Future of Work

A GLOSSARY

PLUS+

Automation

# Automation / A technological revolution
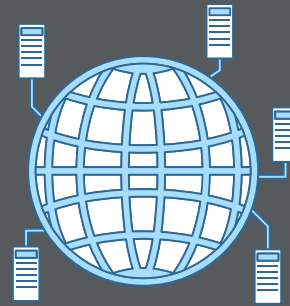
Industrial Revolutions

The First Industrial Revolution began in the 1760s, as the English textile industry became mechanised. The late 19th century ushered in the Second Industrial Revolution, with mass production. The Third Industrial Revolution began at the turn of the 21st century, as internet technology and renewable energies created new economic possibilities, according to American economist Jeremy Rifkin. Others argue, however, that the rise of nuclear power, electronics and computers in the second half of the 20th century prefigured this transformation.

Fourth Industrial Revolution

In 2016, Professor Klaus Schwab, founder and executive chairman of the World Economic Forum, coined the term Fourth Industrial Revolution. This idea represents the development of new digital technologies – such as AI, machine learning, Big Data – and their integration into the physical dimension of everyday life. As Professor Schwab puts it: the 4IR "is building on the Third, the digital revolution that has been occurring since the middle of the last century. It is characterized by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres." Proponents of 4IR theory suggest that this revolution will be more rapid and comprehensive than previous transitions. Critics, however, argue that this theory is based on an elitist, top-down view of economic history which over-emphasises the agency of technology.

Automation
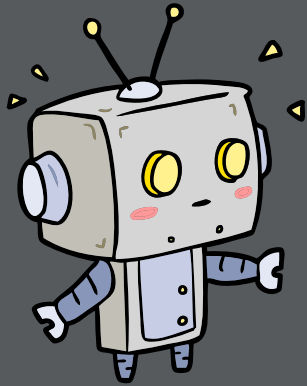
What is automation?

The automation of production processes started with the English textile industry in the 1760s. However, it was the Ford Motor company which specifically coined the term in 1945. The term is used to describe any aspect of a production process (or, indeed, service delivery) that is executed by a machine with little or no human input.

Artificial Intelligence (AI) is a new form of automation

Big data

McAfee and Brynjolfsson argue that there are three key characteristics that distinguish big data. The first is volume – big data is generated in vast quantities. Second is velocity – big data is in a near-constant state of creation. And third is variety – this means that the data comes from a range of sources and in different formats and types. With powerful computing capacity, diverse types of data can be combined to create new insights. Big data helps to create AI; and AI helps to analyse big data.

Algorithims

In the simplest terms, an algorithm is a set of rules or instructions. These instructions are expressed in a computer programming language and they govern the "thinking" processes of a computer, to allow it to solve problems. Algorithms are essential for enabling computers to process big data using artificial intelligence.

Machine Learning

Machine learning is a branch of AI. The core focus of machine learning is enabling computers to become smarter through experience. They do that by applying certain algorithms and finding patterns in big datasets. For example. automated recommendation systems (like Netflix's) use machine learning. AI is achieved through machine learning.

Artificial Intelligence

The concept of AI stretches as far back as 1950, with Alan Turing's notion of "thinking machines" that autonomously replicate human levels of reasoning and intelligence. The question, however, is what constitutes intelligence. Researchers Shubhendu and Vijay argue that this critically involves contemplation, judgement and intention, thus allowing machines to make decisions "which normally require a human level of expertise." Darrel West makes a similar case and believes that such machines are essentially able to display intentionality, intelligence and adaptability. AI use is already widespread today: from automated audio transcription to performing radiological assessments and providing quality control on assembly lines.

Collaborative Intelligence

Collaborative intelligence involves human beings working alongside artificial intelligence. Wilson and Daughery point out that this is currently the predominant way in which businesses are deploying AI, utilising its speed, scalability, and quantitative capacity alongside the leadership, teamwork, creativity, and social skills of human beings. However, there are tensions around the surveillance capacity of these systems and their impact on human autonomy and privacy.

Automation

Automation can improve productivity but also increase inequality

Productivity

In economic theory, productivity is calculated as the rate of output per unit of input (usually labour). For the economy as a whole, this is measured as GDP per hour worked. Worker productivity is influenced by the availability and use of other inputs, including capital, technology, and organisational management. New technologies, such as AI and robotics, have the potential to increase productivity (but this could lead to reduced demand for human labour in certain sectors). However, many advanced western economies have experienced stagnant productivity over the last few decades despite widespread new technologies.
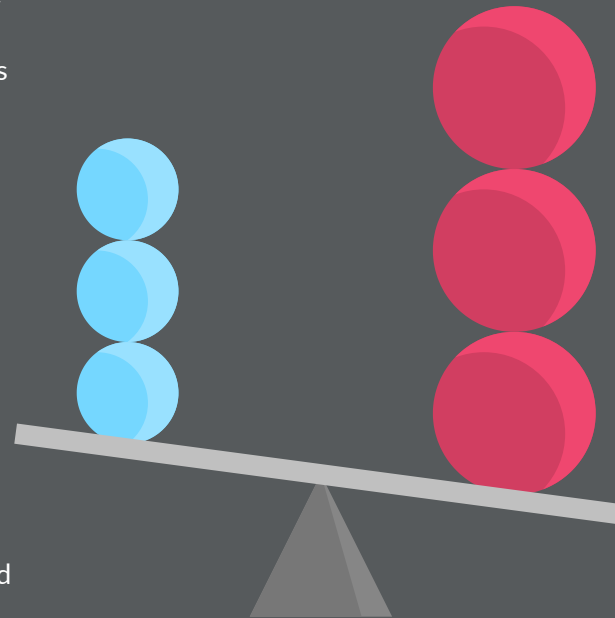
Inequality

Income inequality is measured by the distribution of income across the population as well as specific subsets (e.g. genders and ethnic groups). Despite increasing wealth, automation can also increase inequality. It displaces middle skill jobs and creates opportunities in either high skill or low skill roles. This leads to wage polarisation. Higher income inequality is linked to inequities in health, education and employment outcomes, as well as undermining social cohesion. The OECD measures income inequality using the Gini Coefficient, which ranges from 0 (perfectly equal distribution of income to 1 (maximally unequal distribution).

Automation

Understanding the labour market

Labour market

The labour market is an exchange, just like any other. Workers offer their knowledge, skills and experience; employers select which (and how many) workers will best suit their needs. So, when we talk about a "changing labour market" we are referring to the trends on both sides of that equation. What do workers have to offer – this is largely shaped by the education and training available to them. And what do employers need – this is shaped by new technologies, which offer new ways of delivering goods and services.

Labour force and workforce

In economics, there is an important distinction between the labour force and the workforce. The labour force includes all people who are employable (i.e. people legally allowed to work, including those who are employed and those who are unemployed) and willing to work. The workforce specifically refers to people in employment. Unemployment is the difference betwen the labour force and the workforce.
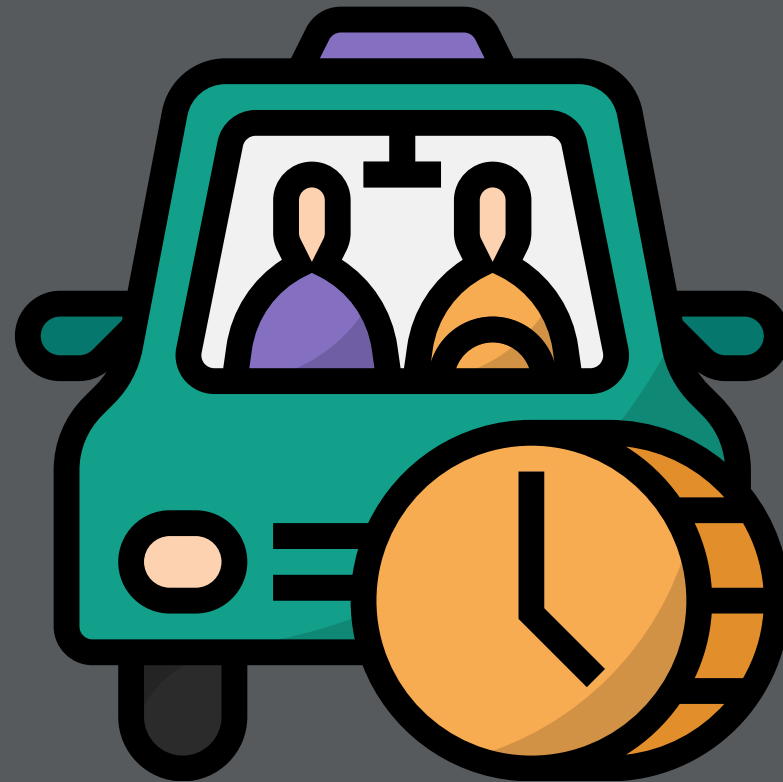
Gig economy

Gig economy

What is the "gig economy"?

The term "gig economy" was <u>coined by</u> journalist Tina Brown in 2009. At the time, she was referring to white collar New Yorkers adjusting to the Great Recession by taking on "free-floating projects, consultancies, and part-time bits and pieces." But in truth, irregular working has long-been a fixture of the labour market: from teenage babysitters to nurses working on-call. What has changed, however, is the digital platformization of this work, which has made it more ubiquitous (though the OECD estimates that, on average, it still accounts for less than 4% of total employment across advanced economies).

Gig economy

Sharing economy

The sharing economy is a subset of the gig economy. There are (asset-based) digital platforms, like AirBnB and Hiyacar, which enable people to share underutilized assets with others and get paid for it. It's a kind of "gigging" because it provides secondary income for people. However, this trend is largely irrelevant to the labour market; though some labour force surveys include asset sharing as part of "gig working," which can make it difficult for policymakers to understand the extent and nature of gig working (i.e. platform labour).

Gig economy

Platform labourers work in the gig economy

Over the last decade, digital platforms like Uber, Deliveroo, and TaskRabbit have grown exponentially. These services – driven by algorithms and AI – provide "on-demand" opportunities for individuals to work, often as "independent contractors." These platform labourers are part of the "gig economy". While this flexibility is great for some, the uncertainty and insecurity is perilous for others. There are also <u>serious tensions</u> caused by the surveillance these technologies impose over workers.

Gig economy
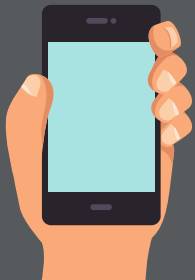
Self-employed

In most countries, self-employed refers to a specific legal status for workers who are not registered as employees of any individual organisation. These workers (also known as "independent contractors") are not, therefore, entitled to the same labour rights as traditional employees (such as minimum wages and paid sick leave). Independent contractors are synonymous with self-employed people. Many companies in the gig economy use this model to build a large base of service providers without having to take on the legal and financial responsibilities of employees, which is a controversial practice (see lesson 2.2).

Dependent self-employed

Labour market policy analysts refer to "disguised employment" – or dependent self-employment. This is where a self-employed worker depends on one or a small number of contractors for the majority of their income, such that the contractor is able to dictate how their work is performed. Some analysts believe this is the case for most platform labourers, such as Uber drivers. They contest that these workers are de facto employees, given the level of control the platforms are able to exert. The platforms, however, would argue that these individuals are not compelled to "turn up" for work (i.e. switch on the app).

Gig economy

Zero-hours contract

With zero-hours contracts, firms can hire employees without guaranteeing them any work. Employees are only called to work when needed and they are only paid for the hours they work. Proponents of zero-hours contracts argue that they provide flexibility. For firms with fluctuating business activity, being able to pay workers only when they are needed increases efficiency. While for workers, being able to accept or reject work may be beneficial. However, many workers feel unable to reject work when it is offered, for fear of being overlooked in the future. And the short notice of employment can make it difficult for workers to plan things like childcare. Critics argue that these contracts promote insecure work.

Quality work

Quality work is about more than just wages. It's about decency and fairness. QuInnE (Quality of jobs and innovation generated employment outcomes) is an analytical framework for evaluating the quality of jobs, developed by researchers from across the European Commission. The framework identifies six key factors:

- Wages
- Employment quality (including contract status and security)
- Education and training (i.e. learning opportunities on the job)
- Working conditions (including autonomy, job variety, health and
- safety, and work intensity)
- Work life balance
- Consultative participation and collective representation

Gig economy

Universal Basic Income (UBI)

UBI is a social welfare policy in which the state guarantees all of its citizens a basic monthly income, instead of a patchwork of unemployment, housing and other welfare payments. The aim of the policy is to ensure a basic standard of living for everyone. UBI has gained increased attention in recent years, as fears have grown about the impact of automation on the availability of jobs for everyone. However, critics argue that the policy would be very expensive, inefficient, and disincentivize labour force participation. It has been trialled on a small scale in some advanced economies.

Skills

Skills

Vocational education

Vocational education involves education and training specifically related to work, as opposed to academic education, which has learning as its primary purpose. Apprenticeships are a form of vocational education. Vocational education has expanded in recent decades to include more knowledge-based and services sector work, such as nursing (which now requires a vocational degree in most countries). Vocational training is becoming more mainstream as policymakers try to improve the capabilities of the labour force to meet growing demand for digital skills.

Apprenticeships

The learning model of "master and apprentice" is centuries old. Today, it is an increasingly common skills development policy employed by governments around the world. Apprenticeships involve a mixture of paid employment alongside job-specific training. Historically, apprenticeships have been concentrated in blue collar jobs, such as manufacturing. However, there are growing opportunities in professional services – such as banking, accounting, and consulting – available to school leavers as an alternative to university. See our Skills Policy Atlas in 3.4 to discover some apprenticeship programs around the world.

Skills

Reskilling & upskilling

Reskilling and upskilling are related but separate concepts in labour force development. Reskilling refers to enabling workers to transition from one career track to a new one: for example, helping unemployed energy scientists move into software development (see lesson 3.3). Upskilling is about increasing the capacity of workers to be more productive and create greater value in their existing career path. Government tends to be more involved in reskilling, while employers often take responsibility for upskilling their workforce.

Lifelong learning

There is a growing recognition that education and development do not simply stop once someone leaves compulsory education. Upskilling and reskilling, for example, are a form of lifelong learning. Governments are seeking to build effective structures to support this, for example, in Germany, by offering lifelong careers advice.

Skills

MOOCs

Massive open online courses (MOOCs) is a learning delivery method growing in popularity. Courses are made available to anyone with an internet connection, free of charge, spanning a wide range of topics. Major providers include Coursera, edX and Udacity. While there is enormous potential for this method, the level of quality and learner engagement is <u>highly variable</u> (and mostly trending toward low). However, in the post-Covid era, governments and education providers could invest more in this method as a safe, low-cost alternative to in-person learning. This could lead to significant improvements. Estonia is already <u>leading the way</u> with free Coursera enrolments for unemployed workers.