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# ADVANCED DIGITAL SKILLS: MEETING THE EDUCATION AND TRAINING CHALLENGES

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**TRINITY COLLEGE DUBLIN, THE UNIVERSITY OF DUBLIN, IRELAND**

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## 1. TARGET AUDIENCE

This is a public deliverable and openly accessible by any interested party. The report will be of interest to numerous stakeholders, including policy makers, providers of both Higher Education (HE) and Vocational Education and Training (VET) and industry, i.e., companies. The report outlines potential education and training solutions to address Europe's critical need to increase talent in the areas of Advanced Digital Skills (ADS).

The report documents the outputs from an expert panel representing educators, industry, and students. It was convened, in person, at Trinity Business School in Trinity College Dublin on 1st December 2023. The panel event focused on how education and training can help to meet the needs for ADS which have been identified in previous reports. Particular emphasis was placed on drawing out examples of existing best practice and identifying specific potential solutions to create diverse talent pools and address the ADS gap.

The report assumes broad familiarity with the context of education and training in Europe as well as demands for ADS and gaps in supply of education and training as outlined in previous deliverables from this project. This document will be read by the Project Consortium and will provide recommendations for the LEADS project, the European Commission, and country members, including policy makers and local governing bodies with responsibilities in education, educational and training institutions and leaders and members of the technology industry community.



## 2. TOPIC INTRODUCTION AND MOTIVATION

The Leading European Advanced Digital Skills (LEADS) project aims to provide insights into the ever-evolving demands of Advanced Digital Skills (ADS) within a dynamic technological development context. The project also aims to provide insights, in the context of digital transformation, on how to best equip skill suppliers (education and training providers) with the knowledge, guidance, and best practices to shape the future of European ADS talent. The goal of Work Package 3 *Ecosystem Formation* within the LEADS project, is to develop a series of practical guidelines to address the current and future supply of ADS while tackling the challenges to achieve the optimum solutions.

Building on the previous findings, the consortium has pinpointed significant challenges in the realm of education and training. These challenges revolve around the task of equipping individuals with advanced digital skills, essential for their successful integration into the labour market. Some of these challenges encompass the need to develop curricula that remain adaptable in the face of rapid technological evolution. Additionally, there's a demand for embedding real-world, problem-solving abilities into the curriculum to better prepare students for the challenges they will inevitably encounter once they transition into the workforce.

Meeting these challenges requires innovative pedagogies and learning methodologies to provide learners with an experience that combines theoretical knowledge and practical skills training. Valuable insights have been obtained from previous workshops, where discussions with industry stakeholders have identified the need for the integration of soft skills into curricula. For example, students will need to apply communication, relationship management, critical thinking, and collaborative skills to fully integrate into the world of work. Therefore, bridging this divide between theory and the practical skill sets required in the workforce, is a key interest to the project team. In order to obtain insights into how this could be achieved, Trinity College Dublin conducted an expert panel to discuss best practices and obtain solutions to address the challenge outlined above.

This report presents the results of this expert panel discussion focused on identifying solutions to meet the challenges of designing curricula for such a rapidly evolving area of ADS. The expert panel was hosted by Prof. Laurent Muzellec, Dean of Trinity Business School, Trinity College Dublin on 1st December 2023 with a select group from academia and industry. The primary objective was to direct the expert panel's attentions to the provision of solutions to meet the scale of the education and training gaps identified. The expert panel event was titled "**Advanced Digital Skills: Meeting the Education and Training Challenges**" and included high-level individual experts who were invited to share their insights and experiences. The main objectives of the workshop were to address the following questions:

- How can educators utilise innovative pedagogies and learning methodologies to deliver core advanced digital skills and promote creativity, problem-solving, and experimentation to prepare students for the dynamic ADS landscape?
- How can collaboration with industry enhance ADS education and training?
- What lessons can be learned from those education and training providers actively delivering advanced digital skills?

### 3. EXPERT PANEL FORMAT

The panel, comprising six invited experts, was asked to contribute to an in-person discussion in Trinity College Dublin, on December 1st, 2023. One expert was unable to participate in the panel discussion on the day however, the panel moderator, Prof. Julie Byrne subsequently held a one-to-one interview on December 18<sup>th</sup> to obtain her views and these are incorporated into this report.

The small number of participants was intentional, as it was anticipated that a focused group of high-level selected experts could engage with potential solutions in a deep way. This assertion proved to be correct, as the discussion although wide-ranging, produced in-depth reflections and insights based on specific examples shared by the participants.

The panel consisted of industry representatives, industry technical skills providers, and academics closely involved in the topic area. The voice of the student was also heard in this session as a student representative was invited to participate in the discussion and input their views and experiences. The invited participants were each chosen for their respective expertise and their knowledge of the topic from different aspects (see Appendix 1 for further details about the panellists).

Prior events where the LEADS team has engaged with both industry and academia, has shown a keen understanding of the challenges and barriers in meeting needs for ADS, but fewer suggestions of potential remedies. This situation reflects the intricate nature of the challenge, underscoring the necessity for comprehensive, integrated solutions. The expert panel was particularly helpful in sharing information and facilitating a deep dive on some topics, as the format encouraged speakers to share best practices and sufficient time was then allocated to focus on the identification of solutions. This session was therefore designed to achieve actionable recommendations to address the education and training challenges associated with meeting Europe's needs for ADS.

The panel event was conducted through a conversation/debate style to encourage the experts to share valuable inputs and allow further exploration of comments. Moreover, as previous workshops and deliverables have all highlighted the different challenges, the moderator (Prof. Julie Byrne, Trinity College Dublin) focused the participants on the identification of solutions to the previously identified challenges. The event concluded with a review of the key factors for success (Brendan Rowan, BluSpecs). The agenda for the event can be found in Appendix 2.

## 4. CHALLENGES, DISCUSSION AND BEST PRACTICES

The participants identified a number of challenges facing educators and industry. The wide ranging discussion revealed a number of best practices for consideration. Importantly, many of the suggestions highlighted the ongoing collaboration of key stakeholders to make change happen. In the following sections the challenges and examples of best practices are outlined from the different participant perspectives, that is, industry, educators, and students.

### 4.1. Industry Perspective

#### Challenges and Best Practices

The discussion on the challenges for industry centred on the need to have availability of talented employees, at all stages of their careers, with sufficient ADS to address commercial challenges. Inflows of new graduates with ADS at the beginning of their careers are just one part addressing this challenge. Due to the scale of the skills shortage and the rapid pace of technological change, industry participants also discussed the need to upskill and/or reskill existing employees at advanced stages in their careers. It was noted that employees' capacity to engage with education and training can vary significantly over the career course and that for lifelong learning to work, it must be available in a manner that works for the learner. While a 4 year full-time, in-person undergraduate degree might fulfil a wide range of needs and motivations at the beginning of a career, those at mid-career or late-career stage are more likely to seek shorter courses and may favour an online or blended delivery. From an industry perspective, shorter courses (e.g., 6 -12 weeks) with applied learning activities are a desirable way to facilitate ADS upskilling and reskilling.

The perceived importance of providing credentials with these short courses e.g. micro-credentials was discussed. There was a view that credentials are not always considered to be important from an employer perspective, however as they offer career value for an employee and facilitate mobility, the employee may place a higher value on such credentials and therefore the option for acquiring credentials was important. This discussion also highlighted the importance of recognising employees' prior learning so that they could gain access to higher level studies or that they could gain exemptions to facilitate a quicker study route.

The key role of industry in providing students with access to real world ADS environments was discussed as it is an essential means of supporting to students to develop skill application which is at the heart of ADSs. Access to real world environment spans the provision of work experiences, placements, and internships to access to technologies themselves where students can use safe 'Sandbox' or 'digital playgrounds' to test, experiment and develop skills.

Other discussions focused on the importance of 'soft skills' in the ADS curriculum. These include social skills, specifically the ability to communicate effectively and to collaborate as part of a team as well as problem solving skills and entrepreneurship.

There were a number of examples of best practice to encourage a more effective mechanism for transitioning students into the workforce and blending the theory from universities with applied skills that would expedite the learning process. The following were specific suggestions put forward by industry panel participants that focus on the part that industry can play in creating environments to support ADS.

- **The application of the German model of apprenticeship:** This focuses on the development of students through structured internships. SAP currently has a big demand for large language computing talent, and they are also supporting global markets. Approximately 120 interns are employed per year in Ireland, focused on BIS and computer engineering. Unlike other companies who have access courses with short internships, SAP engages with students in their third year and the company maintains a deep relationship with the students as they progress through their studies. Using this model, they take students in year 2 and apprentice them as third-level apprentices.
- **Creating meaningful work for interns:** The importance of working on practical problems was highlighted during the discussion about the German model. In SAP, interns are treated as employees and are assigned 'important' work for which they are paid a reasonable wage. This was particularly relevant, as the student representative on our panel had expressed the financial hardship experienced by students. Further benefits accrue from the internships, in that students mature more quickly and are industry ready. They bring back expertise to college and it was suggested that this route can be associated with an increase in performance and grades e.g. between 15% and 30%. The students are paid and then supported when back in university. 90% of these apprentices will take a contract after graduation and 75% of them will remain with the company five years later.
- **Soft skills development:** Providing feedback for interns on soft skills is necessary to ensure development in communication, self-presentation, collaboration, and problem solving and to underline the integral role these skills have in performance.
- **In company fast-track conversion courses:** The existence of industry created short courses to help non-STEM graduates transition into the digital talent pool was highlighted. In addition, examples were also provided of those employees who had left employment, for example due to maternity leave and were re-entering the work force and could obtain re-training to acquire digital skills.

## 4.2. Educators

Two general themes emerged from the discussions regarding the challenges facing HE. The first theme relates to the pace of change in ADS. The impact of this pace on education processes such as curriculum development and accreditation was discussed. The high-level takeaway from the panel discussion was the need for HE providers to adopt business like and dynamic mindsets supported by agile systems. This was seen to be necessary if HE providers are to grasp the ADS opportunity and build a business case for funding and industry involvement. The need for a collaborative approach emerged strongly from the discussions with a view that HE is well placed to meet the ADS challenge if it can activate its networks to advise and support ADS education. The potential for industry funding through subsidised courses/places and scholarships was seen to be strong for ADS and the scope for close industry involvement through advisory boards was recognised. The need for established formal and informal co-ordination between higher education and vocational education providers was also discussed.

The second general theme to emerge was the need to access all talent pools to meet the scale of the ADS challenge. In the discussion, the importance of improving gender diversity in ADS was highlighted, echoing the aims of Europe's Digital Decade to achieve gender convergence among ICT



specialists<sup>1</sup>. While gender diversity in STEM as a broader topic is complex and requires multi-faceted solutions, the scope for ADS educators working in collaboration with industry to make a positive impact was recognised by the expert panel. The potential to promote inclusion in ADS in traditionally under-represented groups e.g. those from the Global South was also highlighted.

Numerous suggestions were proposed and the following were examples of best practice examples that could be utilised by universities and other HE providers.

- **Governance:** Advisory boards play a crucial role in maintaining strong connections between universities and businesses. For example, the composition of National College of Ireland's Cloud Competency Centre advisory board, with its international diversity, significantly contributes to the direction and impact of the centre. While it was recognised that the graduates of ADS courses are more likely to enter industry than education, the role that such alumni can play in advisory boards was highlighted as means of facilitating strong industry/education relationships.
- **Increasing access to learning:** Increasing access is key to broadening the pool of talent for ADS study. Increasing access also has the benefit of diversifying the student base and facilitating inclusion for example by facilitating a return to the workforce after career breaks/maternity leave/life events. The role of RPL (Recognition of Prior Learning) in promoting access was reiterated but the scope for the Recognition of Prior Experiential Learning (RPEL) was also highlighted. For example, many of National College of Ireland's postgraduate micro-credentials are open to applicants who may not hold an undergraduate degree but who can demonstrate through relevant work and other experiences that they meet the entry requirements. The need for RPL and RPEL processes to be less burdensome was discussed. Some ideas for streamlining the processes included the creation of a single form to be used by multiple education providers as completing multiple forms is time consuming if learners apply for multiple courses. Educational institutions could consider the possibility of offering RPL for cohorts in a company e.g. for those with a similar job type. This would create more social support for learners going through the RPL process and increase process efficiencies both for learners and educational institutions.

The importance of flexible and modular learning in facilitating access to study in a way that suits a learner's circumstances was reiterated. The open university model of UNED, Spain's biggest public university was highlighted, as it uses diverse qualification types and open and blended learning to encourage lifelong learning for all. The Springboard initiative<sup>2</sup> in Ireland also aims to increase the skills and talent pool for in-demand skills including digital, by providing opportunities for unemployed people to re-enter the workforce. This Springboard initiative, funded by government was presented as a model of how accessibility to learning about in demand skills was made available at reduced cost to the learner.

- **Focus on increasing diversity:** Women only scholarship programmes were highlighted as a means of increasing gender diversity, partly because of the financial support but also as it allows for the clustering of women to seed courses and thereby encourage gender balanced participation as a norm. An example was given of Microsoft's establishment of a female only scholarship scheme for entrance to Trinity College Dublin's MSc in Quantum Science and Technology. The SandboxAQ

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<sup>1</sup> <https://digital-strategy.ec.europa.eu/en/policies/europes-digital-decade>

<sup>2</sup> <https://hea.ie/skills-engagement/springboard/>

Scholarships were also highlighted. These are for under-represented students from the Global South to gain the advanced practical skills and knowledge needed to pursue future careers in AI and quantum (AQ) technologies.

- **Micro-credentials create new avenues for talent:** The benefit of micro-credentials was acknowledged by all representatives involved in the discussion. It was commented that there needs to be a more accessible way to navigate the offerings, for example, a central portal to facilitate easy searching for courses and subsidisation of funding to generate momentum in the take-up by students of these courses, as in some jurisdictions the cost is prohibitive for potential learners.
- **Increasing the teaching pool:** The shortage of educators in ADS was acknowledged as a bottleneck in the expansion of ADS education provision. The attractiveness of industry salaries vs public sector education salaries was recognised. The potential for ideas similar to the Teach First initiative<sup>3</sup> were discussed. This scheme was deployed in the UK and aimed to encourage high-performing graduates to train in, and deliver, teaching at an early career stage. While this scheme targeted teachers for secondary education and has encountered some problems, deploying industry specialists into teaching nonetheless struck a chord among the panel. The idea of a 'Teach Last' initiative emerged from the discussions, where older technology workers could be encouraged to enter into teaching as a second, third or last phase of their career.
- **Additional incentives to attract talent into education.** Potential learnings from Silicon Valley were highlighted in terms of considering the whole compensation package in order to attract talent. In public higher education institutions where teachers are likely to be public sector workers, salaries are unlikely to compete with the salaries offered in industry to those with ADS. The inclusion of non-salary incentives such as housing and flexible hours were highlighted as a way to attract talent into teaching.

### 4.3. Student perspective

#### Challenges and Best Practices

From the student perspective, the cost of living was expressed as a challenge impacting on general educational participation and any initiative to ease the financial burdens were welcomed. The length of some programmes and requirement to study on-campus can act as financial barriers. This was regarded as particularly important for students from socio-economically disadvantaged groups. The need to use learning activities which develop skills and prepare the student for the job market was highlighted. Specific examples included:

- The use of innovative learning methodologies to offer online and blended courses could help students to participate by reducing rental and travel costs.

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<sup>3</sup> <https://www.teachfirst.org.uk/training-programm/>

- The use of gamification was perceived to be valuable in increasing skills and preparing for real world environments. Gaming is not incorporated to the extent it could be, for example, into student assessments and learning activities.
- Paid internships that provided students with access to income were seen as an important aspect in facilitating educational participation.

## 5. SOLUTIONS

The following recommendations represent the solutions articulated by the panel to address the challenges of meeting the need for ADS at scale. The matrix provides a grid to demonstrate the stakeholders and the role they play in generating the solutions. The key role player for each solution is indicated in bold.

		<b>Policy Makers</b>	<b>Industry</b>	<b>HE Providers</b>
<b>Industry informed evolution</b>	Understand the transition from traditional job profiles to skills-focused profiles and reflect this in HE courses and qualifications.		<b>x</b>	<b>x</b>
	Provide industry scholarships to create real impact. These scholarships should be linked to direct job opportunities.	<b>x</b>	<b>x</b>	<b>x</b>
	Maintain portfolios demonstrating prior and experiential learning to increase access to upskill/reskilling courses and qualifications.		<b>x</b>	<b>x</b>
<b>Building transversal skills</b>	Incorporate transversal skills, such as communication, team working, problem solving and entrepreneurship, into digital skills curricula. This would enable those with digital skills to also drive innovation, communicate initiatives, and collaborate to implement new concepts.			<b>x</b>
<b>Policy Interventions</b>	Identify possibilities for enhanced compensation packages to attract and retain STEM teachers into the publicly funded education sector.	<b>x</b>	<b>x</b>	<b>x</b>
	Facilitate participation across diverse talent pools by promoting learning access policies e.g. RPL and RPEL.	<b>x</b>		<b>x</b>
	Facilitate lifelong learning through the promotion of modular learning with diverse accreditation formats. These need to be offered with a learner centred delivery structure.	<b>x</b>		<b>x</b>

<b>Building flexibility in delivery, learning methodologies and programmes</b>	Build flexibility into HE offerings and offer short, as well as long courses with flexible accreditation linked to market need.		<b>x</b>	<b>x</b>
	Increase the range of micro-credentials and enhance their branding to ensure that they are attractive and recognised.	<b>x</b>		<b>x</b>
	Extend the use of online and blended learning methodologies to enhance accessibility.			<b>x</b>
	Implement more agile methods of accreditation.	<b>x</b>		<b>x</b>
	Implement RPL and RPEL policies through streamlined processes to enhance efficient access to re-skilling and up-skilling courses.	<b>x</b>	<b>x</b>	<b>x</b>
<b>Industry/Academic Collaborations</b>	Identify opportunities for education/industry exchange i.e. for staff from industry to teach and staff from education to work in industry.		<b>x</b>	<b>x</b>
	Develop a framework for joint appointments to facilitate education/industry exchange.		<b>x</b>	<b>x</b>
	Explore a 'Teach Last' initiative to support movement of staff from industry into in education at advanced career stages.		<b>x</b>	<b>x</b>
	Increase the number and length of placements as a means of developing applied learning, supporting adaptation to the workplace, and allowing employers to identify those suitable for later recruitment.		<b>x</b>	<b>x</b>
<b>Increasing participation from under-represented groups</b>	Use focused scholarships for women and those from under-represented communities, to create a cluster effect, i.e., creating role models that attract others from the same demographic.		<b>x</b>	<b>x</b>
	Utilise Corporate Social Responsibility budgets to support initiatives which attract women and those from under-represented communities.		<b>x</b>	<b>x</b>
<b>Collaboration within the education and training system</b>	Establish more formal and informal coordination mechanisms between higher education and vocational education and training to facilitate whole-system responses to emergent challenges such as ADS.			<b>x</b>

## 6. CONCLUSIONS

This discussion covered a wide range of topics reflecting the perspectives of industry, educators, and students. The meeting concluded with a review of the critical success factors provided by Brendan Rowan from BluSpecs Consulting. The key points highlighted were:

- **Universities need to take an entrepreneurial focus.** In order to attract interest and investment from industry it is important to demonstrate a commercial focus and a business case. Industry will invest but universities need to present a business case and demonstrate the same rigour that would be applied in a commercial operation.
- **Governance** –Advisory boards are very important; these need to be diverse and linked to industry. But informal connections between universities and business important. Keeping graduates involved is an important element.
- **Micro-credentials are essential.** Modular and Micro-credentials are a key to addressing the skills gap. However, they need to be branded and appropriate accreditation is needed to ensure that they are attractive and valued. Equally they need to be delivered in an accessible way to encourage the broadest participation.
- **Diversity and inclusivity** – Industry could do more; significant funding is available in companies for CSR initiatives to support STEM and to increase digital literacy. There are some good examples (Microsoft, SAP) but more altruism is needed, especially in the context of under-represented groups.
- **Increasing gender balance** – there is a need for more scholarship programmes to increase female participation and encourage clustering effects, where role models are created and therefore increasing interest from others. Society and industry will also benefit from greater gender balance in product creation.
- **More rounded skill set** involving professional skills – Educators need to create programmes that enhance other skills such as communication, collaboration, and self-presentation skills. Enabling graduates to contribute more fully and create impact.
- **Funding.** It is necessary to create greater visibility and provide more information to industry on the funding available to them to increase their own access to technology.
- **More companies to provide more Internship opportunities.** The benefits of apprenticeships for student and industry are evident from this discussion. There is a need for more internships and using more effective internship models.
- **Experimentation and Sandbox opportunities** to increase innovation. There is a need to create ‘digital playgrounds’ that are safe allowing interns and new graduates to experiment and innovate in safe environments.

## 7. APPENDICES

### 7.1. Appendix A

The expert participants who joined the panel at Trinity College Dublin were as follows:

- Alan Fahey, Senior Vocational Trainer at SAP SSC Ireland
- Prof. John Goold, Associate Professor in Quantum Technologies, Trinity College Dublin, Ireland
- Prof. Covadonga Rodrigo, Deputy Director for Transfer, Research, and Innovation at the School of Computer Science and Telecommunications Engineering, UNED, Spain
- Prof. Dr. Horacio González-Vélez, Professor of Computer Systems and Founding Head of The Cloud Competency Centre, National College of Ireland, Ireland
- Catherine Arnold, Education Officer and Deputy President, Trinity College Dublin Students' Union
- Vivienne Patterson, Head of Skills and Engagement, Higher Education Authority, Ireland. This expert was unable to participate in the panel discussion on 1st December. However, the panel moderator, Prof. Julie Byrne subsequently held a one-to-one interview on December 18<sup>th</sup> to obtain her views and these are incorporated into this report.

### 7.2. Appendix B

#### Expert Panel Agenda: 1<sup>st</sup> December 2023

Start time	Planned duration	Item description	Presenter
10:00	10 min	Introduction and Scene-Setting	Laurent Muzellec (TCD) Julie Byrne (TCD)
10:10	60 min	Sharing of Best Practices	Julie Byrne (TCD)
11:10	60 min	Collective Solution Identification	Julie Byrne (TCD)
12:10	15 min	Critical Success Factors Summary	Brendan Rowan (BluSpecs)
12:25	5 min	Closing	Laurent Muzellec (TCD)
12:30	Lunch & End of meeting		