

Policy Brief

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Digital Automation Technologies and the Future of Work(ers) in the UK: A Policy Roadmap



Image: Courtesy of Tommaso Ciarli, UNU MERIT and Science Policy Research Unit (SPRU), University of Sussex Business School

INTRODUCTION

The UK aims to strengthen its global position in Artificial Intelligence (AI) and other emerging digital automation technologies. With the accelerating pace of recent years, there is an urgent need for policymakers to address the current and future impact of these technologies on jobs, skills demand, and wage inequality. Critical decisions will need to be made to ensure that investment, education, and skills training keep up with a range of technological and socioeconomic shifts.

Effective policies for a just transformation should be grounded in both a knowledge of past waves of Information and Communication Technologies (ICTs) on labour markets as well as ongoing research. The H2020 PILLARS Project is at the forefront of current studies of present and future shifts in jobs and skills demand in labour markets driven by changes in technology, trade, and industrial dynamics. This Policy Brief summarises key project findings alongside policy recommendations generated at a multi-stakeholder Policy Workshop held at Digital Catapult London on the 5th December 2023.

FINDINGS

EMERGING DIGITAL TECHNOLOGY (EDT): EXPOSURE AND ADOPTION

The PILLARS project analysed a large corpus comprising millions of patents and scientific publications related to automation technologies, and identified novel and emerging digital technologies. The research combined intelligence from hundreds of experts, and made predictions about which automation technologies will become prevalent by 2030, which tasks they will perform, and what skills

Key findings

- For firms, workers and society to benefit from automation, we need timely information on industry and occupation exposure to emerging technologies.
- Technicians and professionals are becoming increasingly exposed to different emerging automation technologies across different industries and regions.
- Despite expert optimism, job vacancies indicate limited rate of adoption in UK and EU.
- Emerging technologies cannot yet perform activities that require interpersonal skills.
- The UK lags behind in industrial automation adoption, including in most of the service-oriented emerging technologies.
- Short run labour market impacts smooth out in the long run.
- Phase of technology adoption matters more than regional differences in productivity and specialisation.
- Training decreases automation risk, increases wages and is equally effective for younger and older workers.
- Workers in manual and routine occupations especially affected by skills shortages in all skill domains.

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they will need. The researchers employed state-of-the-art sentence transformers from computational linguistics, and estimated which occupations and industries are most exposed to the tasks performed by emerging automation technologies, and how this has impacted on regional labour markets.

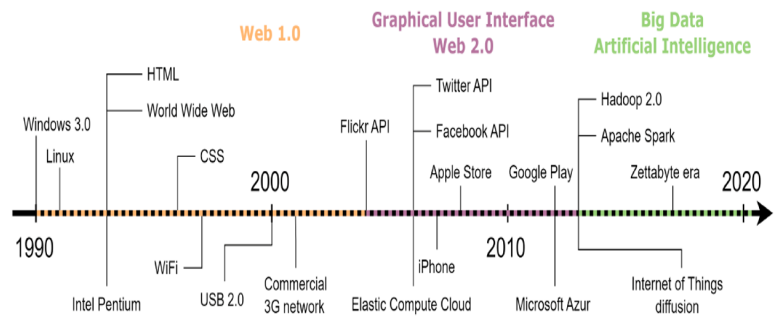
Finally, the PILLARS team examined the extent to which industries open vacancies to hire workers, in the UK and other European countries.

Key findings:

- Besides generative large language models, the most novel and fast growing scientific and technological development are led by cloud computing, secure data infrastructures such as blockchain, advanced additive manufacturing, and mobile and collaborative robots.
- Non-routine cognitive tasks such as those of clerical support workers, technicians, professionals, and managers are becoming highly exposed to emerging digital automation technologies, with managers positioned in the middle of the exposure distribution.
- While firm adoption of most automation technologies is still low, the most exposed regions in the UK and other European countries have experienced an increase in employment, except regions that are exposed to embedded systems such as industrial automation, the Internet of Things and remote monitoring.
- UK firms are lagging behind in the adoption of most emerging technologies, including those in which service-oriented countries are leading, such as machine learning, and cloud computing, and even more so in industrial automation.

TECHNOLOGY INVESTMENTS AND REGIONAL LABOUR MARKETS

PILLARS has investigated the long-term evolution of EU and UK regional investments in digital automation technologies over the life cycle of ICT and Robot developments between 1995-2017. Major technological breakthroughs during this period have been identified and associated with phases of acceleration and deceleration in investment.



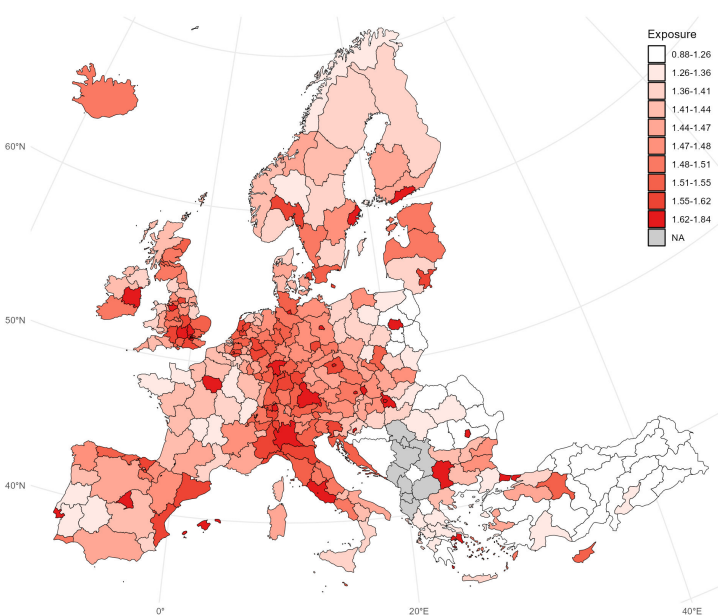
Source: Jaccoud et al, 2023

Long-term and short-term exposure to automation technology affects employment and wages differently. In the short-term, for the different phases of acceleration and deceleration of each breakthrough, PILLARS research found that the negligible long-term impact of automation on employment conceals significant short-term positive and negative effects within phases of the technology life cycle. The research also found that the negative impact of ICT investments on employment is driven by the phase of the cycle when investment decelerates (and the technology is more mature). The phases of the technology life cycles are more relevant than differences in regions' structural characteristics, such as productivity and sector specialisation in explaining the impact of automation on regional employment.

SKILLS AND ON-THE-JOB TRAINING

PILLARS has employed machine learning techniques that link data on skills demand and supply and developed new measures to investigate two key aspects: (1) the prevalence of skills mismatches across occupations and regions in the UK, and (2) how the degree of skills mismatch in the UK compares to other European countries.

The results show that on-the-job training can be an effective measure to upgrade workers' skills and be ready for automation. However, the demand for and efficacy of training might depend on labour market tightness and the level of employer protection. PILLARS' quantification of skills mismatches across occupations and regions serves as a basis for discussions on the effectiveness of training for both firms and workers to strategically adapt to the evolving requirements of the labour market.



Geographic distribution of regional exposure to emerging digital technologies across Europe, 2012-19

Source: Prytkova et al (2024)

RECOMMENDATIONS FOR POLICYMAKERS AND FIRMS

1. FORESIGHT TECHNIQUES

Develop and adopt foresight techniques for government, firms and workers to prepare and adapt to emerging technologies, and to unlock their potential, rather than adapt once they have been introduced.

2. MONITOR EVOLVING TECHNOLOGIES

Monitor the evolution of technologies and the overall level of (un)employment at certain critical points when radical breakthroughs, e.g. Generative AI, create both new emerging tasks and the transition from old to new tasks.

3. INVEST IN RESEARCH

Support firms to invest in research on EDTs, rather than only adoption, so that they can catch up with the cycles of technology and investment that shape the evolution of technological breakthrough.

4. RELEASE UNTAPPED POTENTIAL

Release the untapped potential of firms and regions, especially those lagging in productivity, through productivity improvements associated with adoption of EDTs.

5. INCLUSIVE GOVERNANCE

Ensure inclusive governance of data with the increasing use of data-intensive EDTs in individual activities, digital trade, AI research and other spheres.

6. INTELLECTUAL PROPERTY

Address the boundaries between human and artificial intellectual property rights from the perspective of both antitrust law and value redistribution.

7. TRAINING

On-the-job and vocational training in EDTs delivers most value when combined with other complementary management and soft skills.

8. CITIZENS AND WORKERS' VOICES

Citizens and workers' (e.g. platform workers) voices must be represented in decisions to support critical technologies where the effects on working conditions may worsen.

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ABOUT THE PROJECT

This briefing paper presents the findings of the first three work packages of the PILLARS - Pathways to Inclusive Labour Markets Project. These included: the creation of a dataset and survey to shed light on industry and regional exposure to emerging automation technologies; building on existing theories and analyses of the impact of technology, trade and industrial transformations across regions and labour markets; analysis of the effectiveness of past and present education and training systems in enabling workers to adapt to changing skills demand due to technology, trade and industrial transformations.

The study was conducted at the Science Policy Research Unit (SPRU) at the University of Sussex Business School as well as other partners of the PILLARS Project including ifo Institute - Leibniz Institute for Economic Research at the University of Munich, Catholic University of Eichstätt-Ingolstadt, Technopolis Group, and the United Nations University - Maastricht Economic and Social Research Institute on Innovation and Technology (UNU-MERIT). The findings of the project were then pitched and discussed with stakeholders in the UK public, private and voluntary sectors at our policy workshop co-hosted by Digital Catapult to generate our key recommendations for policymakers.

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Professor Maria Savona is Professor of Economics of innovation at the Science Policy Research Unit at the University of Sussex and Professor of Applied Economics at the Department of Economics and Finance at LUISS University, Rome and she is the recipient of the Premio Linco for Economics awarded by Accademia dei Lincei in 2023. She was previously at the universities of Cambridge, Strasbourg and Lille 1. Her research focuses on the effects of technical change and innovation on employment and wage inequality; innovation and industrial policy; barriers to innovation; the structural change of the sectoral composition of economies, particularly the emergence of global value chains in services. More recently, she works on the economics and governance of data.

Brian MacAulay is currently Principal Economist at the Digital Catapult in London. Brian is a professional economist with over 25 years of experience working at an advanced level of economic theory and applied research. As a member of the Expert Stakeholder Group in PILLARS he contributes experience and research expertise in examining innovation and industrial policies from an interdisciplinary perspective, particularly in the area of digital technologies. At Digital Catapult he examines, at a systems level, the impact of interventions, including skills, market growth and new business models.

We also thank the participants of our policy workshop for their contributions to the co-development of our recommendations for policymakers and other stakeholders for emerging digital technologies and labour markets. We would like to thank in particular the following for their participation in the workshop discussion panels: Dr Robert Smith, Director of Technology - AI and Data Science at Digital Catapult; Matthew Houlihan, Senior Director of Government and Corporate Affairs, Cisco; Nicola Smith, Head of the Rights, International, Social and Economics, Trades Union Congress; Tera Allas CBE, Director of Research and Economics, McKinsey & Company and PILLARS Scientific Advisory Board; Prof Bart van Ark, Managing Director, Manchester Productivity Institute; Prof Jacqueline O'Reilly, Professor of Comparative Human Resource Management at the University of Sussex Business School and Co-Director of the ESRC Digital Centre for the Future of Work; Dr Ashmita Randhawa, Head of Innovation, Digital Catapult North East Tees Valley at Sunderland Software City; Debbie Johnson, Head of Innovation Talent and Skills, Innovate UK; Prof Rebecca Riley, Director of the Economic Statistics Centre of Excellence, King's College London.