AI and Automation: How technology is shaping the future of UK industries

In this special report, IBISWorld analyst Thomas Falconer discusses the use of automated processes and AI technology in the manufacturing and financial and insurance activities sectors.

> Artifical intelligence and automation have the capacity to transform the productivity of the UK economy

In the 21st century, technology has revolutionised our perspective of the world and, due to the ever-expanding Internet of Things (IoT), a day rarely goes by without us using or coming into contact with a technological network of inter-connected devices. Consider the concepts of artificial intelligence (AI) and automation; while the former is a multifaceted and growing field, automation can be found in nearly every sector, from transportation to manufacturing, as machines undertake repetitive tasks and control processes. Although the terms 'artificial intelligence' and 'automation' are often used interchangeably, there are fundamental differences between automated systems and AI machines. Underpinned by algorithms, AI has redefined global industries, providing greater personalisation to users and allowing employees to focus on value-added tasks. The Government Office for Science defines AI as 'the analysis of data to model some aspect of the world. Inferences from these models are then used to predict and anticipate possible future events.'

Broadly speaking, the purpose of AI and automation is to create technologies that ably mimic what humans can think and do, or to develop sophisticated machines that improve efficiency. In turn, developments in AI and automation have the capacity to transform the productivity of the UK economy. According to research conducted by professional services firm PricewaterhouseCoopers, UK GDP could be 10.3% higher in 2030, as nationwide AI adoption could induce labour productivity improvements and drive greater consumer demand through increased personalisation of products.

In recent years, key developments in AI technologies and automated processes have revolutionised the logistics of global supply chain operations. Smart warehouse and ordering systems represent some of the finest examples of manufacturers,

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wholesalers and retailers embracing modern technologies. Smart warehouse systems use various integrated technologies, from AI and robotics to the IoT and radio-frequency identification inventory control processes, to form a technological ecosystem where goods are identified, organised and pulled for distribution automatically. In turn, smart warehousing has made supply chain logistics more efficient and mitigated human error. However, while most consider them socially beneficial, vast developments in AI technologies and increased adoption of automated systems present a number of risks. Perhaps the most prominent AI and automation risk relates to vast integration of machines to replace humans in once labour-reliant industries. This article explores the application of automation and AI, recent developments, and associated risks, focusing on the manufacturing and financial and insurance activities sectors.

The manufacturing sector

In the manufacturing sector, automated processes have been commonplace for decades. However, recent developments have begun to revolutionise certain industries. For instance, Sewbot, robot technology capable of sewing finished garments autonomously, is primed to transform production capabilities in the Clothing Manufacturing industry (IBISWorld report C14.000). General assembly processes can be highly repetitive, arduous and open to human error if done manually. By incorporating a system that performs rote tasks in a standardised and fully automated way, manufacturers can accelerate production rates, reduce factory lead times, attain efficient utilisation of input materials, and ensure greater control and consistency of product qualities.

According to the International Federation of Robotics (IFR), the United Kingdom has a robot density (the number of multipurpose industrial robots per 10,000 persons employed in the manufacturing sector) of 71 units, ranking below the global average of 74 and indicative of a vast potential scope for manufacturing automation. In comparison, nations traditionally recognised for manufacturing excellence, Germany and the Republic of Korea,

Manufacturing automation is multidimensional and can be broadly segmented into four categories:

Numerical control: Machine systems that are programmed to perform repetitive tasks.

Computer-aided manufacturing (CAM): Machine systems that are controlled by computer software to automate the flow of production.

Industrial robotics: Machine systems that are capable of movement on two or more axes and may operate in fixed or mobile applications.

Flexible manufacturing systems: Combines components of numerical control systems, robotics and other industrial automation tools into a single sophisticated system, allowing for flexibility and customisation.

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The manufacturing sector continued

have robot densities that far exceed the global average, reported by the IFR to be 309 and 631 respectively. These nations are renowned for their automotive and electronics industries which make strong use of industrial robotics. Advances in AI technology and remote communication, however, are primed to make manufacturing automation increasingly reliable and more widespread globally . Based on current automation trends, IBISWorld has identified a key benefit and risk in the manufacturing automation market:

Fault prevention

Modern technology allows for an entire manufacturing plant to be run by a limited number of people, with the majority of core operations performed by automated machines and industrial robotics. However, human interaction is still needed to recognise and prevent manufacturing failure. Developers are currently exploring ways in which AI could make it possible for manufacturing machines to interpret faults in the production process, run diagnostics and then potentially correct faults autonomously. In theory, the use of intelligent machines in automated production processes could correct errors without human interaction and prevent costs associated with faulty product recalls.

Robots vs human

According to a survey conducted by UK chip and software design company ARM, the largest proportion of respondents (19%) thought that manufacturing workers were most under threat from AI machines and increased automation. While manufacturing automation translates into greater productivity and employee safety, AI could cause job losses and fundamentally change traditional employment. If human intelligence stagnates while AI algorithms advance, the reliability and flexibility of manufacturing robotics could, theoretically, surpass human capabilities.

Industries significantly affected by automation and AI in the manufacturing sector include:

C11.071 - Soft Drink Production in the UK
C21.100 - Basic Pharmaceutical Product Manufacturing in the UK
C29.100 - Motor Vehicle Manufacturing in the UK

The financial and insurance activites sector

According to professional services firm Accenture, 86% of bank executives agree that the widespread use of AI provides a competitive advantage beyond cost. Almost every big-name consultancy or investment bank has begun to explore ways in which AI can be integrated to improve efficiency and deter financial crime. For instance, JPMorgan uses intelligent machines to execute trades, while Morgan Stanley has an AI fraud detection system. However, recent developments in AI technology suggest that AI could radically transform the financial sector.

In July 2018, Barclays became the latest bank to harness AI, powering a new way of making decisions across lending and risk management divisions after striking a partnership with AI simulation firm Simudyne Technology. While the capabilities of AI are seemingly endless, UK banks and insurance brokers share similar aspirations for AI in financial services.

However, banks must understand the inherent risks that come with harnessing AI. Though technology can better the provision of financial services, lobbyists, including the Financial Stability Board,

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The financial and insurance activites sector continued

an international body that monitors global financial systems, have highlighted several risks that have 'the potential to amplify financial shocks'. Arguably the most obvious risk relates to data security and how AI models use predictive analytics to interpret sensitive, confidential consumer data. For example, although compliance with the recently introduced General Data Protection Regulation ensures that banks using AI are accountable, the fact that AI technologies are not yet faultless suggests a significant degree of risk.

Industries significantly affected by automation and AI in the financial and insurance activities sector include:
K64.191 - Banks in the UK
K65.120 - General Insurance in the UK
K66.120 Investment Banking & Securities Brokerage in the UK

IBISWorld has identified four emerging trends in AI-enabled financial markets:

Chatbots: A chatbot is an AI interface that uses natural language processing and generation software to process customer queries and simulate an appropriate response without the involvement of human staff. Operators in the Banks industry (IBISWorld report K64.191), such as HSBC and Santander, are using chatbots to interact with customers.

Profiling: An AI algorithm capable of collating consumer data and predicting consumer behaviour could allow banks and insurance brokers to offer personalised services and tailored plans. Financial service firms could soon use machine learning technologies to analyse consumer information and behaviour patterns.

Decision making: Algorithmic sorting can be used to assess investment risk and identify high-yield opportunities. In August 2018, investment bank UBS began trialling Netflix-style algorithms for trading suggestions, using AI-enabled systems to analyse clients' previous stock market behaviour and assess whether they might be interested in a specific transaction.

Threat detection: Developed by operators in the Cyber Security Software Development industry (IBISWorld report UK0.035), AI software could be used to identify anomalies in transactions that may indicate fraud, money laundering, and cybercrime. For instance, UK-based AI start-up Darktrace has developed self-learning algorithms that mimic the way the human immune system fights viruses to protect corporate computer systems, parsing masses of unstructured data.