DT LAUNCH PAD

Enabling Deep Tech Entrepreneurship

Synthesis Report: Ireland

Regional Deep Tech Commercialisation Trajectory Report

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Project Consortium

Technische Universiteit Delft (TU Delft) – The Netherlands
University Industry Innovation Network BV (UIIN) – The Netherlands
Univerza V Ljubljani (UL) – Slovenia
Momentum Marketing Services Limited (Momentum) - Ireland
Crazy Town Oy (Crazy Town) - Finland
Institut Mines-Telecom (IMTBS) - France
Munster Technological University (MTU) - Ireland
accent Inkubator Gmbh (accent) - Austria
Ege University (Ege University) - Turkey

1 | INTRODUCTION & POLICY

a. Introduction to the DTLaunchPad Project

The Deep Tech Innovation Launch Pad (DTLaunchPad) project aims to enable the European Deep Tech Community through creating coordinated support services, building the capacity of Deep Tech talent within participating HEIs. It does this by encouraging the international exchange of knowledge and providing partner talents with the opportunity to initiate and sustain Deep Tech start-ups.
Specifically, DTLaunchPad project explores the needs and opportunities for Deep Tech at participating HEIs and incubators through primary and secondary research and asset mapping. It will also enable European Deep Tech talent through a Deep Tech to Market Services pack, including a training programme, (pre-)incubation and acceleration services, mentoring and peer to peer exchange, including the pilot testing of these programmes with participants. We will incubate/accelerate deep teach teams in each partner region with a cohort of mentors. The project will create a platform to pool and host Deep Tech opportunities to encourage international team building and resource gathering. With the project activities; we will raise the awareness of the Deep Tech pathway through an educational Introduction to Deep Tech video services, Introduction to Deep Tech mini workshops series as well as promotional multiplier events. We will bring together the European Deep Tech community to allow Deep Tech trainees to be able to present their ideas and be exposed to potential funding bodies, culminating in in a Fundraising Fair with 100+ participants from across Europe.

In Work package 2, the DT Launchpad project aims to advance understanding of the needs of the Deep Tech community in Europe and specifically at HEI (Higher Education Institutions) partner institutions, and to lay a strong knowledgebase for the subsequent work packages, particularly regarding the planning and implementation of the Market Services Pack (WP3) and Awareness Raising (WP7).

To achieve its goal, WP2 will

- Identify and describe the uniqueness of the Deep Tech commercialisation process, including necessary adaptations to the standard research valorisation process as well as an outline of the necessary support services and skills required in Deep Tech commercialisation.
- Understand the current Deep Tech commercialisation opportunities in Ireland, as well as the drivers and challenges associated to the commercialisation of Deep Tech solutions.
- Identify, describe, and prioritise the skills needed for Deep Tech talent in Ireland to pursue Deep Tech ventures.
- Define the focus and scope of the remaining project activities.

b. Deep Tech Regional Policy in Ireland

Numerous policy measures have been adopted which aim to increase the level of innovation in the Irish economy and increase the impact of innovation on economic development. The Irish government recognises that the rate of commercialisation of research in Ireland, particularly research conducted in the public sector, is low by international standards. This is significant when we consider the scale of public research investment. Over the past decade, the Irish government has invested in research to bring about economic and societal development in Ireland. This is particularly salient at present as state research investment has held up relatively well compared to other areas of public expenditure amidst a changing economic landscape. Retaining and increasing levels of investment in research will be dependent more than ever on researchers' ability to illustrate the potential economic and societal impact of their research.

The global economy is moving towards a knowledge-based economy, where competitive advantage is increasingly becoming the domain of new ideas, products, and processes. Many developed economies have identified the ability of innovation to directly contribute to economic growth, increased productivity, and job creation. Innovation is highly complex, and its success is uncertain, with many initiatives failing. Governments play a crucial role in stimulating innovation, and an increasing emphasis has been placed on the commercialisation of research, particularly that conducted in the public sector, to drive economic growth.

Irish governments and its agencies have been engaged in the promotion of high-technology industries for the past five decades. Starting in the 70s and 80s, the focus was on attracting multinational corporations (MNCs) to set up production only facilities moving to include R&D activities a part of the brief of MNC's location in Ireland. This policy was initially very successful, but the changing global economics of the late 20th and early twenty-first century, particularly the rise of activity in low-cost countries, has meant that Ireland has had to seek a new technological industrial base moving to high value added manufacturing, business support functions and R&D. At the same time, the change in focus of the EU research and development policies to a more structural funding base instead of being market-led has meant that Irish university researchers have sought to engage more with industry. In recent times there has been a lot of activity around the development of high-tech start-up firms for the commercialisation of deep tech. The recent national strategy for science, technology, and innovation can be seen as having this as its central pillar.

2 | METHODOLOGY

Research Methodology

Secondary research activities: Literature Review

The aim of the Literature Review was to identify the current status of the Deep Tech commercialisation process in Ireland, by documenting opportunities, challenges, needed support and Deep Tech talent's skill gaps for commercialisation.

A **white and grey Literature Review** was completed to investigate the following research topics:

- **Deep Tech Context**
  - Definition and importance of Deep Tech per different partners countries
  - Policy context of Deep Tech on both European and regional/national level

- **Uniqueness of Deep Tech commercialisation process**
  - Necessary adaptations to the standard commercialisation process
  - Deep Tech commercialisation process on a European and commercialisation context on partners' regional/national levels

- **Deep Tech commercialisation potential on a regional/national level**
  - Common barriers and challenges to incubating Deep Tech ventures
  - Enablers and success factors of Deep Tech incubation
  - Pre-incubation, incubation, and acceleration support instruments
  - Knowledge, skills, and attitudes for talent to pursue Deep Tech commercialisation
  - Identification of best training practices on supporting Deep tech commercialisation

Phase 1.2: Secondary research activities: Asset Mapping

The **aim** of Asset Mapping was to help us understand and catalogue existing resources/assets and identify key professionals and stakeholders supporting Deep Tech commercialisation in their regions on two levels: 1. Internally, within Munster Technological University and 2. Externally, within national eco system.

1. **Munster Technological University:**

Project partner Munster Technological University (MTU), resulting from a recent merger of the Cork and Tralee Institutes of Technology, has been a centre of technological research and excellence for over two centuries. Today MTU is a significant higher educational and research organisation. From a research perspective, the University is a key national player in areas of Deep Tech development. Additionally, MTU is a national leader in terms of supporting Innovation and enterprise at its onsite incubator The Rubicon Centre which has been to the forefront in supporting the rollout of enterprises. Research centre's at MTU who are actively participating in and exploring Deep Tech opportunities include:

(a)BioExplore Research Group- Activity in this group focuses on bio-analysis, diagnostics, antimicrobial screening, molecular epidemiology, bioinformatics, peptide engineering, protein purification and mass spectrometry, medical microbiology, veterinary microbiology, antibiotic resistance, biocontrol, food fermentation, food pathogens, animal production, food production, cell biology, bacterial viruses and animal health.

(b) CAPPA Research Centre- Activity in Cappa focuses on generating and harnessing light, impacting a wide range of areas such as telecommunications, gas sensing, food and medical imaging.

(c) **Clean Technology Centre-** Activity in the CTC is focused on providing innovative and effective resource efficiency solutions since 1992

(d) **The Halpin Research and Innovation Centre** undertakes maritime research, with the aim of promoting the development of a vibrant and dynamic maritime sector, capable of realising its full potential in contributing to the sustainable economic, social and environmental development of the island of Ireland and that of our international partners, for the benefit of all.

e) Activity in the **NIMBUS Research Centre** addresses Cyberphysical Systems, the Internet of Things (IoT) and the digitalisation of industry and society.

f) **Cyber Explore at MTU**, is on a mission to strengthen the security of Ireland's digital assets and resilience of its critical infrastructure. Its core aim is to securely blend the digital world with the physical world, protecting everyone and making systems more resilient to cyber security by fostering skills, research and innovation.

g) **The Tyndall National Institute** in Cork, where MTU is a key participant. Tyndall National Institute is a leading European deep-tech research centre in integrated ICT (Information and Communications Technology) hardware and systems. Specialising in both electronics and photonics – materials, devices, circuits and systems.

h) Activity in the **Space and Astronomy Research and Policy Group** (SARP) develops and uses instruments for astronomy and space with both terrestrial and space applications, provides advice to industry on opportunities in the space domain, advocates and supports the development of national space.

i) Activity in the **SIGMA Research Group** focuses on applying Artificial Intelligence and computational techniques to enable next generation digital engagement, across video, speech, text and immersive technologies, and support inclusion, accountability and appropriate controls.

Researchers, research managers and administrators from all MTU research groups are closely involved in industry engagements, which extend from small start-ups to interactions with global multinational corporations, many of which are headquartered in our region. MTU is a strong pull factor for multinational high-tech investments in Southwest Ireland.

2. National ecosystem:

An article entitled "Here's why the deep-tech scene in Ireland is thriving" in the May 2021 issue of Business Insider noted that Ireland is thriving in the sector because:

- Ireland is already home to multinational tech companies and startups that are focused on deep technology.
- This area of tech focuses on advances in areas like AI, Robotics, and IoT.
- With increased investment and research on the horizon, Ireland is poised to become a deep tech powerhouse**.**

The article notes that the Tyndall Institute in Cork, in which MTU is a key partner, is one of Europe's leading tech research centres, which launched a pre-accelerator for deep tech start-ups that work in agriculture, transport, health and sustainability. The institute has also added a lab in Dublin that will look at future deep tech in wireless communications and is set to create innovations in "next-generation IoT communications, Wi-Fi, 5G, 6G and beyond,"

While Ireland has been successful in promoting a wide array of successful Deep Tech ventures, the extent of the challenge to successfully foster a high volume of indigenous enterprises in Ireland cannot be overestimated in the light of the relatively small size of the economy and a background of relatively low numbers of indigenous high technology-based enterprises. Additionally, the high risks associated for SMEs with new Deep Tech products or services, frequently renders them as being unattractive to early investors. This is exacerbated by a low level of private investment in start-up enterprises.

With a view to addressing some of these challenges, the Irish Government has introduced the **Disruptive Technologies Innovation Fund** (DTIF) which provides investment in the development and roll out of disruptive technologies and applications in the international marketplace. DTIF will support both the nation's world-class research base and Irish industry through enabling enterprises to competitively seek funding supports for the development and adoption of deep tech and similar technologies and thereby fund new start-ups. The DTIF is an integral part of the National Strategic Outcome 5: A strong economy, supported by enterprise, innovation and skills.

The areas being targeted by the funding are in ICT, health and wellbeing, food, energy, climate action and sustainability, manufacturing and materials, and services and business processes.

The funding initiative lists its main eligibility criteria as follows: all projects should be seeking minimum funding of €1.5 million over three years.

- each project to have at least three independent partners seeking funding from DTIF, including at least one SME and one other enterprise partner.
- SMEs can claim no more than 50% of their eligible costs, while large companies can claim no more than 40% of their eligible costs.
- research organisations (including colleges) can claim up to 100% of their eligible costs but can receive no more than 50% of the total DTIF grant aid per project.
- to draw down funding under DTIF, project partners must be:
    - a current client of Enterprise Ireland, IDA Ireland or Údarás na Gaeltachta or an eligible Research Performing Organisation (RPO)
    - based in Ireland.
- the type of eligible research to be carried out by all partners, must include 'industrial research' and/or 'experimental development', that is, within Technology Readiness Levels 3-9
- all company partners must provide financial information to prove that they are not Undertakings in Difficulty

Phase 2.1: Primary research activities: Qualitative Interviews

Through the **Interview process,** the **aim** was to collect insights on (1) the opportunities, challenges and success factors of the Deep Tech commercialisation process on a European and partners' regional level, via **Deep Tech experts' interviews** and (2) the current status of Deep Tech pre-incubation, incubation and acceleration services and gaps within the partner HEIs, via **Deep Tech educators/incubator staff interviews.**

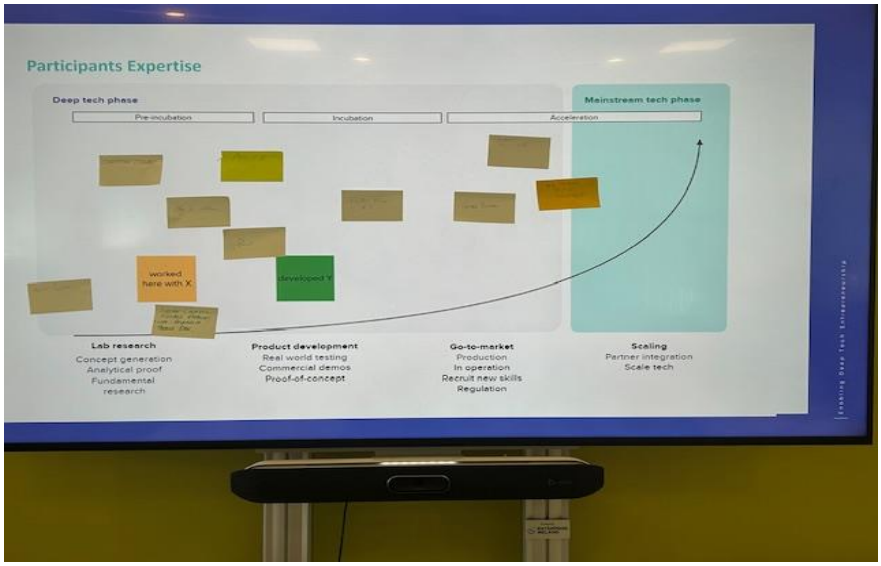
We conducted a series of eight interviews with experts and educators in the Deep Tech arena. The interviewees are all working at the coal face between research and Industry and their expert views help to illuminate the present position and potential future pathways.

Phase 2.2: Primary research activities: Deep Tech Community Roundtable

2.2.1. DT Roundtable

The **aim** of the Deep Tech Community Roundtables was to corroborate, validate, and communicate the insights collected by the Literature Review, the Asset Mapping, and the Interviews on the current status of the Deep Tech commercialisation trajectories on European and regional levels.

The Round Table discussion considered the responses garnered from the interviews and within the context of a prior presentation to attendees on the literature review. It is fair to conclude that the round table did not produce any notable additional information or commentaries. It did copper fasten the information already collated and within the university environment in which it was undertaken, it highlighted the potential unrealistic expectations which can exist about launching multiple deep tech projects at one institution. A main comment emerging from the round table related to the difficulty of a single institution being successful in accelerating deep tech in a stand-alone mode. It was believed that deep tech acceleration is better provided by several such institutions working in close collaboration. Additionally, such collaboration would be significantly enriched by the participation of large high-tech industries, which are already successfully engaged in deep tech technologies.



3 | DEEP TECH COMMERCIALISATION IN IRELAND

a. How Deep Tech Ventures are Different from Standard Tech Ventures

i. Overview

Deep tech ventures are of a nature that can take up to a decade to launch. They are highly complex and require an initial much heavier infrastructure investment. A key difference is the difficulty being experienced by deep tech venture to secure investor finance. This is related to the time scales, potential elevated risk, and the complexity issues.

In December 2022, Enterprise Ireland hosted its 14th annual Big Ideas event to highlight how deep-tech companies from research backgrounds are making an impact in Ireland.

An article from that event adequately sums up the challenges. As noted by Silicon Republic *"One of the keynote speakers at the event was Sean Ward, a member of the UK's Biotechnology and Biological Sciences Research Council and an experienced deep-tech entrepreneur. In 2011, Ward founded Synthace, a life sciences cloud software company designed to help scientists innovate with a no-code R&D platform.*

Ward spoke at the event on the journey required to build a deep-tech company. Speaking to SiliconRepublic.com, he said two of the challenges many deep-tech start-ups face is around securing funding and the fact they are working on something new.

"You're often still tackling a degree of science risk, although ideally, you will have done work in an academic setting or partnered with an academic collaborator to be able to take on a lot of the science risk," Ward said.

"Often the science risk requires a substantial investment in capital equipment to be able to deal with, whether that's lab facilities or specialist equipment in the semiconductor industry.

"To get out the gate as a start-up, if you need to drop €1m in hardware to be able to do your work, that's quite an obstacle compared to building a software business where you need a MacBook Pro and a coffee shop," Ward said.

Issues around deep techs securing funding for their products have been raised before. At Future Human 2022, Prof Catherine Welch of Trinity's Business School said it can sometimes take decades for these companies to get an innovation to market.

Welch also said the best way for deep-tech companies to manage risks in the sector is to "learn from those who have been there and done that before."

The funding issue has also been noted across Europe. In January, a report found that start-ups within Europe's deep-tech sector raised $17.7bn in 2022, which was strong compared to other sectors but lagged far behind the US in terms of investment.

Last May, a joint report by the European Patent Office and the European Investment Bank said a lack of access to finance and skilled talent were key reasons the EU's deep-tech businesses lag behind their US counterparts.

Ward said the differences in funding can lead to some European deep techs forming "complicated hybrid structures," where the founding team relocates to the US but keeps its research teams in Europe to "take advantage of the assets in each place."

"The quality of talent is normally very, very high in Europe," Ward said. "And I would agree the same applies with all the people I met in Cork.

"But it takes talent, it takes ideas, and it takes capital, all of those coming together to bridge the gap with these world-changing innovations."

ii. HIGHLIGHTS FROM VALIDATION AND INTERVIEWS

The structured interviews undertaken in relation to this research clearly demonstrated the nature of the opportunity and challenges. One of the first areas explored examined what makes deep tech different in terms of its commercialisation from more mundane technologies. Respondents pointed out that in many cases, such as start-ups in software products, *"all one needed was a laptop and a nearby coffee shop"*

Delving deeper into the important differences, respondents highlighted the long-term nature of developing a deep tech project, its complications in areas of Intellectual Property (IP) and IP Protection and the more complicated ecosystem in the EU around regulations and standards. These differences clearly underline the challenges being faced and the need for promoters to have very specific skillsets.

A Commercialisation Specialist with extensive experience stated:

"There must be an understanding of the market need through customer discovery and a potential for licencing. The time length can be 10 years plus from ideation to market for deep tech projects. The regulation process can also be longer and can differ for everyone. IP Protection is very important and takes a big chunk of money. The IP and Regulatory process makes deep tech commercialisation a unique process. US market entry is easier because of regulations. Initial market entry is much easier with a clearer process. This can be a heartache for companies and individuals in Ireland. EU countries have their own standards."

"There are great supports for early-stage start-ups, however there is a gap when it comes to deep tech projects. These projects need more supports and often they get stuck and don't know what to do and fail."

"The journey is way longer and participants need to be made aware of this. Longer funded programmes are needed for Deep Tech to get them through the initial - 24–36-month period"

Another interviewee who is an experienced research team leader in a Research Centre, when asked if there was a standard process for the commercialisation of Deep Tech, responded:

"I don't think there is a standard process A lot of companies try to reinvent the wheel and time can be wasted developing new coding that may already exist. If it is there- use the existing data. Time should be spent integrating the blocks rather than developing them if they are already there."

Asked further about the specific challenges in universities to spin out Deep Tech it was noted that "Most researchers in academic setups are in full time permanent contracts and to do a start-up you have to walk away from that, and it is often too high a risk."

On the adequacy of funding support which are in place to promote Deep tech initiatives from academics it was noted that;

"There is a lack of money to form a team to spin out. You would need a CTO nearly straight away. Money is provided for R&D but no point in doing that unless there is follow up funding to form the team for commercialisation. Criteria should be more flexible."

And it was also stated:

"The main missing drivers are funding for training and funding for the construction of data sets. Also, the understanding of the large costs associated with developing a deep tech project. Also, an understanding of the large costs associated with this space by the government funding agencies"

A Company CEO with experience in Deep Tech innovation was interviewed. This executive has been involved in both deep tech and more traditional high-tech ventures. When asked about deep tech ideation and commercialisation responded "When you have an idea you must find funding to build it. Deep Tech is also a longer process. You must find early adapters that will test. – Customers in this area often have a problem they didn't know there was a solution to. Again, it is a much longer journey. There are two paths 1. develop then sell or 2. While developing bring in partners. The path you chose depends on how difficult it is to build.

The Bottleneck in the process is funding. When you are trying to bring an idea into reality funding can be difficult to get. The application process is also the same for all projects. There is also no funding available specifically for high-risk projects that give you the opportunity to fail fast. The funding providers are not thinking far enough ahead, and funding seems to only become available when something becomes popular. Need funding to allow for failing. "

The interview then progressed to explore the uniqueness of deep tech commercialisation and differences with the standard commercialisation process. A valuable insight was provided by the following response>

"With Deep Tech there is a far longer time spent on the development phase. For a normal project, time is manageable. Also, with Deep Tech you need a large amount of funding. Funding must be a blend of institutional and VC's. VC's will validate the idea and look ten years ahead.

The funding model also needs to be looked at differently for Deep Tech Projects. There should be a new set of metrics for each project. You can't measure against normal projects."

On the challenges of successfully launching a new deep tech venture the following was his response'

"Finding the right people for the research is a challenge. You only have a certain number of resources available and finding the right partner can be challenging- The funders should also look at what resources the company needs that will allow for faster commercialisation. Timing is key. The problem with working with RPO's is their time frame is not the same as yours and this results in delays for the entrepreneur. This can be overcome by changing the process, once they are working on your project, they need to be in your project. Rules of engagement must be different. Milestone driven rather than 9am to 5pm driven."

On providing acceleration services for deep tech ventures- "For a deep tech accelerator – you must mix 2/3 types of people, a researcher in the specific area, a researcher with overall knowledge and an entrepreneur. The standard process won't work. You must be mindful of the funding, with milestones being managed effectively. People controlling must be aware of the difficulty of the project "

In conclusion, the interviews encompassed a diverse array of participants with varying roles and skill sets in the deep tech field, yielding consistent insights regarding the intricate nature of deep tech startups. The findings highlighted the protracted timelines typically associated with these ventures, as well as significant challenges in securing funding. Participants emphasized not only the necessity of financial support to develop and deliver highly innovative, market-ready products but also the critical need for substantial resources dedicated to market development and commercialisation from the earliest stages.

The interviews conducted effectively highlighted the various challenges faced by deep tech startups, especially within the context of a European landscape characterized by stringent regulations and a strong commitment to quality standards. This regulatory environment

presents unique obstacles that these startups must navigate, underscoring the complexities of bringing innovative technologies to market.

b. The Current State of Deep Tech Commercialisation on a Regional Level

i. Overview

In Ireland, enterprise support is addressed via a national level with Enterprise Ireland being the main state agency involved in delivering the supports. As noted earlier in this report the **Disruptive Technologies Innovation Fund** (DTIF) is one of the main mechanisms used by the Irish government to drive Deep Tech in the multinational and indigenous sectors.

The country is strong in the cybersecurity sector and as noted by Enterprise Ireland:

"From hackers to cyber terrorists, there are plenty of bad actors in the digital world, but Irish firms are leading the way in combatting these threats.

As the volume and sophistication of cyberthreats continues to rise around the world, Ireland is emerging as a global cybersecurity leader. That's largely due to our innovative and collaborative cybersecurity ecosystem, with Irish firms supporting each other in gaining ground internationally.

This ecosystem didn't spring up overnight, explains Jessica Baker, VP, Digital Technologies at Enterprise Ireland in the US. "Not only is there a strong research and development focus on cybersecurity in Ireland, but Irish universities have also developed specific degrees in this area to address the global talent and skills shortage in cybersecurity," says Jessica Baker, based in Austin, Texas.

Enterprise Ireland currently supports more than 60 companies delivering cybersecurity solutions to the global marketplace. These companies range from early-stage builders to multinational organisations".

ii. Extent of the existence of three (i.e., [pre-]incubation and acceleration) deep tech commercialisation stages

Ireland has an excellent history and record of (pre)incubation and acceleration for SMEs however there are a limited number of programmes focusing solely on deep tech.

Tyndall National Institute runs a pre accelerator programme for deep-tech startups. This programme aims to help develop entrepreneurial ideas and early-stage startups in the areas

of photonics and microelectronics, covering tech such as energy efficient chips, power semiconductors, smart sensors, advanced optical equipment, and compound materials and applications.

The Rubicon Centre www.rubiconcentre.ie located on the Cork campus of Munster Technological University is widely recognised as a national exemplar of incubation provided by a third level education and research institution. With a strong record and a solid reputation for fostering technology incubation, the Rubicon Centre and MTU have successfully supported a number of startups from concept to commercialisation.

While the acceleration for deep tech initiatives has begun in the region, it is important to recognise that this effort is still in its infancy. As highlighted during our interviews, roundtable discussions with stakeholders, enhanced facilities and services are crucial for propelling deep tech ventures forward. A potential advantage for our region is the presence of numerous multinational companies in the deep tech sector already headquartered in Ireland. Their established presence may serve as a valuable asset in fast tracking the growth of smaller companies, many of which are already integrated into the supply and service chains of these larger entities. However, to effectively support emerging deep tech ventures, it is believed that additional expertise- particularly in financing, market development and commercialisation is needed.

c. Common Barriers and Enablers of Deep Tech Commercialisation

i. Overview

In Ireland, the commercialisation of deep tech faces several common barriers and enablers. One of the key highlights is the recognition that deep tech commercialisation is a highly complex process that cannot be approached as a turnkey solution for aspiring startups. This complexity arises from several factors, including the lengthy timescales required to bring innovative technologies to market and the significant challenges associated with securing adequate funding.

Additionally, the need for specialized expertise and resources in areas such as market development and commercialisation further complicated the journey for these startups. However, enabling factors such as access to established networks, mentorship from experienced professionals, and the presence of supportive institutions can significantly aid in overcoming these barriers facilitating the successful commercialisation of deep tech innovations in Ireland.

ii. Barriers and Challenges

As previously mentioned, the barriers and challenges facing deep tech commercialisation include the complexity of the process, the need for a diverse range of multi-disciplinary skill sets, the difficulty in securing funding, and the challenges associated with intellectual property management, These factors collectively create significant obstacles for start ups as they navigate the path from innovation to market readiness.

iii. Enablers and success factors

The key enablers identified from our inquiries appear to be the establishment of multidisciplinary teams that encompass expertise in technology, commercialisation, funding, and legal intellectual property. This comprehensive approach enhances the startups' chances of success.

d. Knowledge, Skills, and Attitudes for Talent to Pursue Deep Tech Commercialisation

i. Overview

Our research has revealed fundamental differences between launching a tech venture and a deep tech venture. Deep tech initiatives require a significantly longer runway for successful development and take off. Achieving success in this space necessitates a more comprehensive team, including highly specialized expertise across various disciplines. As previously mentioned, deep tech ventures demand higher levels of investment, which poses a considerable challenge in securing funding. This difficulty is not only due to the substantial financial requirements but also because potential investors tend to be risk averse. Consequently, the complexity, extended timelines, and associated costs involved in deep tech ventures further deter risk averse funders, making it even more challenging to attract the necessary capital.

ii. Technical and transversal competencies

While the founder of a deep tech venture may possess the necessary technical competence in their specific technology area, it is unlikely that they will also have the full range of transversal competencies required such as marketing, financing, and business development skills. As highlighted in our interviews, deep tech ventures often need to hire a Chief Technology Officer and other essential specialists at an early stage of their development. However, these hiring costs can be prohibitive for founders who have not already secured substantial investment, potentially hindering the venture's progress.

iii. ENTREPRENEURIAL COMPETENCIES

Possessing entrepreneurial competence is undoubtedly a fundamental requirement for establishing any commercial venture. However, deep tech ventures often elevate this necessity, as highlighted in our round table discussions. Ideally, a deep tech initiative would benefit from the guidance of an entrepreneur who has successfully navigated the complexities of launching a deep tech venture. Such experience can provide invaluable insights and strategies that are crucial for overcoming the unique challenges associated with this sector.

4 | RESEARCH INTO PRACTICE: SUPPORTING DEEP TECH

a. Overview and Next Steps for Training and Service Packs Development (WP3)

MTU through its on-site Incubator is exceptionally well equipped to provide incubation and acceleration support. Ongoing efforts are focused on the specific requirements for delivering tailored (pre)incubation and accelerator programmes for deep tech ventures. While there are effective service provisions currently in place for traditional tech startups, the unique challenges of deep tech require a different approach. The university aims to leverage insights and best practices from partnering countries through this project, with the intention of enhancing its capabilities in developing specialized deep tech incubation and acceleration services. This knowledge will help better support the growth and commercialisation of deep tech startups in Ireland.

b. Recommendations on How Training, Mentorship, Peer-to-peer Learning and Deep Tech Incubation Support Tools can be Utilised to Support Deep Tech

Our findings indicate that foundational approaches to incubation such as providing office /lab space, mentorship, assistance with investor relations, and guidance on intellectual property development and protection serve as essential building blocks for supporting deep tech startups. However, for deep tech incubation to be truly effective, we believe an incremental increase in the intensity of support will be necessary. Ideal supports include specialized mentorship, technical resources, funding access, networking opportunities with deep tech entrepreneurs, industry experts, potential partners and customers, regulatory guidance, and market validation. By incorporating these enhanced support mechanisms, we envision a more effective incubation environment that can better address the unique challenges faced by deep tech start ups and facilitate their successful growth and commercialisation.

c. Identification of Existing Training Best Practices on Supporting Deep Tech Commercialisation

Cyber Innovate at Munster Technological University and BioInnovate in Galway represent two exemplary training programmes that effectively support deep tech commercialisation in Ireland. Both initiatives emphasize interdisciplinary collaboration, bringing together expertise from various fields to foster innovation. Cyber Innovate focuses on the rapidly evolving cyber security sector with BioInnovate concentrating on the biotechnology and medical device sectors.

5 | CONCLUSION

Summary of the Main Findings of the Research Phase

In conclusion, our research, which included comprehensive literature review, structured interviews, and insights from a round table discussion, has highlighted the complexities and challenges inherent in deep tech commercialisation. These challenges underscore the critical need for more intensive pre-incubation, incubation and acceleration programmes specifically tailored for deep tech start-ups. At MTU, our investigations involving staff and independent eternal stakeholders revealed that deep tech ventures often experience protracted timelines, sometimes extending up to ten years, due to the intricate nature of the projects and the risk-averse tendencies of financial backers, which complicate fundraising efforts.

Furthermore, the diverse skill sets required for successful deep tech ventures necessitate the inclusion of technical, marketing, and managerial expertise from the outset. Additionally, the distinctive characteristics of deep tech products demand a stringent focus on intellectual property rights and protection to safeguard innovations. Our research underscores the importance of collaboration with established deep tech industry sectors, which in the Irish context are likely to include larger multinational firms possessing relevant expertise and experience.

To maximize the effectiveness of deep tech incubation programmes, we advocate for a cooperative approach that fosters the development of a jointly resourced regional programme, rather than a fragmented effort among individual institutions. Such collaboration is likely to yield more favorable outcomes for deep tech ventures, enhancing their potential for success in the competitive landscape of innovation and commercialisation. By addressing these key areas, we can better support deep tech entrepreneurs and contribute to the growth of this vital sector in Ireland.

6 | APPENDIX

Interviewee and Roundtable Discussion's Profiles

Participants in the interviews and roundtable discussion comprised of a diverse and dynamic group including deep tech researchers, incubator staff, deep tech entrepreneurs, commercialisation specialists and venture capital experts. Contributions from this wide range of experts fostered a collaborative environment encouraging engaging discussions and diverse opinions leading to productive outcomes.

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