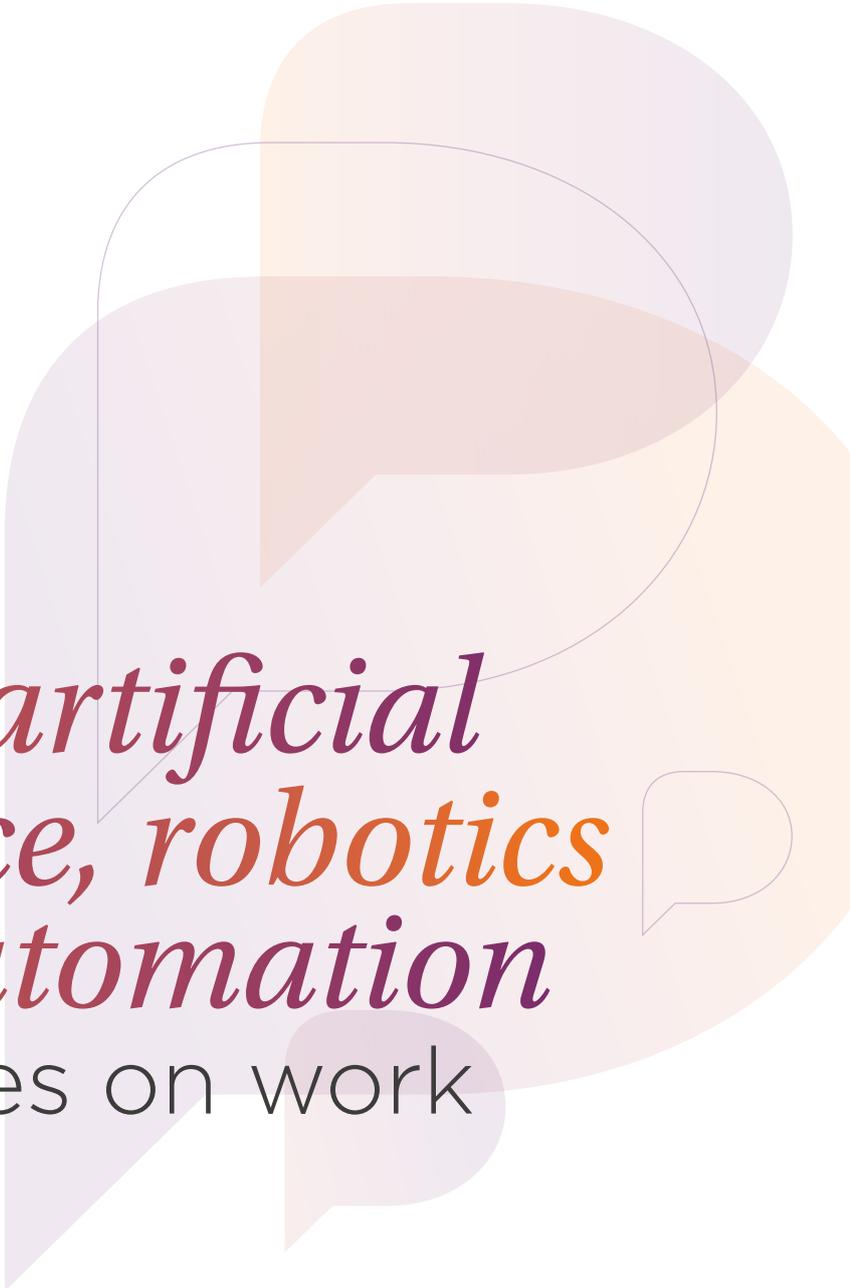


CIPD

Championing better
work and working lives

Executive summary

December 2017



Impact of *artificial
intelligence, robotics*
and *automation*
technologies on work

Impact of artificial intelligence, robotics and automation technologies on work

The CIPD is the professional body for HR and people development. The not-for-profit organisation champions better work and working lives and has been setting the benchmark for excellence in people and organisation development for more than 100 years. It has more than 145,000 members across the world, provides thought leadership through independent research on the world of work, and offers professional training and accreditation for those working in HR and learning and development.

Acknowledgements

This report was written by Professor Donald Hislop, Dr Crispin Coombs, Dr Stanimira Taneva and Dr Sarah Barnard at the University of Loughborough. We would like to thank Ramya Yarlagadda, Research Adviser, CIPD, for her contribution to the report.



**Loughborough
University**

Executive summary

‘Work-related outcomes of emerging technologies in the transport and healthcare contexts suggest that these technologies will complement and extend human capabilities rather than remove humans from the process.’

The impact of technology on jobs and people has been strenuously debated by academics, policy-makers, and commentators. While some, such as Frey et al (2013)¹, have predicted large-scale job losses, others (Arntz et al 2016)² have challenged this view by suggesting that when a task-based analysis is considered, only 9% of jobs in the OECD economies are potentially automatable. What is clear, however, is that technology will continue to shape the world of work and that policy-makers, academics, researchers, and employers need to get to grips with this changing landscape.

The purpose of this report is to add evidence to the ongoing debate on how emerging technologies are shaping the world of work, and the ethical issues related to the contemporary usage of these technologies. It summarises the findings of a rapid evidence review that was conducted on the impact of artificial intelligence, robotics, and automation technologies on knowledge and service work and professions.

What is the focus of the research?

Three main types of emerging technologies – identified from the search strategy – are featured in this research:

- artificial intelligence, or AI (including machine learning and cognitive computing)
- robotics (including service robots, robot-assisted procedures, and robotic process automation (RPA))
- automation technologies.

The majority of research that considers the work-related outcomes of aforementioned technologies has been conducted in the healthcare and transport sectors. Although manufacturing has seen its fair share of automation and computerisation, it was decided not to examine this sector because of the likely maturity of research in this area. It was anticipated that developments in the computerisation and automation of knowledge and service work represented some of the most significant contemporary technological developments in the work context.

Findings from the literature search

Because of fast-paced developments and the emergent nature of this field, just over 40% of papers in the review detailed original empirical evidence. Therefore, the extent of robust academic knowledge on the topics examined in this report is embryonic.

More than 50% of the material consisted of literature reviews (which typically ended by making predictions regarding possible future scenarios), analysis based on brief anecdotes of unknown quality, or pure speculation and reflection.

While evidence suggests that technology is augmenting what people are doing and enabling some degree of role expansion for employees, our ability to generalise the findings is limited.

¹ FREY, C., OSBORNE, M. A., ARMSTRONG, S., BOSTROM, N., CHINELLATO, E., CUMMINS, M., SHANAHAN, M. (2013). *The Future Of Employment: How Susceptible Are Jobs To Computerisation?*

² ARNTZ, M., GREGORY, T., & ZIERAHN, U. (2016). *The Risk of Automation for Jobs in OECD Countries: A Comparative Analysis* (No. 189).

What are the work-related outcomes of the utilisation of AI, robotics and automation technologies?

Work-related outcomes of emerging technologies in the transport and healthcare contexts suggest that these technologies will complement and extend human capabilities rather than remove humans from the process. An example of this is the automated decision support for air traffic controllers that increases the performance and accuracy of controllers. Similarly, James et al's (2013)³ qualitative study of implementation of an automated dispensing system (ADS) in a single UK hospital revealed that the change had a broadly positive impact on the pharmacists – for instance, reducing the amount of time they had to stay in the dispensary, allowing them to become more active on patient wards. However, on the negative side, when the system malfunctioned, their inability to fix it was seen to be a source of stress.

Which factors influence the utilisation of emerging technologies by workers?

Workers' attitudes and behaviour in relation to emerging technologies is a key mediator of the extent and the manner in which they are used. For example, workers' trust in the technological systems can impact significantly on the effectiveness of their application (Hengstler et al 2016)⁴, but this is likely to evolve over time. Thus, a full understanding of user trust requires application of longitudinal research methods.

For organisations and workers to realise the benefits of innovative technologies, it is crucial that employers involve their people in times of technological

implementation. Employees should not view this change as something that is 'done to them' – but 'done with them'.

What is the impact of AI, robotics, and automation technologies on relevant professions and society?

There are potentially significant social impacts related to the increasing work-related use of AI, advanced robots and cognitive computing – one of which is on employment levels. However, as mentioned earlier, opinion is divided on this topic, ranging from those who predict large-scale job losses through the automation of non-routine work, to other perspectives which suggest that large-scale job losses are unlikely, and that there might in fact be a net increase in employment. What cannot be disputed, however, is that technology will have some degree of impact on jobs.

Second, as the presence of these technologies within organisations increases, there is a bigger question around skills – as there will be an increased need for people, both workers and consumers, who are able to work and interact with these technologies. For instance, there are various reports which suggest that the lack of in-house AI skills is holding back organisations from implementing the technology within their workplace.

The need for skilled individuals who can work with innovative technologies is outstripping supply. A recent report by the Government on how the artificial intelligence industry in the UK can be developed makes a series of recommendations on how this skills gap can be addressed – from developing

more industry-funded courses in AI to an international AI fellowship programme for the UK. A similar set of policy recommendations would be useful to consider the possible skills implications of robotics and automation.

What are the ethical issues related to the contemporary utilisation of AI, robotics and automation technologies?

Recently, both scientists and practitioners have pointed to the need for a robust ethical strategy that will ensure the safe usage of advanced technologies. There are calls for those who develop these technologies to be responsible for the impact they have on people. It is important that the legal and policy approaches focus on the human values we are trying to protect rather than on the range of possibilities technological development represents. But there is a great need for further research in this area. Evidence on how these technologies are being implemented in the workplace and how those that are interacting with the technologies experience this should be an important focus area.

Another important area of focus must be the organisational decision-making process behind technological implementation. How is the choice between human capital and technology being made? What people factors are considered in the introduction of technology in the workplace? For instance, is adequate consideration given to the impact of technology on employees' well-being? These are important questions with ethical implications for any organisation and warrant further examination.

³ JAMES, K. L., BARLOW, D., BITHELL, A., HIOM, S., LORD, S., OAKLEY, P., WHITTLESEA, C. (2013). The impact of automation on pharmacy staff experience of workplace stressors. *International Journal of Pharmacy Practice*, 21(2), pp105–116.

⁴ HENGSTLER, M., ENKEL, E., & DUELLI, S. (2016). Applied artificial intelligence and trust – The case of autonomous vehicles and medical assistance devices. *Technological Forecasting and Social Change*, 105, pp105–120.

‘What is clear, however, is that technology will continue to shape the world of work and that policy-makers, academics, researchers, and employers need to get to grips with this changing landscape.’

Questions for HR and L&D practitioners to consider in times of technological change

How is technology influencing the wider world of work and your industry? What impact might this have on your organisation? How aware are the top management about the potential impact on the business and people?

Do HR and L&D professionals within your organisation have the knowledge and insights they need to help organisational leaders make evidence-based decisions about implementing innovative technologies in the workplace?

- If yes, are they communicating their insights to organisational leaders?
- If no, have they considered who they could engage with to build their knowledge base in this area?

What are the factors considered when making decisions about implementation of technology? What is the respective weight attached to efficiency gains, compared with considerations of employee experience, skills and other people factors?

What are the opportunities offered by emerging technologies to evolve the business model and the relationship between the business and employees?

What is the role of HR and L&D professionals in this debate?

As organisations evolve and the implementation of emerging technologies gains pace, HR professionals have a critical role in ensuring that this change delivers positive outcomes for their people. But to be a critical stakeholder in this transformation, HR professionals need to have the knowledge and insights to enable their organisations to make informed decisions. The challenge for HR professionals is to recognise the changing expectations of businesses and employees, and ensure that the utilisation of technologies is for the benefit of both.

HR and L&D professionals also have an important role in identifying and addressing the skills gap, and ensuring that their organisations have the ‘in-house’ talent pool that can work with emerging technologies. They need to proactively engage with critical internal (such as business leaders) and external stakeholders (such as policy-makers) to ensure that policy recommendations from the Government resonate with the needs of their organisation. They should be open to learning from organisations that have made some progress in this area and develop learning strategies that are agile and adaptable to the changing nature of work.

HR professionals must shape a future of work that is human. While most of the narrative in the media seems dystopian – focusing on the idea that technology will leave human beings with no jobs – our literature review shows that in the healthcare and transportation sectors, technology is allowing for some degree of role expansion by augmenting jobs that people are already doing. Therefore, it is incumbent upon HR professionals to put the emphasis back on people and create work environments where technology and people can co-exist – with technology complementing or augmenting the work people are already doing and making jobs more meaningful.

Skills and emerging technologies

Does your organisation have a strategy for accessing skills required to work with emerging technologies?

- If yes, have you considered how these could be further developed in consultation with your employees?
- If no, have you considered undertaking a skills audit to identify the gaps?

Has the HR and L&D function at your organisation considered the impact technology might have on their own profession and how they could upskill themselves?

Is your organisation proactively engaging and consulting with policy-makers to address the larger issue of skills shortages as technologies become more innovative?

What is your organisation’s proposition to those employees whose jobs are changing considerably because of the impact of emerging technologies?



CIPD

Chartered Institute of Personnel and Development
151 The Broadway London SW19 1JQ United Kingdom
T +44 (0)20 8612 6200 **F** +44 (0)20 8612 6201
E cipd@cipd.co.uk **W** cipd.co.uk

Incorporated by Royal Charter
Registered as a charity in England and Wales (1079797) and Scotland (SC045154)
Issued: December 2017 Reference: 7632 © CIPD 2017