Automation hits the knowledge worker: ChatGPT and the future of work

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Abstract

The advent of Large Language Models (LLMs) like ChatGPT has sparked debates about their potential to automate knowledge work and transform the world of work. This policy brief examines the current and potential impact of LLMs on knowledge workers. The brief makes clear that while attention is often on job displacement, the larger effect is likely to be on the transformation of the day-to-day tasks of knowledge workers. It also discusses the importance of not only focusing on job quantity, but also job quality. Drawing on historical examples, the brief argues that technology is neither inherently good nor bad, but its impact depends on how it is managed.

Within the first five days of its launch in November 2022, ChatGPT reached 1 million users, making it the fastest growing consumer application in history (Gordon 2023). ChatGPT is the first of several Large Language Models (LLM) currently in the pipeline of the big tech companies, marking a new era of generative AI focussed on human-like interaction with the user (Chow and Perrigo 2023). As with the introduction of other technologies, much of the media attention surrounding ChatGPT has focused on its potential to automate jobs, in this instance, "knowledge work".

What is knowledge work?

Knowledge work is not a well-defined concept. It is typically used to describe professionals who create, analyse and share information, though it may be interpreted as encompassing different tasks, depending on cultural and language contexts (Surawski 2019). For purposes of this analysis, we consider a lower and upper-bound range of knowledge work that, at the lower bound, includes "white collar" jobs ("managers" and "professionals" as defined by the International Standard Classification of Occupations (ISCO) at the 3- and 4-digit level) and an upper bound that includes a range of jobs that might not be "white collar" jobs per se, but which typically have tasks associated with "white collar" work, mainly paraprofessional and clerical occupations. Based on these parameters, globally, there are between 644 and 997 million such jobs, which represents between 19.6 per cent and 30.4 per cent of global employment respectively (ILO, 2023).

Figure 1. Total number of knowledge workers, by country income group
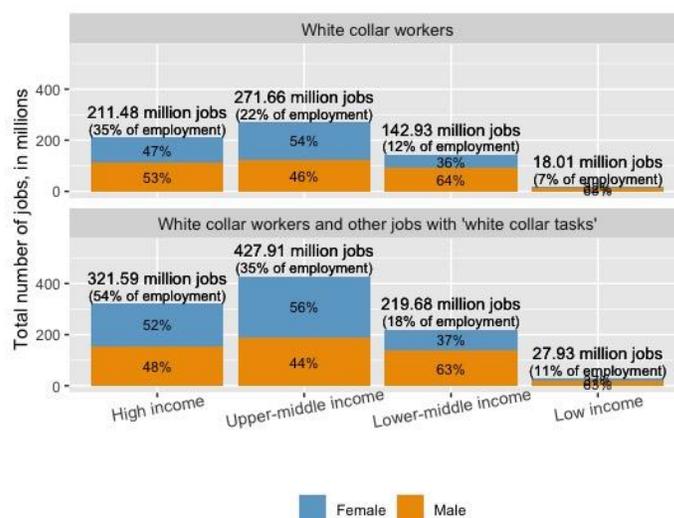
Figure 1 presents the breakdown of these jobs using the World Bank's country income group classifications. Knowledge workers have the greatest employment share in high-income countries (35-54 percent of all jobs) and in upper-middle income countries (22-35 percent). Among high-income and upper-middle-income countries, women are well represented in knowledge work.

By region, the largest absolute number of knowledge workers can be found in Asia and the Pacific (519 million), though their share in total employment is less than one-third (Figure 2). In comparison, in Americas and Europe and Central Asia, the share of knowledge work in total employment ranges from close to a third and a half of all jobs.

Jointly, figures 1 and 2 demonstrate that that the share of knowledge work in employment is highly related to the income level of countries, which is not surprising, given the economic diversification that accompanies economic development.

Figure 2. Knowledge workers as a share of total employment, by region
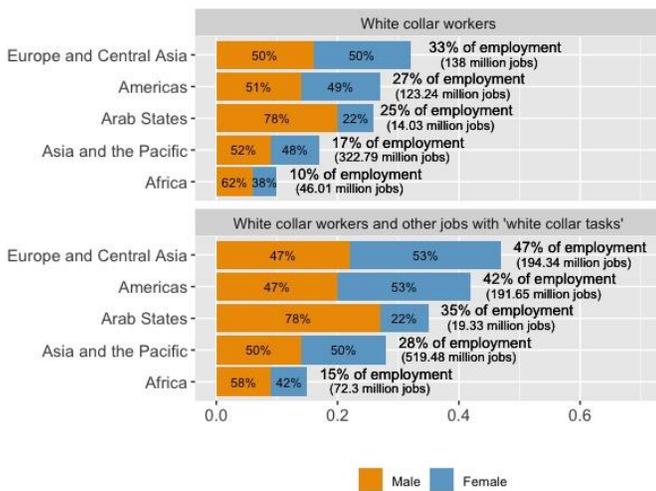
Job losses vs job transformations

Knowledge work has not been immune to technological changes. From the arrival of portable typewriters in the early 1900s, to the invention and popularization of computers, the internet and a wide range of analytical and communication tools, knowledge work has undergone several technological transformations (Cherry 2020). In that sense, generative AI should be considered another development in this long continuum of change.

Much like Google changed how we search for information, ChatGPT and similar tools will further affect how we approach the information acquisition. LLMs are a powerful tool for quickly summarizing knowledge from existing sources, speeding up initial drafting of content, providing a general text structure or even writing code in multiple programming languages. Many of these functions represent typical tasks performed by knowledge workers, which leads to questions about the impact of these new technologies on jobs.

The literature on automation and jobs, which primarily focuses on OECD countries, tries to identify job-level tasks that could be replaced by machines and then estimate macro-level effects of such a replacement (Frey and Osborne 2017; Brynjolfsson, Mitchell, and Rock 2018; Felten, Raj, and Seamans 2018; Acemoglu and Restrepo 2020; Fossen and Sorgner 2022). Recent studies have tried to produce better estimates for developing countries (Balliester and Elsheikhi 2018; Carbonero et al. 2020; Aly 2020; Carbonero et al. 2023)

but given the challenges in estimating at the individual country level, extending such estimates globally, where tasks by occupation can differ widely, is fraught with problems.

More importantly, such calculations are unable to forecast how existing jobs will see their tasks transformed or the new jobs that will be created to accompany the technological advancement (Autor 2015). Twenty years ago, there were no social media managers, and thirty years ago there were few web designers. LLM-based tools, and generative AI more broadly, seem more likely to enhance human performance on certain basic and time-consuming tasks rather than replace jobs altogether.

For example, in programming, ChatGPT works well as an online assistant. It can produce and debug code in several languages and provide code for typical daily tasks: API requests, web-scraping scripts or standard data mergers and transformations. It can identify mistakes, shorten code, suggest edits, and accompany its suggestions with detailed explanations. Such assistance is particularly useful as a learning support for intermediate users but still requires sufficient understanding of programming to be able to design and break down the workflow into mini-tasks and phrase the prompts with accuracy. While one can attempt to make a crude tally of the number of programming tasks potentially accelerated with the use of ChatGPT, it is much harder to predict how the job of a programmer will evolve, and such evolution can significantly differ across countries and regions.

It is also important to note that the impact of digital innovation on jobs is directly related to access to technology and broadband connection. In 2022, 34 percent of the global population, corresponding to some 2.7 billion people, still did not have access to the internet (ITU 2023), and many with access would not be able to use ChatGPT due to the limitations in the quality of their connection or the cost of the service. In this respect, the broader concern is how large swathes of the population are left behind in terms of potential productivity gains from this new wave of technological change (Figure 3).

Figure 3. Share of population not using the internet[1]
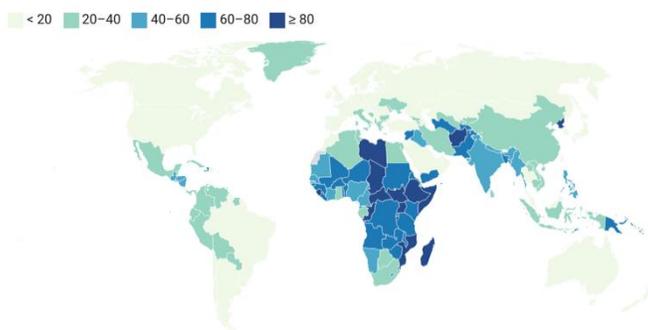
Implications for job quality

Beyond net job effects, another consideration is the effect on job quality. The historical record of automation's impact on working conditions is mixed. The most well-known example is the introduction of the assembly line, which standardized production, leading to the replacement of skilled artisans, with less-skilled and lower-paid manual workers. On the other hand, the introduction of automatic teller machines led to bank workers' tasks shifting from handling money (teller) to advising clients (Bessen, 2015), an arguably more rewarding and higher-paying job.

With respect to LLM, it is still too early to tell, but there have been reports in the popular press of journalists, illustrators and copywriters being offered a fraction of their usual pay for consultancy-based editing of automatically generated content.[2]

The case of Mohammed, a Pakistani IT-specialist interviewed as part of our research project, illustrates how LLM technology has already begun to reshape a source of employment that several years ago seemed promising. Until late 2022, Mohammed, a data science and programming instructor, had developed a stable base of foreign customers through an online freelancing platform, who would either follow his courses or reach out to him for expert support. From early 2023, many of his regular clients requested training on how to properly phrase ChatGPT prompts to solve their programming queries. While his overall work hours on the platform have not dropped so far, his work shifted

from regular cooperation with returning customers to a myriad of unpredictable gigs and greater insecurity (Mohammed 2023).

Another consideration is the working conditions of the "invisible workers" who perform the labour-intensive task of training and monitoring algorithmic systems. Jobs involving data labelling, ranking of output quality and other tasks required by machine-learning processes are typically outsourced to countries with lower labour costs (Tubaro, Casilli, and Coville 2020), and given the trans-border, online nature of the work, they have, for the most part, escaped any regulation (Cherry, 2019). While they can offer an important source of income for local workers, the absence of regulation means that the jobs are highly precarious, with no job security and low pay (Berg et al. 2018; ILO 2021). With respect to ChatGPT, investigative journalism revealed that some of its training work had been sub-contracted to a Kenyan company and performed by workers paid between 2-3 USD per hour (Perrigo 2023).

More troublesome are the psychosocial risks that many of these jobs entail. For the training of LLMs and deep neural networks in general, the work involves not only tagging inappropriate content that was generated by the model, but also inputting content that is sexually explicit, violent, or discriminatory, to prevent the algorithm from producing such output at a later stage. Such work, which is widely used by social media platforms, has been well documented as causing post-traumatic stress disorder (Roberts 2019). Given these risks, it is imperative to have adequate occupational safety and health systems in place, and to regulate these new occupations.

Policy considerations

LLMs are likely to become a much-used tool by many of today's knowledge workers. While some jobs will likely be lost in the process, the more likely scenario is for occupations to be transformed as tasks evolve. How these effects play out will depend on how such transitions in the world of work are managed.

At the workplace, social dialogue is best used at the onset, as the technological system is designed and adapted in workflows. Consultation and negotiation between employers and workers can help mitigate job

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[1] Authors' calculations based on most recent country data (ITU 2023). Map created with Datawrapper. The boundaries shown, designations used, and any other information shown does not imply official endorsement or acceptance by the International Labour Organization.

[2] And ironically, the content being used to train these systems was produced by these workers (Metz 2022).

loss by favouring redeployment and training, ensuring that working conditions are not adversely affected, as well as improving output quality and productivity by garnering workers' input.

Tripartite social dialogue is also needed for the development of other broader policies, including expanding and strengthening social protection systems as well as implementing active labour market policies to support transitions in the labour market. Labour regulations need to be adapted to support employment quality.

To garner the benefits from this new technology, policymakers should also invest in workers' digital literacy, with a particular focus on youth so that new generations can benefit from its potential. For countries affected by the digital divide, there is a need to invest in digital infrastructure to limit exclusion from productivity benefits, and to invest in sectors with the greatest potential for economic and social gain.

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