



Space 2040 The global space economy is set to reach €1 trillion by 2040 - the commercial space race has begun

Skills development to harness space opportunities



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According to the Department of Business, Enterprise and Innovation, jobs in Irish companies with European Space Agency (ESA) contracts are expected to almost double from 4,500 in 2020 to 8,000 by 2025.

However, despite the enormity of the opportunity that space commercialisation offers, many businesses remain unaware of its likely impact on their sector, and potentially lack the skills and knowledge necessary to participate to their full potential. To avoid missing out, businesses need to act now to understand the commercial space value chain and upskill as necessary to push their potential for value creation.

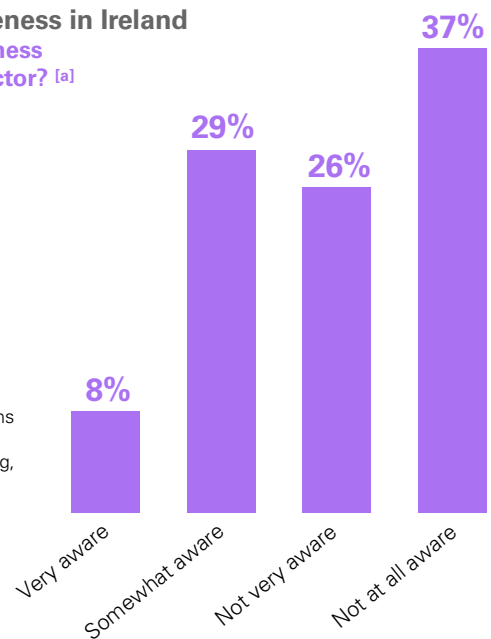


Commercial space awareness in Ireland

What is your level of awareness of the commercial space sector? [a]

Sources: [a] KPMG Space Commercialisation Survey. Fieldwork conducted from 04-April-2023 to 26-March-2023.

Sample size: 38 Irish organisations across sectors such as IT and software, advanced manufacturing, engineering, and health and life sciences.



Where is the opportunity?

We see a broad opportunity set for Irish industry in commercial space. In particular, we think businesses operating in Ireland's highly-developed agriculture, manufacturing, IT, logistics and transport sectors can develop a wealth of novel business models, particularly in the midstream (ground-based support of space hardware) and downstream (exploitation and application of space data) sections of the value chain.

It's important to stress that businesses entering the commercial space ecosystem aren't required to be 'space companies' in the conventional sense. Rather, they have the opportunity to use space-derived technologies and data to hone and improve existing

services and products, as well as develop new revenue streams from servicing space-based enterprises with their traditional products and offerings. Obvious examples would be the scope we see for manufacturers to exploit space tech to manufacture precision agriculture products, or for farmers to use these products to grow production. Likewise, there are clear opportunities for utilities, transport, manufacturers, and any major asset owners to employ satellite data to protect assets and optimise their usage, as well as verify supply chain claims.

For the vast majority of businesses, however, upskilling and knowledge acquisition will be a prerequisite to taking advantage of these opportunities.

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Where are the skills gaps?

Unsurprisingly, companies looking to harness space data, or tailor existing service solutions for space-based activity, often require high levels of technical skill and deep sector knowledge.

Specific skills gaps will vary by enterprise, but at the industry level we believe they are most likely to arise in:

- Software and data analytics
- AI and machine learning
- Data analytics
- Systems engineering
- Spacecraft operations
- Electronics design
- Aero/mechanical design
- Commercial operations
- Lightweighting
- Materials selection
- Telecommunications

According to Ireland's Department of Enterprise, Trade and Employment, specific upstream skills gaps include quality assurance for space projects, testing for space hardware and programming training for software. Downstream, they cite Earth Observation (EO) data analytics and developing EO data applications. In Ireland, the Space Industry Skillnet is one of the main public bodies for coordinating efforts to meet these gaps via training courses, whilst Enterprise Ireland can guide companies looking to access ESA expertise or engage with relevant EU Space programmes.

For example, EIRSAT-1, Ireland's first satellite, is being developed by University College Dublin and has been implemented through the 'Fly Your Satellite!' programme via ESA's Education Office providing students hands-on experience in building satellites.

Similarly, NI could leverage local and wider GB higher education institutions (HEI), Invest NI and Enterprise Northern Ireland to address these gaps.



“ Translating graduates' knowledge and skills from STEM disciplines into the space sector can be achieved through PhD research, for more specialised skills, or through micro-credential, Certificate, Diploma and Masters pathways. Universities, in collaboration with industry, can ensure the curriculum addresses key skills gaps and needs. Often students are not aware of the range of career opportunities in the space sector, and these are evolving rapidly. Third level institutions play a key role in broadening awareness through their undergraduate programmes, recruitment and outreach campaigns, and through their inspiring space and astrophysics research. ”



Prof Lorraine Hanlon
Director,
UCD Centre for Space Research

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What needs to happen?

Addressing these gaps is a matter of urgency and requires a systemic response. In the short term, proactive businesses can make greatest progress through:

- Informing themselves on space technologies and their potential impact in their sector and on their business;
- Direct upskilling of existing staff with relevant technical and commercial skills, via courses, seminars, and interaction with the space industry;
- Developing a network in the commercial space ecosystem, by attending relevant space sector events and collaborating with sector bodies, such as Space Industry Skillnet and Invest NI;
- Appointing internal champions for oversight of space industry developments and pursuit of opportunities.

Better-resourced companies may take inspiration from examples such as Airbus, which is creating its own conversion courses at its Defence and Space Engineering Academy to bring people with engineering and science backgrounds into space^[b]. Further up the human resource supply chain, its bespoke careers truck carries out hiring events and outreach across Europe to educate prospective recruits about space opportunities^[c].

Northern Ireland is uniquely positioned to play in the upstream space sector, with an existing aerospace supply chain and the presence of a space prime manufacturer. Northern Irish

universities should consider how to produce high quality graduates to support this industry from downstream to upstream. The existing aerospace supply chain should consider the space diversification opportunity as a priority and consider how to upskill their workforce to play in the space industry.

Another small island nation to have made substantial progress in space in recent years is New Zealand, which has developed a small but viable upstream and downstream space economy. New Zealand founded its Space Agency in 2016, and has invested significantly in skills via its University of Auckland-based Space Systems Institute, which undertakes applied research in space science, engineering, and applications of space data, as well as educational activities meant to shape the next generation of scientists and engineers^[d]. Government funding has also been actively channelled into the use of space data for public ends, encouraging relevant skills acquisition and diffusion^[e].

In Ireland, the government is currently consulting on a Detailed Description of Needs (DDN), whose purpose is to inform the development of space-focused programmes and courses, but this has yet to be delivered. Meanwhile the UK published its Space Sector Skills Survey report earlier this year (2023), and has committed £15m over the coming two years to education, skills, and outreach interventions via the UK Space Agency^[f].

Whilst the island of Ireland addresses these requirements, it is clear that its HEIs can help significantly by:

- Developing courses targeted at upskilling specific industries to harness space sector technologies.
- Developing postgraduate conversion courses and undergraduate modules focused on space sector knowledge and applicable skills.
- Raising awareness of the disruptive potential and employment opportunities in the space sector.
- Publicising space education resources such as the Copernicus Academy, European Space Education Resource Office (ESERO) Ireland, Low Frequency Array (LOFAR) telescope and European Southern Observatory (ESO).

Businesses can also catalyse the role of HEIs by engaging with them directly, whether to participate in outreach, events, or careers fairs, or to offer internships, PhD sponsorships, competitions, or scholarships.

[b] <https://www.aerosociety.com/media/20336/aerospace-magazine-march-2023.pdf>

[c] <https://www.airbus.com/en/careers/hiring-events?fbclid=IwAR02ZeCm3NZAPEYra-NNQ39avFpp5KlnZfhVXqe2kPGUGG4RZREZxtzMBMI>

[d] <https://space.auckland.ac.nz/>

[e] <https://www.oecd-ilibrary.org/sites/12b61b3c-en/index.html?itemId=/content/component/12b61b3c-en>

[f] <https://www.gov.uk/government/news/uk-space-sector-has-sights-set-on-artificial-intelligence-and-machine-learning-professionals>

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Develop a skills strategy

We believe businesses in all sectors can improve existing products and services, as well as develop new revenue streams, by plugging into commercial space. For the majority, doing so will require a strategy to acquire skills, knowledge, and relationships they currently lack.

At a minimum, businesses should aim to inform themselves about commercial space technologies and identify looming threats and opportunities they pose. Armed with this baseline information, they can be clear about skills gaps specific to their potential use cases and train or hire tactically with those gaps in mind. Given the extreme pace of sectoral development, the time to begin this process is now. Such efforts must take place as part of a broader skills focus, including:

National Policy Makers

- Accelerate efforts to draw up both Ireland's and Northern Ireland's detailed description of needs for the space industry, to form a clear basis for the provision of training, education, and placements.
- Publicise space opportunities and the existence of the government's National Space Strategy.
- Increase funding available for space-related R&D and education.

Academic Institutions

- Fast-track the development and delivery of practical space courses at undergraduate, diploma, and postgraduate level.
- Promote understanding of STEM applicability in space, and commercial space career prospects.
- HEIs should deepen ties with industry active in the space value chain across the island, and vice versa, facilitating the swift commercialisation of space tech research and the stimulation of innovation.

Investors

- Review existing portfolios to identify companies that could benefit from a space sector play, based on practicality and viability of adapting their technologies for space applications or adopting space data for downstream applications.

Private Enterprise

- Clearly identify skills, knowledge, and relationships lacking to understand and seize opportunities to enter the commercial space value chain.
- Engage with Space Industry Skillnet and STEM schools and universities across the island to promote skills acquisition via training and courses.
- Deepen collaboration and relationship building with HEIs active in the space value chain across the island, to facilitate relevant knowledge and skills acquisition, whether through internships, PhD sponsorships, outreach, or other means.

“The commercialisation of the space race means significant economic opportunities for a range of sectors globally. For regions and countries to benefit directly from the space economy, however, basic science education needs greater emphasis in school curricula, along with specialised university training. The good news is that space as a topic can be a great entry point for wider scientific interest in the next generation, as shown by the number of young people visiting space research, education, and outreach centres such as ours. Our aim is to leverage our internationally respected astronomical research capabilities in the interest of wider and deeper public awareness and understanding of the importance of space.”



Prof Michael Burton
Director,
Armagh Observatory
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