selected by 32 respondents (31.1%) and short micro-learning videos by 30 (29.1%). Half-day online workshops were selected by 21 respondents (20.4%), self-paced MOOCs by 18 (17.5%), and other formats by 2 (1.9%). The near tie between the leading formats supports a blended offer combining concise preparatory resources with interactive application; it does not show a dominant preference shared by most respondents.

10.4.12 Open-text themes

The 72 nonblank beneficial-skill responses and 70 nonblank barrier responses were coded with a documented multi-label codebook, retaining respondent IDs and original text in an internal audit. Ambiguous and multi-theme answers received a second-pass review. Percentages below use both the relevant nonblank-response denominator and all 103 respondents; because one response can receive several themes, percentages do not sum to 100%.

For beneficial skills, the most frequent themes were Communication (19 of 72 nonblank responses, 26.4%; 18.4% of all 103 respondents), Research methods and domain expertise (18; 25.0%; 17.5% of all respondents), Project and time management (16; 22.2%; 15.5%), and Data, digital and AI (15; 20.8%; 14.6%). For barriers, Cultural and expectation differences led (23 of 70, 32.9%; 22.3% of all respondents), followed by Limited industry experience or exposure (20; 28.6%; 19.4%); IP, commercialisation and business knowledge and Skills or knowledge

mismatch each appeared in 18 responses (25.7%; 17.5%). These coded observations complement, but do not replace, the ordinal results.

10.4.13 Key takeaways

The analysis yields five principal findings relevant to the design of INSIGHT training and mentoring activities.

First, IP Protection and Starting a Business are the clearest practical-experience gaps. IP Protection has a mean skill level of 0.757 against mean importance of 2.330 and a positive adjusted skill–importance association ($p = 0.271$; $q = 0.011$). Starting a Business has a mean skill level of 0.515 and mean importance of 1.854, indicating a narrower but still relevant optional pathway.

Second, Deadline management (mean 2.534; median 3) and Communication (mean 2.340; median 2) are the strongest self-reported skills. They can provide familiar contexts for applied learning, while the survey does not establish that further development in these areas is unnecessary.

Third, training-format preferences are distributed across in-person bootcamps (31.1%), micro-learning videos (29.1%), half-day online workshops (20.4%) and self-paced MOOCs (17.5%). This pattern supports a blended offer that combines short accessible resources with intensive opportunities for collaboration and practice.

Fourth, TAM is the least familiar concept in the valid responses (mean 0.542; median 0). Of 72 respondents who answered the item, 39 (54.2%) had never heard of it. This supports introductory TAM content while requiring explicit acknowledgement of item non-response and sample composition.

Fifth, the open-text responses broaden the training rationale. Communication, research methods and project/time management were the most frequent beneficial-skill themes, while cultural and expectation differences, limited industry exposure, and business or skills mismatches were the most frequent barriers.

10.4.14 Online survey limitations

Several methodological limitations should be kept in mind when interpreting these results.

The 103-response sample is a project-relevant convenience sample, not a representative estimate of European researchers. It provides useful descriptive evidence about the respondents who took part, but does not support generalisation across all institutions, disciplines or national contexts. The five BH-significant skill–importance associations (Communication, Starting a Business, Funding, IP Protection, Deadlines) are genuine effects for this sample; the three non-significant findings (Agile, Data Management, Business Translation) are inconclusive rather than absent.

Career-stage subgroups are uneven. Research students account for 38 respondents, while the 3–5-year post-PhD and PhD-not-completed groups contain only 2 each, Other/unspecified contains 4, and Up to 3 years contains 8. All career-stage comparisons therefore remain descriptive. Concept-familiarity valid N ranges from 54 to 72, equivalent to 52.4%–69.9% of the full sample. Missing values were not imputed. If non-responders tended to be less familiar with the concepts, which is plausible, then the reported means overestimate the true population familiarity. This potential upward bias should be considered when interpreting the concept familiarity results, particularly for TAM and Psychophysiology, which already show the lowest familiarity levels among those who did respond.

All skill and familiarity data are self-reported ordinal judgments rather than externally validated competence assessments. The retained means aid comparison with the earlier report, but medians, interquartile ranges and

response distributions are the primary summaries. Qualitative theme frequencies indicate recurring coded observations; because coding is multi-label, totals can exceed 100% and do not estimate population prevalence.

Geographical representativeness is limited. Greece and Austria together contribute 33 respondents (32.0%), 8 country entries remain not specified, and most of the 27 country categories are sparse. The baseline wave of 70 and added wave of 33 also differ substantially in career-stage composition. Wave differences are therefore recruitment/composition sensitivity findings, not longitudinal change or population trends.

11 Appendix B: Detailed needs analysis evidence

The WP3 survey focused on skills considered important for doctoral students and postdoctoral researchers pursuing careers within or outside academia. Respondents assessed competencies related to business, innovation and intellectual property, professional networking, career navigation, project delivery, user and organisational needs, interdisciplinary collaboration, communication with non-scientific audiences, and translation of research results into practical applications, services or products.

Semi-structured interviews were used to complement the survey data. They allowed participants to explain which skills and support measures were most relevant in their own context, especially in relation to academic-industry mobility, collaboration with external stakeholders, and preparation for career pathways beyond academia.

The event-based inputs were used to test similar questions in different professional settings. These included project-related consultations, the EuroSPI conference consultation in Riga, which captured early-stage researcher, scientific expert and industry expert perspectives, and the Executive MBA Advanced Digital Technologies kick-off at TU Graz, which provided an industry-oriented view from technically experienced professionals in the semiconductor sector. These sources strengthened the practical and industry-facing dimension of the needs analysis. The surveys provided broader structured evidence, while the interviews allowed more detailed reflection on individual career development, learning preferences and collaboration barriers.

The collected inputs were analysed thematically. Recurrent needs were grouped into competency areas and compared with the structure of ResearchComp and the objectives of WP4. This made it possible to distinguish between needs that should be addressed directly through INSIGHT training pathways and needs that should be acknowledged but left outside the scope of D4.1. The results informed the learner profile, competency baseline, desired competency areas, gap matrix and final scope decision presented in the following sections.

11.1 EuroSPI conference consultation, Riga, Latvia

The EuroSPI conference consultation was held in Riga, Latvia, on 16 September 2025. The consultation collected structured input from one early-stage researcher, two scientific experts and four industry experts. The questions focused on why industry needs early-stage researchers, which skills they bring or lack, what research and career pathways are available to them, what forms of recognition or support would be useful, and what an ideal early-stage researcher looks like from the perspective of academic and industrial stakeholders.

The early-stage researcher response showed a strong interest in practical frameworks and applied research pathways. The respondent associated their own strengths with communication, critical thinking, problem-solving and presentation skills, while identifying limited knowledge of the latest technologies in industrial use as a gap. The desired pathway combined academic achievement, such as completing a PhD, with industry-relevant recognition, such as CISSP and domain-specific certificates. This suggests that early-stage researchers may value both formal academic progression and recognised professional credentials.

The scientific expert responses placed early-stage researchers in a context of shorter innovation cycles and rising costs of fundamental research. Participants argued that industry increasingly needs researchers who can work

closer to higher-TRL environments, understand complex systems, ask the right questions and transfer knowledge between industry and teaching. At the same time, they identified gaps in industry-relevant tools and methods, model-based systems engineering, complex system thinking and specialised technical knowledge. The ideal early-stage researcher was described as analytical, able to cope with complex and diverse environments, technically credible, willing to challenge the current state, and able to communicate across different professional and generational groups.

The industry expert responses were more direct about practical constraints. Industry participants pointed to the need for specific domain standards, company-specific knowledge, customer needs, time-pressure skills, practical expertise, social competences and teamwork. At the same time, they valued special technical knowledge, curiosity, communication, creativity, flexibility, integrity and output orientation. Several responses suggested that early-stage researchers are attractive to industry when they bring expertise in a needed topic and fresh research knowledge, but that they must still learn to operate within company-specific systems, standards and customer-driven environments.

11.2 UNITE online workshop

The UNITE online consultation was organised on 12 March 2026 as an interactive discussion workshop on training the next generation of researchers and bridging the gap between academia and industry. The discussion involved experienced academic participants with direct experience of doctoral training, industrial PhD arrangements, university-industry collaboration and supervision of researchers working on applied problems.

The consultation showed that industry-facing doctoral training creates specific tensions that are not present, or are less visible, in conventional academic training. Participants noted that industrial PhD students often operate between two sets of expectations: universities require formal research outputs, publications and compliance with doctoral regulations, while companies usually expect practical deliverables, problem-solving and shorter-term outputs. This creates a situation in which the researcher must understand and navigate both academic and industrial logics.

A second finding was the difference in language and success criteria between academia and industry. Academic work was described as oriented toward methods, data, publications and formal scientific contribution, while industry is more directly concerned with problems, solutions and applicability. This difference affects how researchers communicate their work, how they define value, and how they position research results in front of non-academic stakeholders.

Participants also pointed to practical skills, cooperation, exploitation of research results and interdisciplinary collaboration as areas where researchers often need additional preparation. The discussion highlighted that researchers working with industry need more than technical expertise. They need to cooperate with different actors, understand industrial constraints, communicate across disciplinary and organisational boundaries, and recognise how research may be translated into products, services, processes or other forms of applied value.

The workshop also provided useful input on training formats. Online workshops were seen as useful for reaching a wider group of participants, but bootcamp-style formats were considered more effective when the purpose is to make participants work together and produce concrete outputs. The final recommendation from the discussion was closely aligned with this view: if one module could be added to doctoral training, it should focus on multicultural and multidisciplinary communication and cooperation, preferably through project-based or bootcamp-style activities.

11.3 Executive MBA advanced digital technologies kick-off, TU Graz

The Executive MBA Advanced Digital Technologies kick-off was held online on 26 April 2026 at TU Graz. The session involved 29 participants, predominantly industrial professionals with technical backgrounds working in or around the semiconductor sector. The broader Executive MBA course has a strong orientation toward digital technologies and green sustainability in semiconductor-related industrial contexts. For the INSIGHT needs analysis, the session was used to collect Slido-based input on skills gaps, individual strengths, ideal co-worker traits, long-term success factors and preferred training formats.

When asked which additional skills participants lacked for better industry positioning, the responses clustered around change management, strategic thinking, business understanding, leadership, transformation capability, the connection between business and technology, data evaluation and processing, systems engineering, AI and agentic AI, advanced digital technologies, and trustworthy or human-centred digitalisation. This is important for D4.1 because it shows that technically experienced industrial participants do not frame future readiness only as a technical issue. They also emphasise business translation, leadership, systems integration and the ability to manage organisational change.

The responses on existing strengths show a complementary pattern. Participants identified curiosity, critical thinking, problem-solving, empathy, customer-centricity, communication, openness, common sense, rational systems thinking, bridge-building and the combination of technical and people skills. These strengths are highly relevant to the academia-industry interface because they point to hybrid profiles: people who can understand technology, communicate with others, keep the bigger picture in focus and connect different organisational or disciplinary perspectives.

The ideal co-worker responses reinforced the same theme. Participants valued reliability, self-sufficiency, responsibility, commitment, curiosity, communication, complementarity, willingness to challenge ideas, different perspectives and constructive opposition. Several responses referred to the importance of someone who asks the right questions, questions their own knowledge and can manage operational work. This confirms the importance of collaboration skills, psychological safety, constructive disagreement and responsibility in applied technology environments.

The long-term success factors identified by the group included cash flow, cost control, quality work, innovation, adaptability, diversity of thought, internationality, strategic independence, speed, creativity, grit, resilience, diversification and lifelong learning. Preferred training formats were strongly practice-oriented: case studies, real-life experiences, examples and applications, interactive formats, hands-on problem-solving, problem-based learning, presence-based interaction and mixed formats combining reading, short videos and reflection.

11.4 Southeast Europe AI Summit workshop, Novi Sad, Serbia

The Southeast Europe AI Summit consultation was held in Novi Sad on 28–29 May 2026. For the needs analysis, the relevant input came from Slido responses collected during the event. The questions focused on barriers to earlier cooperation between researchers and companies, skills that could improve academia-industry collaboration, and measures that could help translate research into commercial, societal or operational value.

The responses pointed to a cooperation gap that is not only technical. Participants identified several barriers that prevent researchers and companies from working together earlier, including weak links between the two sides, lack of incentives, limited trust, different ways of thinking, unclear knowledge of each other's capacities and interests, and mismatched timelines. Several answers referred directly to pace and timing, suggesting that academia and industry often operate according to different planning cycles and expectations.

When asked which skill would most improve academia-industry collaboration, respondents mainly referred to communication, networking, project management and the ability to present research to companies. This

indicates that researchers may need support not only in conducting research, but also in making their work understandable, relevant and accessible to external partners.

The responses on translating research into value also pointed toward practical orientation. Participants mentioned the need for concrete use cases, numbers, stronger spin-off support, funding, incentives, marketing and sales skills, and better alignment between research topics and real-world industry needs. These inputs suggest that research results are more likely to be taken up when they are connected to clearly defined problems, supported by appropriate mechanisms, and communicated in terms that external stakeholders can act on.

11.5 ISPIM doctoral session, Granada

The ISPIM doctoral session was held in Granada on 7 June 2026 and focused on the skills, barriers and support mechanisms relevant to researchers working with industry and creating real-world impact. The discussion brought together doctoral students, recent PhD graduates and experienced researchers, allowing the needs analysis to capture both early-career and supervisory perspectives.

The discussion identified communication as one of the most urgent skill gaps. Participants repeatedly referred to the need for researchers to adapt their language, communicate across disciplinary and organisational boundaries, and explain research in a way that is understandable outside an academic setting. Knowledge transformation was also raised as a key skill, meaning the ability to move from research knowledge to forms of value that can be used by industry or society.

The session also highlighted several structural barriers to academia-industry cooperation. Participants referred to different goals, administrative boundaries, mismatched expectations and the tension between publications and commercial orientation. In the final vote, the biggest barriers were framed as goal misalignment, “application vs theorising” and “product vs paper”. This confirms that the gap is not only about missing skills, but also about researchers having to operate across systems with different definitions of success.

The support mechanisms identified by participants were also relevant for WP4. Networks, intermediaries, incentives, mediators and project managers were mentioned as ways to support collaboration. The idea of an intermediary or translation function is particularly important, as it points to the need for researchers to understand both academic and industrial expectations and to communicate between them.

11.6 ISPIM World Café session, Granada, Spain

The ISPIM World Café session was held in Granada on 8 June 2026 and focused on whether there is a need for R&D leaders and whether PhD graduates entering industry can be prepared for leadership-oriented roles. The discussion explored the transition from academia to industry, the role of PhD training in preparing researchers for applied work, and the conditions under which researchers can become effective in R&D environments.

A central finding was that PhD graduates entering industry are often technically strong but not necessarily prepared for the organisational and leadership aspects of R&D work. Participants noted that researchers may have deep expertise in their own topic, but also need broader awareness of alternatives, competing technologies, user contexts and market-oriented decision-making. This was described as a need for “T-shaped” people: researchers with depth in their own field, but enough breadth to understand related domains and collaborate beyond their specialism.

The discussion also showed that universities and industry often prepare researchers for different types of work. Universities train researchers to conduct research, but not necessarily to lead teams, make decisions under uncertainty, or operate in industrial decision contexts. Participants noted that leadership skills, decision-making, communication and exposure to real industry settings are difficult to develop through university-based training

alone. Collaborative PhDs, industry-based use cases, short industry exposure and stronger mentor preparation were all suggested as possible responses.

Another important point was the concern that industry does not always value PhD graduates if they are perceived as too theoretical or insufficiently prepared for practical work. One participant summarised this tension by stating that “research for factories must come ahead of research for libraries.” This does not reject academic research, but it points to the need for researchers to understand application contexts, organisational needs and practical routes to implementation.

11.7 WP3 survey input: researcher skills for career success

The WP3 organisational gap analysis included a survey section asking respondents to rate the importance of predefined researcher skills for pursuing a successful career within or outside academia. Although the main purpose of D3.1 was the organisational gap analysis linked to the European Charter for Researchers, this final survey section provides relevant input for WP4 because it captures how different institutional actors understand the competence profile needed by researchers. The analytical sample for the full survey consisted of 173 valid responses from 17 European countries, with respondents mainly coming from universities, higher education institutions and public or private research institutions.

The researcher skills section was answered by 113 respondents. Across all items, respondents assigned high importance to a broad set of researcher competencies. The highest ratings were given to high-quality, ethical and rigorous research, including disciplinary and interdisciplinary work and responsible AI use, with 91.9% rating it as highly important. Critical, analytical, strategic and creative thinking was rated almost as highly, with 91.2% of respondents placing it in the high-importance category.

The results also showed strong support for skills that go beyond narrow disciplinary expertise. Collaboration, networking and communication in diverse research environments were rated as highly important by 88.5% of respondents. Planning, organising and managing research activities and resources was rated highly important by 87.6%. Dissemination, translation into impact and engagement with non-academic audiences and innovation ecosystems was rated highly important by 86.8%. Self-management, resilience, initiative, adaptability and entrepreneurial mindset were rated highly important by 86.7%. Digital and data-related skills, including research data, digital tools, software, IP and open science or open-source practices, were also considered highly important by 83.2% of respondents.

The WP3 results therefore point to a broad understanding of researcher competence. Respondents did not limit career success to scientific expertise alone. Instead, they associated successful research careers with a combination of rigorous research practice, analytical thinking, project and resource management, collaboration, communication, impact orientation, personal adaptability, digital competence and IP-related awareness. The analysis of role differences also indicated broad agreement across respondent groups, with no strong or systematic differences between roles in how they assessed the importance of these skills.

At the same time, this source should be interpreted carefully for D4.1. The WP3 survey measured perceived importance of skills, not actual competence levels or training gaps. It therefore does not show, on its own, whether researchers currently possess these skills.

11.8 WP2 academia–industry collaboration workshop, online

The WP2 academia–industry collaboration workshop was held online on 16 July 2026 and brought together 60 participants from across the research and innovation ecosystem. The largest groups represented universities, research organisations and the early-stage researcher and PhD community, while SMEs and industry, business-support and innovation organisations, public authorities, research-support structures and project partners were

also represented in a smaller number. The workshop examined barriers to cooperation between academia and industry, the visibility of non-academic careers and practical formats for supporting more sustainable research careers.

A central finding was that early-stage researchers often have limited awareness of career opportunities outside universities and research organisations. Participants suggested that the problem is not necessarily the absence of alternative pathways, but insufficient information, guidance and support in recognising how research competencies can be transferred to other professional settings. The discussion also highlighted differences between academic and industrial expectations. Academic environments may prioritise publications, theoretical quality and long-term investigation, while companies tend to place greater emphasis on implementation, timely delivery and customer or market needs.

Participants therefore emphasised the need for greater practical exposure to non-academic working environments. Proposed formats included company visits, job shadowing, internships and placements, industry case studies, guest lectures and short-term research residencies in companies or public organisations. Structured mentoring and career guidance were also considered important, particularly for researchers who need support in understanding different career options, navigating institutional and industrial expectations and maintaining motivation when academic opportunities are limited or uncertain.

Networking was viewed as useful when it leads to concrete follow-up rather than remaining an isolated exchange of contacts. Participants proposed career talks, matchmaking, thematic workshops, informal networking communities and support for developing joint projects, consultancy activities, training or applied research challenges. The discussion also presented academia–industry cooperation as a two-way process. Companies were expected not only to recruit or host researchers, but also to contribute to education, curriculum development, research questions and longer-term collaborative projects.

For WP4, the workshop supports the inclusion of structured mentoring, cross-sectoral career guidance, practical exposure and industry-facing communication within the training and career-support offer. It also reinforces the need to prepare researchers for differences in working cultures, output expectations and definitions of value across academic and applied environments. As academic and research participants were more strongly represented than industry and HR actors, the findings should be treated as exploratory stakeholder input and further examined through the planned sectoral workshops.

11.9 Semi-structured interviews

The semi-structured interviews were used to complement the survey and workshop data by allowing more detailed reflection on individual career development, industry-facing research, collaboration barriers and preferred forms of support. In addition to addressing the questionnaire topics, some interviews began with open discussion, allowing experienced researchers and cross-sector experts to reflect more freely on what helps researchers succeed and what they would have benefited from earlier in their own careers.

A recurring message was that early-stage researchers need more than technical competence. Interviewees emphasised the importance of strategic thinking, the ability to prioritise, and the confidence to say no when necessary. One reflection was that high-quality work depends on having enough time and mental space for creativity, rather than working continuously under stress. This is relevant for doctoral and postdoctoral training because researchers are often encouraged to be productive, but receive less preparation for managing overload, protecting deep work and making strategic choices about where to invest their effort.

The interviews also reinforced the importance of meaningful contribution and leadership. The ideal researcher or employee was not described simply as someone who manages tasks, but as someone who is respected across

areas, can provide impactful contributions, and can work in ways that make the value of their work visible. This points to a distinction between managerial execution and leadership-oriented research practice: researchers need to understand how their work contributes to broader organisational, technological or societal goals.

Several interview insights focused on the practical difficulty of transferring research capability into industrial environments. Interviewees noted that companies may expect doctoral graduates to already understand specific tools, workflows, standards, customers and applied environments, while overlooking the broader capacities developed through doctoral work, such as independent learning, complex problem analysis, structuring uncertainty and creating new knowledge. At the same time, researchers may struggle to interpret their own value in financial or business terms, to understand what their work is worth, or to communicate how their expertise contributes to organisational performance.

The interviews also highlighted the importance of networks, timing and exposure. Successful research careers were described as shaped not only by individual ability, but also by being present in relevant environments, cooperating with capable people, recognising emerging topics and responding to gaps in one's own knowledge. This suggests that career support should help researchers build networks, identify relevant communities, understand where their expertise is needed, and position themselves in relation to emerging industrial and research trends.

The questionnaire-based part of the interviews confirmed several findings from the wider needs analysis. Communication, interdisciplinary work, teamwork, time and resource management, data-related competence, digitalisation and the ability to work in agile environments were generally seen as important. However, the interviews also showed that concepts such as technology acceptance, social impact, business translation, funding strategy, IP, entrepreneurship and human-centred digitalisation may be interpreted differently depending on career path and sector. This supports the need to explain such concepts through practical examples rather than assuming that all researchers understand them in the same way.

The interviews also provided useful input on learning formats. Interviewees did not identify one universally preferred format. Instead, they stressed that the format should depend on the audience, topic and purpose. Micro-learning can be useful for establishing a baseline or filling specific knowledge gaps, while workshops and smaller-group formats are more effective when participants need to apply concepts to their own work. Several comments pointed to the importance of relevance to daily work: training is more likely to be taken seriously when participants can connect it directly to practical questions, project situations, regulatory requirements, stakeholder expectations or career decisions.

Mentoring was also seen as valuable, particularly for understanding career options outside academia, expanding professional networks, receiving feedback on ideas, and developing professional habits and attitudes. The interviews suggest that mentoring should not be limited to technical advice. It should also support reflection on work habits, career positioning, collaboration style, personal confidence and the transition between academic and industrial environments.