

# Skills in Age of AI: Shaping Ireland's Path to a Future-Ready Workforce

**Inter-Agency Working Group (IAG) Workshop on the Trends and Impact of AI in the Labour Markets and Skills Needs**

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# Skill Requirements for Emerging Technologies in Ireland

- Presentation draws on recent ESRI research funded by our Department of Further and Higher Education, Research, Innovation and Science (DFHERIS), building on methodologies developed during the CHAISE project (EC, Erasmus+)
- Aim: To explore how emerging technologies are reshaping labour market demands, highlighting the balance of technical, transversal, and business skills needed to support workforce adaptability

# ESRI and DFHERIS Programme Agreement

- In Ireland, a high-skilled labour force has allowed for strong economic growth over the last few decades
- Country's ability to exploit emerging technologies and other innovations depend on the existence of an adequately skilled labour force
- Policymakers require tools that allow them to be proactive in the face of changing labour market requirements, to avoid future skills shortages and gaps

# Key Findings

- Labour demand vs. graduate supply: Medium-term outlook shows Irish universities are meeting new-entrant demand in terms of numbers for AI, automation, and blockchain related roles
- Breakdown of skill requirements: 50–60% technical competencies (e.g., machine learning, programming languages); 20–30% transversal skills (e.g., problem-solving, communication); 20% business skills (e.g., project management, regulatory awareness)
- High degree of overlap in required skills across ‘emerging tech’ roles
- Need to integrate content into wider curricula for well-rounded skill development across all levels and fields (‘modules rather than masters’)

# Introduction I

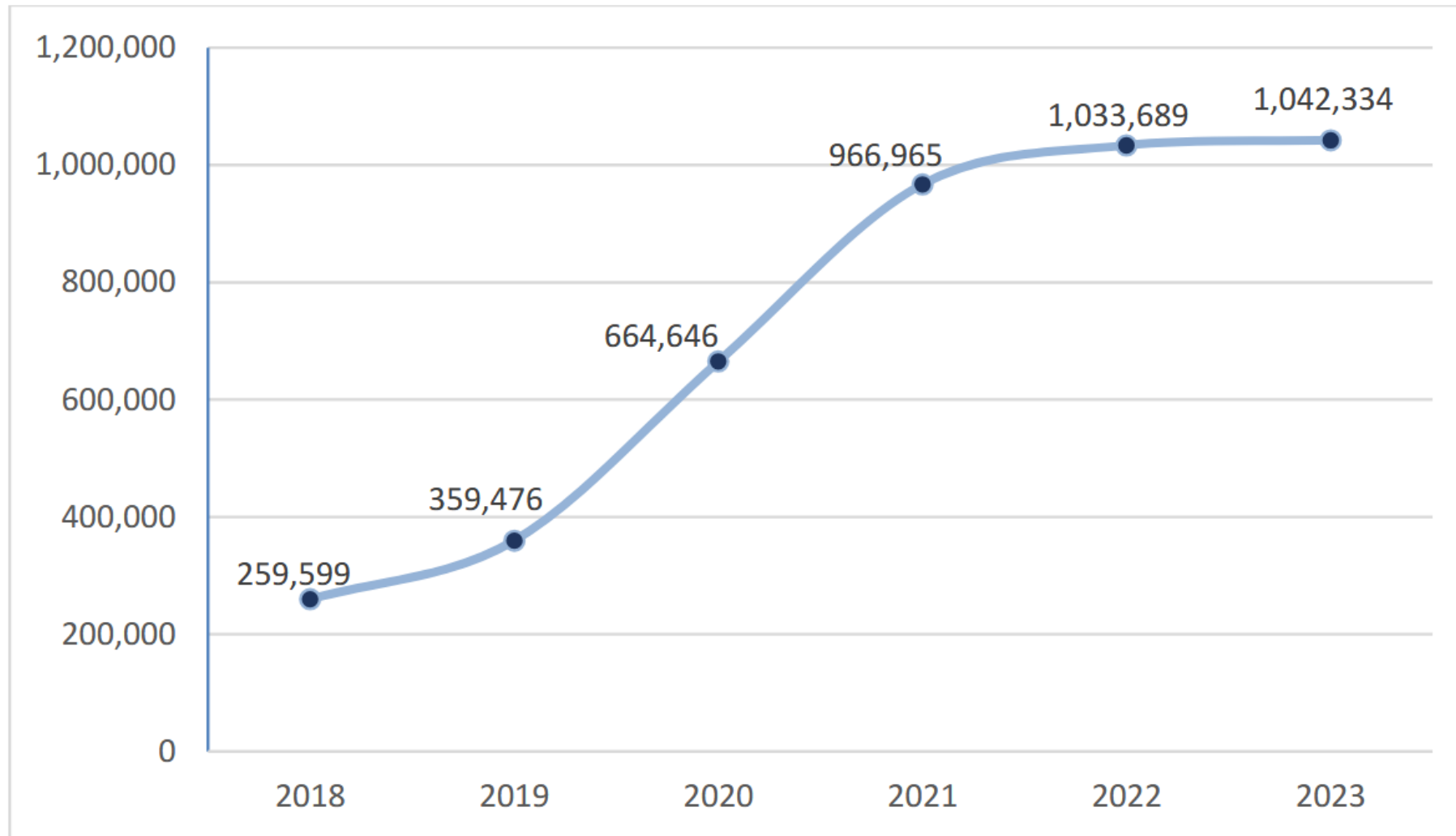
Using **recent online job vacancy advertisements** (Lightcast & LinkedIn), we analyse the type of jobs and skills that are becoming more important in Ireland in the agreed fields of emerging technologies:

- **Artificial Intelligence**
- **Blockchain**
- **Automation**

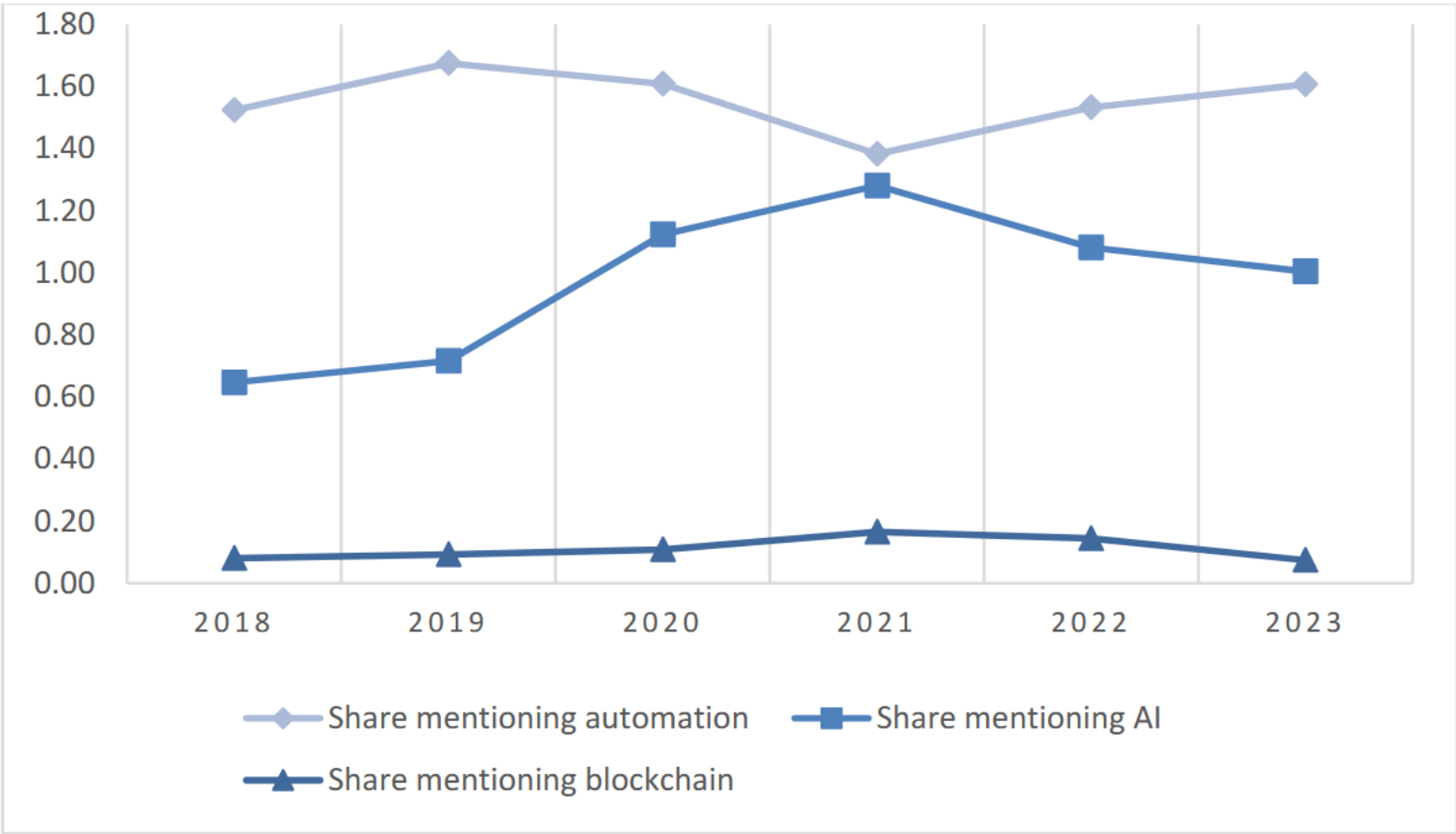
# Context

- ‘Automation’ skills have a long history of demand and remain important; AI represents a new wave of more advanced automation
  - In 2023, general ‘automation’ had a slightly higher share of job postings (1.5%) than AI (1%) in Ireland
  - In contrast, ‘blockchain’ saw a burst of interest that has largely receded (0.2%), indicating that not all ‘tech trends’ sustain high demand
  - Note that combined they remain a small share of total hiring
    - Limitations: Uncertainty of trajectory of emerging technologies; Advertised jobs include new AI-related roles and/or replacement jobs, however, existing jobs also require AI skills (upskilling across a range of basic to advanced skillsets)

# Absolute Number of Job Postings for Ireland (Lightcast, 2018-2023)



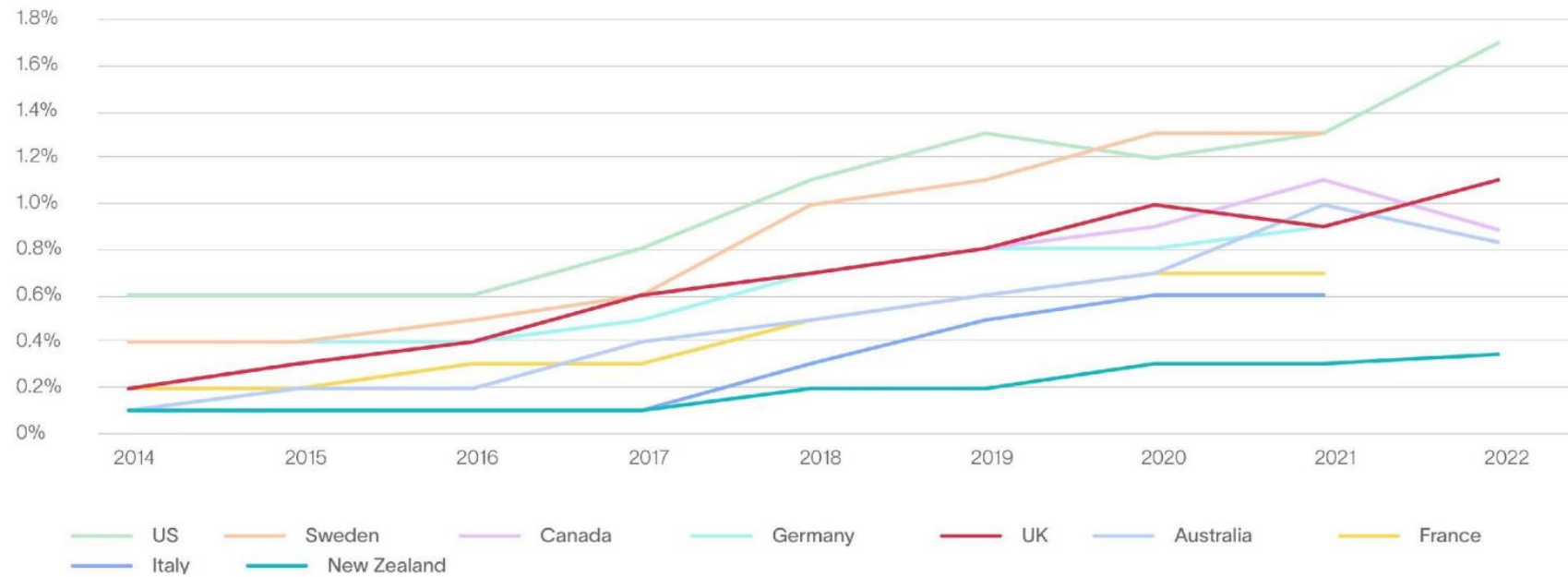
# Shares (%) of Total Job Postings in Ireland Related to Emerging Technologies (Lightcast, 2018-2023)



# AI Postings in Other Countries

## International Comparison of AI Adoption

AI Share of Total Postings, by Country, 2014-2021 (and to Q1 of 2022 for five countries)



Source: Lightcast Job Posting Analytics



# FORECASTING METHODOLOGY

## DEMAND

- Using job adverts with keywords (e.g. Blockchain) and mapping them using job title and descriptions to specific ISCO occupational categories
- Proportion of each of ISCO categories that are Blockchain jobs
- CEDEFOP employment forecasts for each occupational category

## SUPPLY

- Proportion of BC graduates from total graduates in BC related fields of study such as ICT
- Forecasts for 2020-2026 using linear trends sourced from 2015-2020 Eurostat Data



# DEMAND – JOB ADVERTS

## Lightcast Data

# AI Jobs, Ireland, 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
	<b>TOTAL</b>	<b>12,528</b>	<b>100</b>

Sample of companies include Amazon, Apple, Deloitte, Dublin City University, Google, IBM, Intel, Johnson & Johnson, Meta, Microsoft, NUI Galway, Qualcomm, UnitedHealth Group, UCD

# AI Jobs, Ireland, Lightcast 2024

ISCO code	ISCO occupation	Freq	%
25	Information and communications technology professionals	4375	32.56%
21	Science and engineering professionals	2661	19.80%
12	Administrative and commercial managers	1532	11.40%
24	Business and administration professionals	1528	11.37%
26	Legal, social and cultural professionals	805	5.99%
13	Production and specialised services managers	381	2.84%
33	Business and administration associate professionals	341	2.54%
23	Teaching professionals	299	2.23%
31	Science and engineering associate professionals	264	1.96%
41	General and keyboard clerks	183	1.36%
35	Information and communications technicians	165	1.23%
75	Food processing, wood working, garment and other craft and related trades workers	151	1.12%
11	Chief executives, senior officials and legislators	124	0.92%
	Other	626	4.68%
	<b>TOTAL</b>	<b>13,435</b>	<b>100</b>



# SUPPLY

# Total ICT Graduates, 2015-2023

- Eurostat figures showing substantial increase in numbers over time at a rate significantly above the EU average

Country	2015	2016	2017	2018	2019	2020	2021	2022	2023	Increase 2015 to 2023
Ireland	4,449	4,851	5,275	6,251	6,271	7,154	7,011	7,221	7,437	67%
Total EU-27	122,852	117,288	122,547	123,211	135,080	143,210	152,383	156,493	167,623	36%

Source: Eurostat

# Supply Forecasting Methodology I

**Baseline Scenario:** Using Higher Education Authority data, assume that the numbers remain constant, similar to 2020-2021 number of graduates

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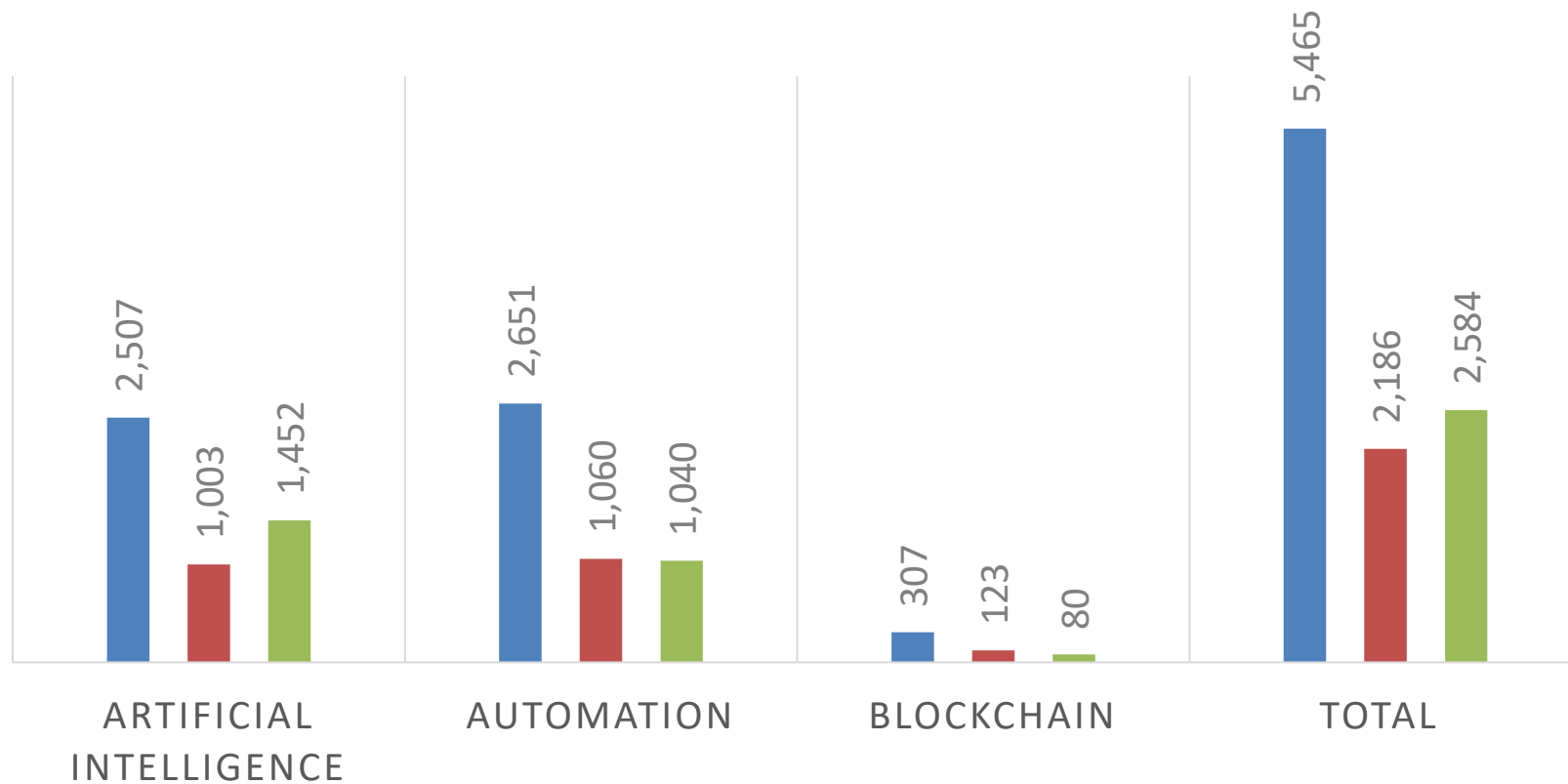
	2017	2018	2019	2020	2021	Average per year
<b>AI</b>	0	0	125	390	335	363

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*Source: HEA data for AI, Automation and Blockchain (HEA and non-HEA Institutions), SOLAS data for FET.*

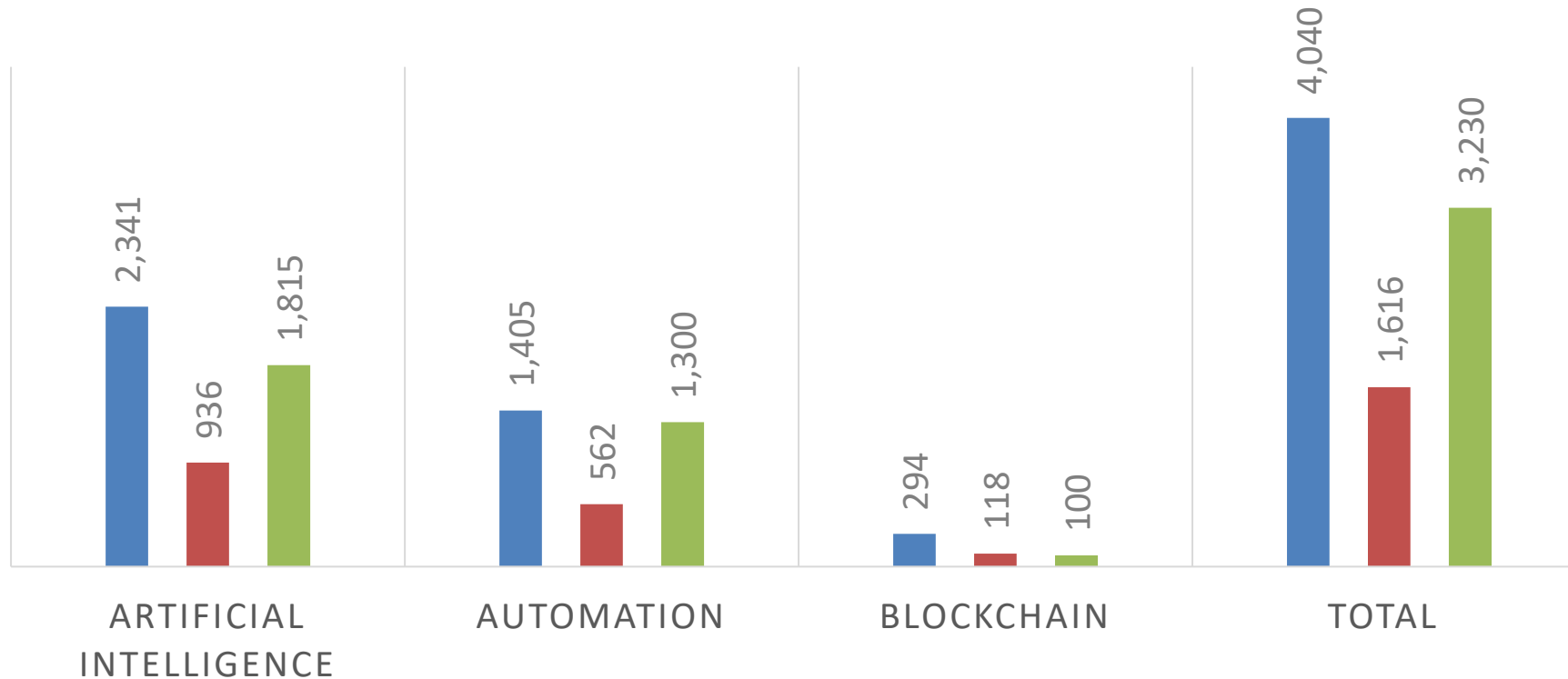
# Five-Year Demand and Supply Forecasts for Ireland, 2021- 2025

■ Total Demand ■ Graduate Demand (@ 40%) ■ Graduate Supply (remaining constant)



# Five-Year Demand and Supply Forecasts for Ireland, 2025-2030

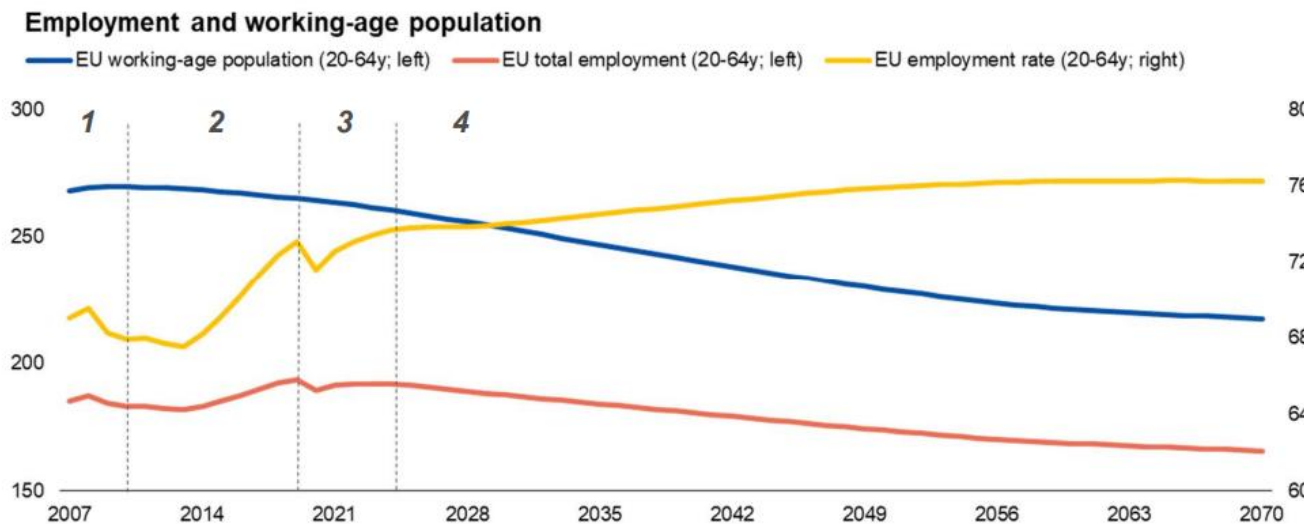
■ Total Demand ■ Graduate Demand (@ 40%) ■ Graduate Supply (remaining constant)



# Why decreasing forecasts in 2025-2030?

- **Lower CEDEFOP Skills Forecasts for relevant ISCOs** for 2025-2030, compared to 2021-2025
- **Long-term projections** in CEDEFOP Skills Forecasts employs data from 2021 Ageing report

## The employment outlook



Source: 2021 Ageing Report

1. until 2010: sluggish employment and slow growth in working-age population
2. 2011-2019: rising employment, working-age population started to decline
3. 2020-2023: impact of the Covid-19 crisis and subsequent recovery
4. as of 2024: both employment and working-age population decline

“As of 2024,  
both  
employment  
and working  
age population  
decline”

# What Skills do Emerging Tech Jobs Require?

- Beyond coding: rise of transversal and business skills; 40–50% of skills required for “AI” roles are soft skills
- Examples including critical thinking, adaptability, regulatory literacy (e.g., EU AI Act), working in teams
- Consultations with Ireland’s employers’ emphasis on cross-functional teams

# Methodology: Skills Requirements

Our dataset of Lightcast data from 2021 contains:

- 13,412 automation related job postings
  - 12,525 artificial intelligence related job postings
  - 1,591 blockchain related job postings
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- Using Python and machine learning techniques, we extract the most common skills required.
  - We mapped into into three categories: **Technical, Business, and Transversal**
    - Also, examined differences **across seniority levels**: entry, mid-senior and senior

# Technical Skills by Emerging Tech

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

\*Automation appears as skill in 34% of job postings

## 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

\*AI appears as skill in 51% of job postings  
 Automation appears as skill in 18% of job postings

## 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

\*Blockchain appears as skill in 90% of job postings  
 Automation appears as skill in 18% of job postings

# Technical Skills – an extension to 20 skills

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
Auditing	0.10
Computer science	0.10
Instrumentation	0.10
Human machine interfaces	0.09
Change control	0.09
Mechanical engineering	0.08
Continuous improvement process	0.08
New product development	0.08
Distributed control systems	0.07
Environment health and safety	0.07

## 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
Java (programming language)	0.15
mathematics	0.13
Microsoft azure	0.13
Scalability	0.12
Big data	0.12
Algorithms	0.12
R (programming language)	0.12
Application programming interface (api)	0.10
Devops	0.09
Javascript (programming language)	0.09

## 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
Financial services	0.17
Microservices	0.17
Python (programming language)	0.17
Scalability	0.16
Docker software)	0.16
Machine learning	0.14
Finance	0.14
Sql (programming_language)	0.14
Ethereum	0.13
Javascript (programming_language)	0.13

# 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

# Conclusions for Ireland

- Preliminary **five-year demand and supply forecasts for graduate jobs in emerging technologies appear broadly aligned in terms of numbers**
  - **Substantial increase in overall ICT graduates since 2015, at a rate significantly above the EU average**
  - **Long-term projections from CEDEFOP Skills Forecasts assumes that from 2024 both employment and working age population decline**
- In relation **to job adverts and modelling potential shortages**
  - **'Automation' posts have the highest number and share of job adverts**
  - **Potential shortages are currently greater for 'Automation' (particularly, new entrants) and for 'AI' in Manufacturing**
  - **Demand for new entrants in 'Blockchain' has fallen**
  - **Some variations by geographical locations**

# Conclusions: Skills Requirements I (Lightcast)

- Skill Requirements by Category: Approx. 50-60% of skills requested are 'Technical', 20-30% are 'Transversal', and 20% are 'Business', across emerging technology jobs examined
  - **Technical Skills:** Some overlap between artificial intelligence and blockchain; As we consider a higher number of skills, the overlap increases; Many skills are technology-specific
  - **Business Skills:** A wide skills overlap; some skills are common to Artificial Intelligence and Blockchain; Some are technology-specific (but less required)
  - **Transversal Skills:** High degree of overlap between the three emerging technology areas; Few skills that are technology specific

# Conclusions: Skills Requirements II (LinkedIn)

- Skill Requirements by Emerging Technology:
  - **Technical Skills** - stronger requirements for entry and mid senior level posts; some overlap at mid-senior level across all technologies
  - **Business Skills** - stronger requirements for senior level posts; high degree of overlap across all seniority levels
  - **Transversal Skills** - similar requirements across all seniority levels; some degree of overlap across all seniority levels

# Policy & Educational Implications

- Strengthening curricula to embed technical, business and transversal skills in STEM programmes; Establish a periodic monitoring framework (replicable methodology);
- High degree of overlap in required skills across ‘emerging tech’ roles
- Need to integrate content into wider curricula for well-rounded skill development across levels and fields
- Lifelong learning pathways to upskill current workforce through micro-credentials
- Stakeholder roles: government, universities, industry partnerships; Strengthening industry–university partnerships for continuous upskilling
- Provision of adequate education including the required skills accumulation: the present work will feed into skills development policy by DFHERIS

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# Automation Jobs, Ireland, Lightcast 2021

ISCO codes	ISCO occupation	Freq	%
21	Science and Engineering Professionals	5,719	42.81
31	Science and Engineering Associate Professionals	1,372	10.27
25	Information and Communications Technology Professionals	921	6.89
74	Electrical and Electronics Trades Workers	862	6.45
12	Administrative and Commercial Managers	686	5.13
24	Business and Administration Professionals	446	3.34
71	Building and related trades workers, excluding electricians	433	3.24
13	Production and Specialized Services Managers	322	2.41
	Other	2,599	19.46
	TOT	13,360	100

\*80 per cent of employment within these occupations

Sample of companies include Bristol-Myers Squibb, Google, Johnson & Johnson, Lotusworks, Pfizer

# Blockchain Jobs, Ireland, Lightcast 2021

ISCO code	ISCO occupations	Freq	%
25	Information and Communications Technology Professionals	517	33.46
24	Business and Administration Professionals	195	12.62
21	Science and Engineering Professionals	163	10.55
12	Administrative and Commercial Managers	154	9.97
26	Legal, Social and Cultural Professionals	100	6.47
13	Production and Specialized Services managers	51	3.3
74	Electrical and Electronics Trades Workers	43	2.78
81	Stationary Plant and Machine Operators	34	2.2
	Other	288	18.65
	<b>TOTAL</b>	<b>1,545</b>	<b>100</b>

Sample of companies include Ernst & Young, Deloitte, IBM, Accenture, Consensus Systems, Latoken, Coinbase, Citigroup, Crypto International Ltd., KPMG

# Supply Forecasting Methodology I

**Baseline Scenario:** Using Higher Education Authority data, assume that the numbers remain constant, similar to 2020-2021 number of graduates

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	2017	2018	2019	2020	2021	Average per year
AI	0	0	125	390	335	363
Automation	95	125	190	210	310	260
Blockchain*	0	0	0	15	25	20

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*Source: HEA data for AI, Automation and Blockchain (HEA and non-HEA Institutions), SOLAS data for FET.*

*NB: Additional work to be completed for supply estimates as accurately as possible*

# 2024– Top Ranked Skills for AI Jobs in Ireland

SKILLRANK	SKILL	SKILLCOUNT	% of ai jobs
1	work in teams	11683	86.94%
2	have computer literacy	11623	86.49%
3	teamwork principles	11074	82.41%
4	use microsoft office	10892	81.05%
5	adapt to change	10675	79.44%
6	create solutions to problems	9801	72.93%
7	manage time	9795	72.89%
8	problem solving	8587	63.90%
9	use spreadsheets software	7642	56.87%
10	brainstorm ideas	7451	55.45%
11	think creatively	7179	53.42%
12	assume responsibility	7077	52.66%
13	lead others	6845	50.94%
14	communication	6518	48.50%
15	computer programming	6321	47.04%
16	lead a team	6251	46.52%
17	business ICT systems	6239	46.43%
18	project management	6186	46.03%
19	develop creative ideas	5693	42.36%
20	e-learning	5570	41.45%
21	team building	5503	40.95%
22	tolerate stress	5370	39.96%
23	use office systems	5237	38.97%
24	think proactively	5228	38.90%
25	follow company standards	5028	37.42%
26	assist customers	4680	34.83%
27	keep company	4546	33.83%
28	manage quality	4145	30.85%
29	cloud technologies	4142	30.82%
30	think analytically	4137	30.79%

SKILLRANK	SKILL	SKILLCOUNT	% of ai jobs
31	attend to detail	4137	30.79%
32	database	4111	30.59%
33	show commitment	4054	30.17%
34	online analytical processing	3964	29.50%
35	excel	3953	29.42%
36	communication principles	3835	28.54%
37	analyse software specifications	3728	27.74%
38	customer service	3572	26.58%
39	analytics	3455	25.71%
40	quality standards	3437	25.58%
41	use software design patterns	3314	24.66%
42	adjust priorities	3193	23.76%
43	show determination	3133	23.31%
44	design prototypes	3055	22.73%
45	define quality standards	2998	22.31%
46	perform data analysis	2891	21.51%
47	plan teamwork	2888	21.49%
48	provide information	2868	21.34%
49	use object-oriented programming	2750	20.46%
50	use scripting programming	2722	20.26%
51	hardware components	2718	20.23%
52	computer science	2641	19.65%
53	economics	2631	19.58%
54	engineering principles	2623	19.52%
55	Python (computer programming)	2605	19.39%
56	process data	2512	18.69%
57	integrated development environment software	2386	17.76%
58	office software	2253	16.77%
59	SQL	2194	16.33%
60	maintain relationship with suppliers	2122	15.79%