AN INSTITIÚID UM THAIGHDE EACNAMAÍOCHTA AGUS SÓISIALTA
ESRI ECONOMIC & SOCIAL RESEARCH INSTITUTE

Skill requirements for emerging technologies in Ireland

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Research rationale

- In a rapidly changing world experiencing global megatrends, economies and their labour markets need to anticipate change at a sharper pace in order to strengthen adaptive capacity and competitiveness.

- New technological developments have the potential to substantially raise productivity levels within labour markets and it is important that education and training policy is proactive in equipping students and workers to take full advantage of technological progress.

- Conventional approaches to skills anticipation/intelligence gathering, based on historical administrative and survey data, are less effective, given the fast development and adoption rate of technological change.

Goals of the Research

- We wanted to develop a dynamic methodological framework: to identify relevant areas of emerging technology for the Irish labour market, to assess the current nature and composition of labour demand, and demand/supply forecasts.

- The results provide valuable evidence that can be utilised as a key input into any national skills strategies and any education programmes reform, designed to ensure that the growth of employment in emerging technologies will not be restricted as a consequence of skill mismatches.

- A key objective was to produce a framework that is highly replicable and can be implemented periodically to monitor variations in technologically driven labour demand, so that policy can be fully informed of, and reactive to, changing labour market conditions.

Areas of Emerging Technologies Considered

We aim to assess both the level and nature of labour demand for jobs in three '*Emerging technologies*': **Automation, Artificial Intelligence and Blockchain**.

- Artificial Intelligence, Automation and Blockchain were identified as areas of emerging technology with the greatest employment implications for Ireland (job portals monitoring).

- Research builds on previous work on modelling the demand for Blockchain workers at an EU level (CHAISE project).

Key Contributions

- In-depth analysis of job advertisement trends for emerging technology jobs in Ireland;
- Demand and supply forecasts at graduate level in the medium-term for emerging technology jobs;
- Skill requirement analysis for technical, transversal and business skills for AI, Automation and BC jobs (to inform curricula development);
- Measurement of potential skill shortages in a particular emerging technology area and correlated job characteristics;
- Expert consultations to verify our findings and unpack the perceptions of emerging technology employers.

Data Sources

DEMAND

Job advertisement data

- Lightcast Data
- LinkedIn Scraped Data

(tailored Python Programme- 6 months scraping)

CEDEFOP Skills Forecast data

SUPPLY

Data from HEA, SOLAS and QQI on relevant course graduations 2018-2022

Consultation workshop with employers from emerging technology areas

Trends in online job postings and occupations - Lightcast Data

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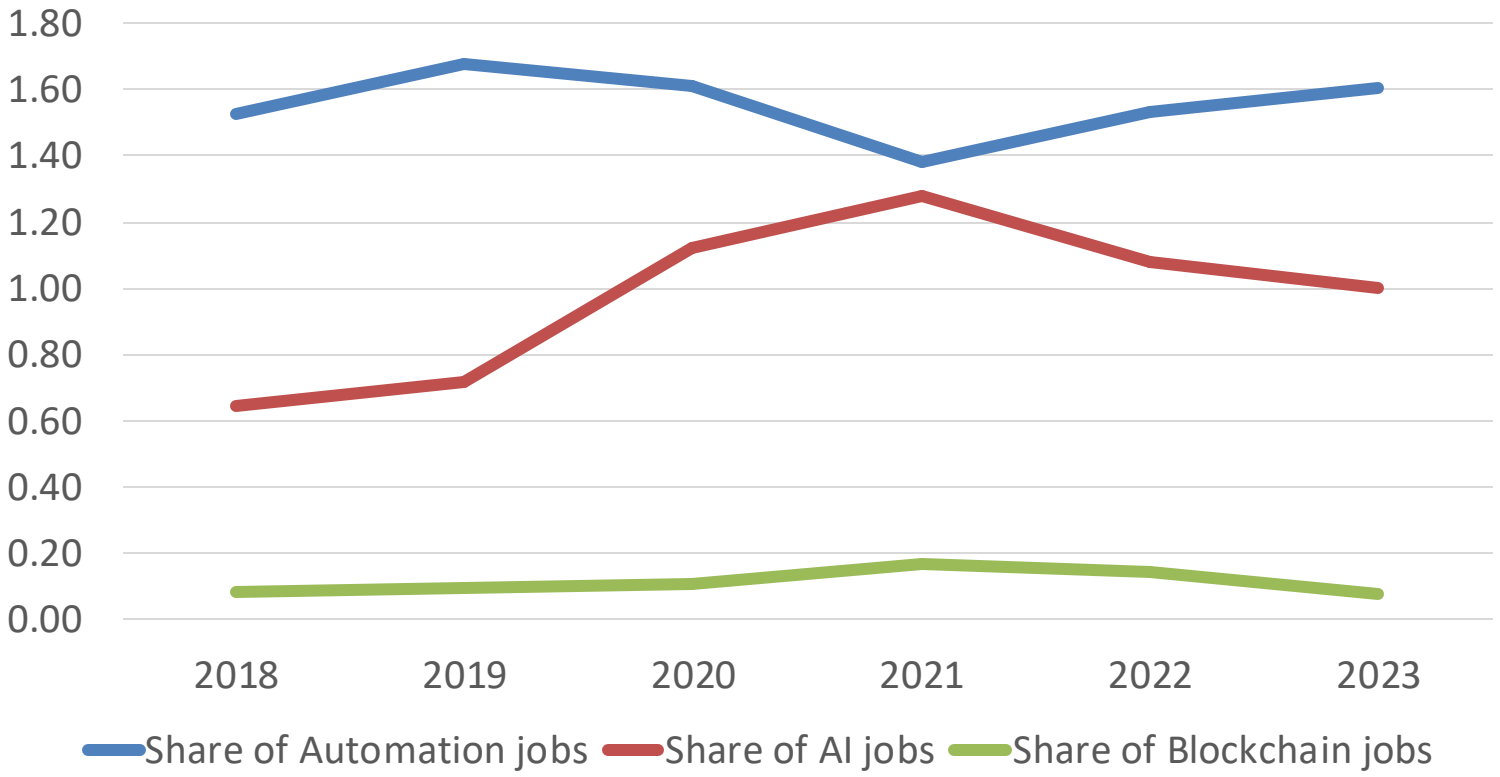
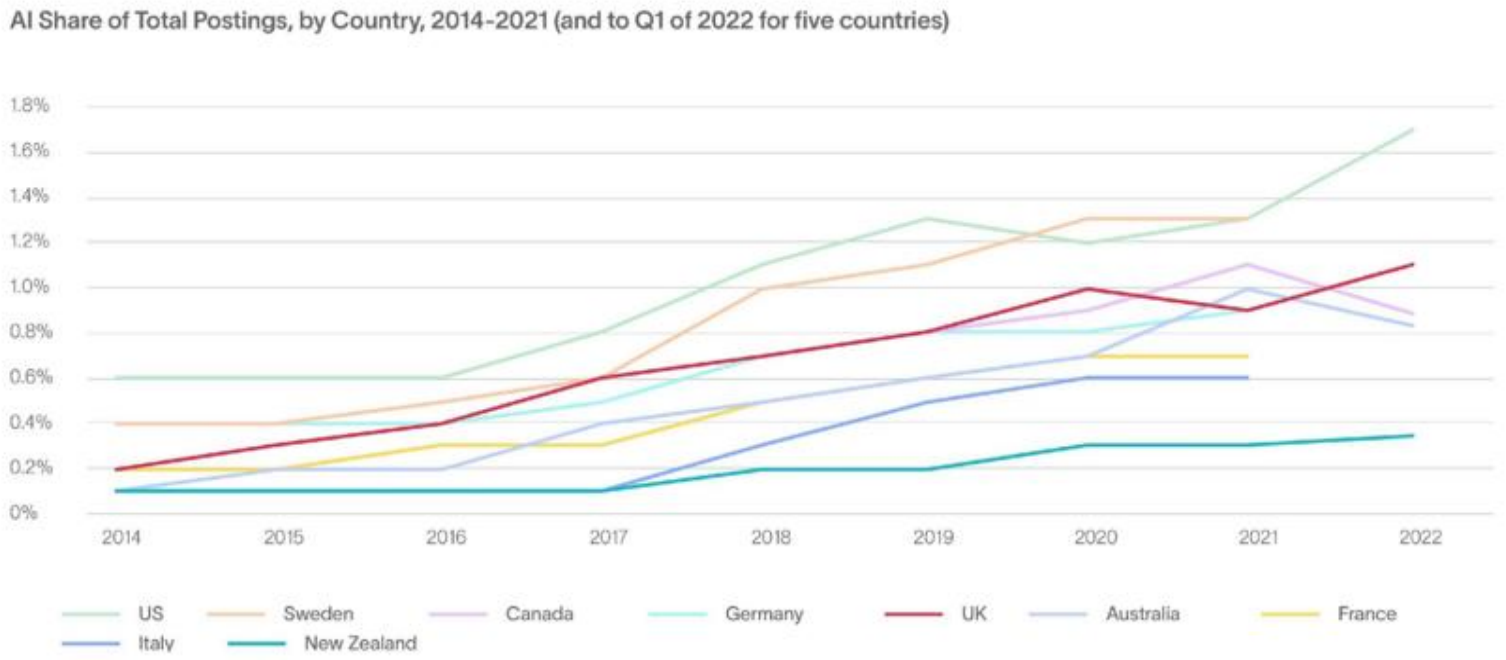
Shares (%) of Total Job Postings Related to Emerging Technologies (Lightcast, 2018-2023)



International comparison on AI jobs growth



Source: Lightcast Job Posting Analytics

Lightcast

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Demand and Supply Forecasting Model for AI, Automation and Blockchain jobs

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Demand Forecasting Methodology

- We calculate the shares of emerging technology-related advertised jobs in each ISCO occupation category advertised jobs (2021 Lightcast data as anchor year).
- We apply the shares to the CEDEFOP occupational Skills Forecast data/ LFS data.
- We forecast labour demand at graduate/entrant level for AI, Automation and Blockchain jobs over 2021-2025 and 2025-2030.
- Based on our analysis of Lightcast data, we assume that approximately 40% of new jobs will be at the new entrant level.

AI Jobs Demand, Lightcast 2021

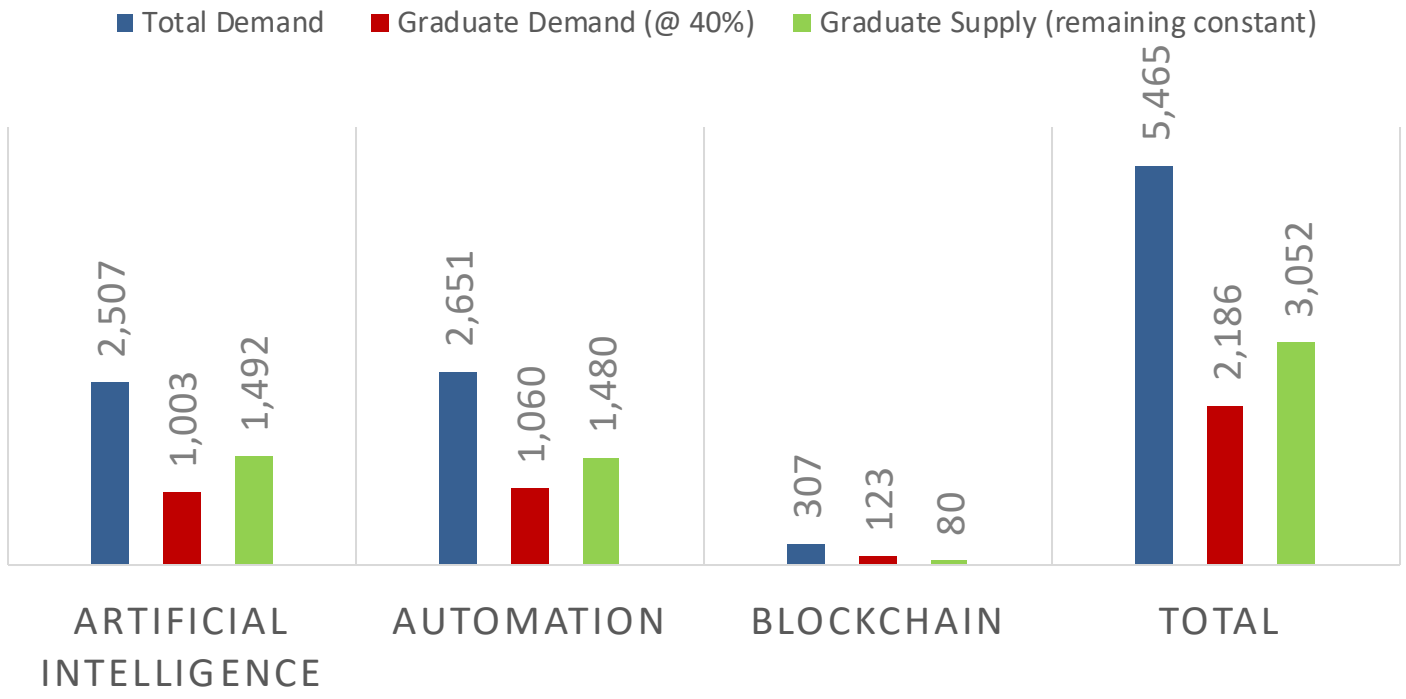
ISCO code	ISCO occupation	Freq	%
25	Information and Communications Technology Professionals	4,080	32.57
21	Science and Engineering Professionals	1,497	11.95
24	Business and Administration Professionals	1,445	11.53
12	Administrative and Commercial Managers	939	7.50
26	Legal, Social and Cultural Professionals	612	4.89
31	Science and Engineering Associate Professionals	396	3.16
74	Electrical and electronic trades workers	359	2.87
42	Customer Services Clerks	320	2.55
33	Business and Administration Associate professionals	311	2.48
81	Stationary Plant and Machine Operators	294	2.35
	Other	2,275	18.15
	TOTAL	**12,528**	**100**

Supply Forecasting Methodology

- Number of graduates from AI, Automation and Blockchain-related courses (data from HEA, SOLAS and QQI).
- Assuming number of graduates remain constant, similar to 2020-2021 average.
- Limitation: estimation framework cannot take into account inward/outward migration.

	2020	2021	Average per year	FORECAST 2021-2025
AI	390	344	373	1,492
Automation	329	410	370	1,480
Blockchain	15	25	20	80

Demand and Supply Forecasts for 2021-2025



Labour market demand for new entrants is currently being met by supply projections.

Skill Requirements for Emerging Technology Jobs

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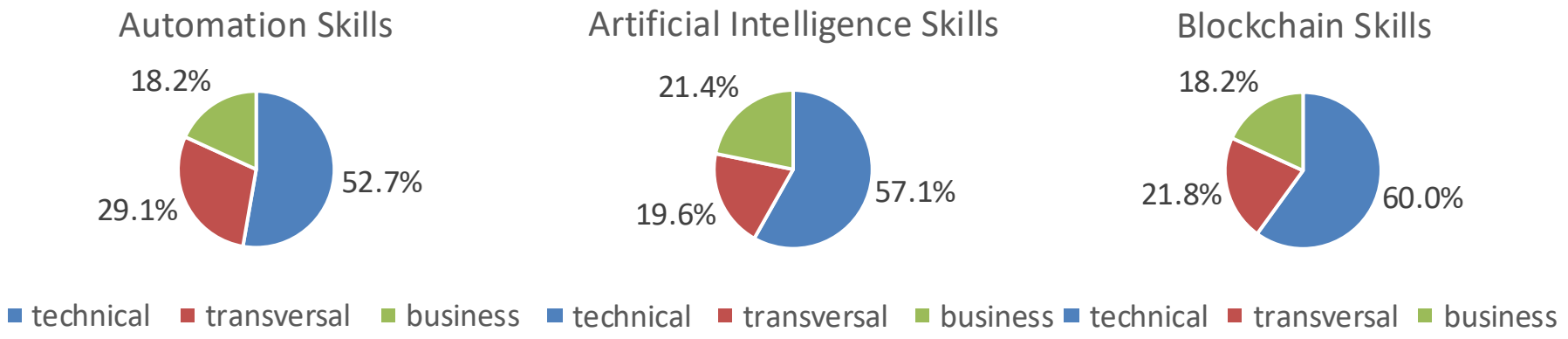
Skill Requirements - Methodology

- Lightcast's Skills Taxonomy: it captures all the skills mentioned in the job postings' description.
- Able to extract how many times a skill appears across all job postings related to AI, Automation and Blockchain: rank from the most common to the least common skill required.
- Three categories: **Technical** ('hard' skills), **Business** (business capabilities), and **Transversal** ('soft' skills).

Aim of the analysis: inform any national skills strategies and any curriculum development reform programme.

Skill Requirements by Category



Employers place much emphasis on technical competencies, but there is a significant demand for workers to also be equipped with non-technical skills (in line with OECD, 2023).

Technical Skills by Emerging Technology

Black: technology specific
Orange: common to 2 technologies
Green: common to 3 technologies

Automation

Skill	Frequency
Control systems	0.34
Programmable logic controllers	0.26
Building automation	0.24
Pharmaceuticals	0.21
Good manufacturing practices	0.19
Supervisory control and data acquisition (scada)	0.18
Systems engineering	0.14
Electrical engineering	0.12
Commissioning	0.12
Hvac	0.10

Artificial Intelligence

Skill	Frequency
Machine learning	0.61
Python (programming language)	0.38
Computer science	0.33
Data science	0.22
Agile methodology	0.20
Sql (programming language)	0.19
Data analysis	0.19
Amazon web services	0.18
Software engineering	0.16
Software development	0.15

Blockchain

Skill	Frequency
Agile methodology	0.31
Amazon web services	0.24
Microsoft azure	0.21
Devops	0.20
Java (programming language)	0.20
Kubernetes	0.19
Computer science	0.18
Software engineering	0.18
Software development	0.17
Application programming interface (api)	0.17

Business Skills

Black: technology specific
Orange: common to 2 technologies
Green: common to 3 technologies

Automation

Skill	Frequency
Management	0.32
Operations	0.25
Project management	0.25
Customer service	0.13
Sales	0.08
Process improvement	0.06
Procurement	0.06
Training and development	0.05
Time management	0.05
Change management	0.04

Artificial Intelligence

Skill	Frequency
Management	0.24
Customer service	0.16
Sales	0.16
Operations	0.16
Project management	0.12
Marketing	0.09
Business development	0.08
Business intelligence	0.07
Product management	0.06
Workflow management	0.06

Blockchain

Skill	Frequency
Management	0.22
Project management	0.19
Operations	0.19
Sales	0.11
Marketing	0.09
customer service	0.08
Customer relationship management	0.08
Workflow management	0.08
Stakeholder management	0.07
Business development	0.07

Transversal Skills

Black: technology specific
Orange: common to 2 technologies
Green: common to 3 technologies

Automation

Skill	Frequency
Communications	0.43
Problem solving	0.22
Troubleshooting (problem solving)	0.21
Planning	0.16
Leadership	0.14
Self-motivation	0.13
Interpersonal communications	0.12
Detail oriented	0.11
Innovation	0.10
Investigation	0.08

Artificial Intelligence

Skill	Frequency
Communications	0.42
Research	0.21
Problem solving	0.20
Innovation	0.19
Leadership	0.17
Writing	0.13
Detail oriented	0.12
Planning	0.10
Presentations	0.10
Self-motivation	0.10

Blockchain

Skill	Frequency
Communications	0.48
Problem solving	0.22
Self-motivation	0.22
Leadership	0.20
Innovation	0.19
Consulting	0.15
Planning	0.15
Detail oriented	0.15
Coaching	0.13
Writing	0.13

Modelling Potential Skill Shortages

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LinkedIn data

LinkedIn jobs scraped from May to October 2023.

Over 2,000 adverts: 53% in Automation, 30% in AI and 17% in Blockchain.

Measure of potential skill shortage, potentially 'hard-to-fill' vacancies: duration >=30 days and applications <10.

	AI	Automation	Blockchain
Average duration	10.1	11.5	9.4
Average applications	33.0	39.2	49.0
% potential shortage	5.8	7.7	3.9

Potential Skill Shortages- Results

- No evidence that the incidence of potential skill shortages is statistically higher in any of the emerging technology areas.
- Where recruitment difficulties do exist, they are more common in Automation posts for entry level positions.
- Potential shortages for ‘AI’ in Manufacturing.
- Remote/hybrid working arrangements is a factor in reducing potential skill shortages in Automation.

Consultation Workshop with Employers in Emerging Technology Areas

Validation of our results, risk factors and future changes and developments

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Focus Group- Main Findings I

- Methodological approach and forecasts validated by employers; however, high levels of uncertainty regarding the development and adoption of AI could result in levels of demand exceeding that predicted by our research.
- Substantial amount of legal and ethical/privacy requirements arising from the forthcoming regulatory environment (the EU Artificial Intelligence Act): demand for people who can implement change within organisations (legal professionals) and interact with the regulators. The application of the new regulations will require changes in the skill sets of workers in the impacted fields.
- Policy needs to be prepared for assisting organisations to implementing change that will occur at a national level across a whole range of dimensions related to AI.

Focus Group- Main Findings II

- The importance of transversal skills and work experience (entry-level employees in the post-COVID era with greater difficulties in adapting to the workplace).
- More emphasis on business capabilities within courses that teach students how to adapt new technologies into a business environment.
- Micro credentials were seen as a valuable tool for fostering lifelong learning and upskilling, and they can be concentrated in a relatively short time period.
- The need for industry and education institutions to collaborate more closely to smooth the transition from education to employment.

Conclusions

Conclusions I

- This research involved the development of a methodological framework that enabled us to identify relevant areas of emerging technology for the Irish labour market, in order to assess the current nature and composition of labour demand for these technologies, including the incidence of a potential skill shortage occurring.

- The key objective was to provide information and data that will allow policy makers to act proactively to avoid the emergence of skill shortages and skill gaps in key areas of emerging technologies. The research provides information for the planning of university places and curriculum development.

Conclusions II

- The research indicates that Ireland is currently well placed in terms of place provision for emerging technologies, however, significant challenges remain, particularly in relation to helping employers adjust to forthcoming changes in the regulatory environment and make sure people are provided with the right skills.

- A key value of the present research is its development of a dynamic methodological framework that is highly replicable. As such, it can be implemented periodically to monitor variations in technologically driven labour demand, so that policy can be fully informed of, and reactive to, changing labour market conditions.

Thank you for the attention!

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