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Defining and classifying AI in the workplace

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Defining and Classifying AI in the Workplace

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Abstract

This document serves both as a conceptual and practical guide for defining and classifying AI, in order to help stakeholders analyse and understand its impact on the workplace. It first discusses how AI can be defined and provides a selection of AI use cases to help stakeholders identify AI and distinguish it from other advanced technologies. The document then provides a framework for classifying AI according to its impact on the workplace, consisting of a set of questions intended to help stakeholders evaluate any AI application from a workplace perspective (either a priori or ex post) and to promote informed discussion so that AI is implemented in a way that empowers and complements workers and improves job quality, and that no one is left behind.

Résumé

Ce document sert de guide conceptuel et pratique pour définir et classer l'IA, afin d'aider les parties prenantes à analyser et à comprendre son impact au sein des entreprises. Il examine tout d'abord la manière dont l'IA peut être définie et présente une sélection d'exemples d'utilisation de l'IA pour aider les acteurs à l'identifier et à la distinguer d'autres technologies avancées. Le document fournit ensuite un système de classification de l'IA en fonction de son impact au sein des entreprises. Ce système consiste en une série de questions destinées à aider les acteurs à évaluer toute application de l'IA du point de vue de son effet sur le fonctionnement des entreprises (a priori ou a posteriori). Il vise à promouvoir un débat éclairé, afin que l'IA soit mise au service de l'autonomisation des travailleurs et vienne les compléter, qu'elle améliore la qualité de l'emploi, et bénéficie à tous.

Übersicht

Dieses Dokument dient als konzeptioneller und praktischer Leitfaden für die Definition und Kategorisierung von KI, um dessen Auswirkungen auf die Arbeitswelt zu analysieren. Zunächst wird anhand von Anwendungsbeispielen beschrieben, wie KI identifiziert und von anderen Technologien unterschieden werden kann. Im Weiteren entwirft das Dokument eine Kategorisierung von KI, die Stakeholdern helfen sollen, anhand einer Reihe von Fragen jede KI-Anwendung im Hinblick auf deren Wirkung auf die Arbeitswelt zu bewerten (entweder a priori oder im Nachhinein). Dies soll eine fundierte Debatte darüber ermöglichen, wie KI auf eine Art und Weise eingesetzt werden kann, die die Beschäftigungsqualität verbessert und Arbeitnehmer*innen unterstützt sowie befähigt, anstatt sie zu benachteiligen.

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Introduction

A period of rapid development in Artificial Intelligence (AI) is raising a major question for firms, unions and governments, namely: how to implement AI that fosters entrepreneurship and productivity, while at the same time empowering and complementing workers, enhancing occupational safety and health and the quality of jobs, and ensuring that the benefits from AI are broadly and fairly shared?

There is currently little guidance on how to meet these objectives. One challenge is that AI is not a single, uniform technology that will steer the labour market in one known direction. In reality, AI comprises a range of different systems, which can impact workers in different ways, from influencing the demand for their labour to changing the environment where they work and to affecting the inclusiveness of the labour market overall. Fundamentally, the impact of AI on the workplace will depend on the type of AI, how it is deployed, and on contextual factors, including policies and institutions.

This document serves both as a conceptual and practical guide for defining and classifying AI, in order to understand its impact on the workplace.[1] Part 1 examines the conceptual side, discussing how AI can be defined and providing a selection of AI use cases to help stakeholders identify AI and distinguish it from other advanced technologies. The aim is to establish a common understanding of AI in the workplace to facilitate discussions and decision-making about the adoption, implementation and use of AI.

Part 2 then provides a framework for classifying AI according to its impact on the workplace, consisting of a set of questions for stakeholders to consider. These questions are intended to help stakeholders evaluate any AI application from a workplace perspective (either a priori or ex post), so that this important dimension is not overlooked.

The framework contributes to a policy discussion currently attracting a lot of attention, which is how to differentiate between AI applications with different risk or impact levels in order to apply appropriate regulations and policy measures. Box 1 provides some examples of governments exploring differentiated approaches to AI regulation and policy. Although much of the policy discussion is about how to regulate potentially harmful AI, governments will also want to steer innovation towards AI that enhances the workplace, the economy and society as a whole.

The framework presented here is intended to support such an approach by enabling stakeholders to give due consideration to workplace risks and impacts. One recent paper (Klinova and Korinek, 2021[1]) points out that, while developers and deployers will often agree that any AI system should be human-centred, transparent and accountable, they will too easily concede that AI will disrupt labour markets and induce job loss. The framework aims to promote informed discussion of the potential positive and negative workplace impacts of AI, so that AI is implemented in such a way as to empower and complement workers and improve job quality, and so that all workers can share in these benefits.

The conceptual and practical thinking developed in this document has underpinned much of the OECD's other work on the impact of AI on the workplace. In particular, it has influenced the design of the

[1] See the OECD Framework for the Classification of AI Systems (OECD, 2022[6]) for a broader framework that classifies all AI applications according to the full set of OECD AI principles, including those relating to people and planet; human rights, privacy and fairness; transparency and explainability; robustness, security and safety; and accountability.

questionnaires used for employer and worker surveys the OECD conducted in the manufacturing and finance sectors of 8 OECD countries to collect new data on the impact of AI in the workplace (see Annex A for further details). An expert workshop was held on 14 December 2020 which greatly informed this work (Annex B). Annex C provides a summary of the framework in table format.

Box 1. Differentiated approaches to AI regulation and policy

Policymakers are exploring differentiated approaches to AI regulation and policy

Policymakers are currently exploring how to develop regulation and policy in a way that acknowledges that different AI applications may require different treatment. Such an approach would allow regulation to be targeted and proportionate, focusing oversight on AI applications with the potential to cause most harm while minimising the burden of compliance for benign and beneficial applications. Examples include (OECD, 2023[2]):

- The European Commission, which is proposing a risk-based regulatory approach that differentiates between uses of AI that generate minimal risk, low risk, high risk and unacceptable risk. For example, the European Commission considers all AI systems used in "employment, workers management and access to self-employment" as "high risk", which would include using AI for recruitment and employee monitoring (Council of the European Union, 2022[3]).
- The Canadian government, which seeks to establish measures to mitigate risks of physical or psychological harm and biased output of "high-impact" AI systems.
- The United Kingdom government, which proposes an approach that is both risk-based and context-specific, acknowledging that risks may differ within and across sectors and over time.

Determining "high-risk" or "high-impact" AI applications is a complex task and regulators are likely to diverge in their determinations. However, the appeal of such an approach lies in the heterogeneity of AI applications, owing primarily to AI's ability to be combined with other technologies and to be deployed in different contexts.

Similar ideas are found in the economic literature

The idea of being able to draw a line between different types of AI is also found in the economic literature: Acemoglu and Restrepo (2020[4]) find it useful to differentiate between the "right and wrong kind" of AI when reflecting on the labour market and broader economic and social implications of AI. Acemoglu (2023[5]) argues that when markets favour the wrong technologies, such as AI which is good enough to replace a worker but not good enough to increase productivity substantially, policymakers may have a role to play in identifying and correcting the systematic distortions that steer innovation towards suboptimal or harmful outcomes.

Part 1: What is meant by AI in the workplace?

This section discusses how AI can be defined and provides a selection of AI use cases. The aim is to establish a common understanding of AI in the workplace to facilitate discussions and decision-making about the use of AI.

Definition of AI

Defining what is meant by AI can help establish a common foundation for considering the impact on the workplace. A useful starting point is the definition established by the OECD's AI Experts Group (AIGO) (OECD, 2022[6]):

> *An AI system is a machine-based system that can, for a given set of human-defined objectives, make predictions, recommendations or decisions influencing real or virtual environments. It uses machine and/or human-based inputs to perceive real and/or virtual environments; abstract such perceptions into models (in an automated manner e.g. with machine learning or manually); and use model inference to formulate options for information or action. AI systems are designed to operate with varying levels of autonomy.*

A recent OECD paper (2021[7]) on AI measurement in ICT usage surveys compares the OECD definition to those used by other organisations and statistical agencies. Highlighted here are some notable commonalities across definitions, with relevance for AI in the workplace:

- Reference to the capabilities of AI: Definitions typically either describe the system as intelligent or list cognitive tasks that it can perform (in the case of the OECD definition: making predictions, recommendations or decisions). AI's ability to perform cognitive tasks means it could transform occupations that have been historically more sheltered from automation.
- Reference to the form(s) that AI can take: Definitions often describe AI as a "system", "technology", "machine" or "software". This can serve as a reminder that, despite AI's intelligence, it should not be anthropomorphised. [2]
- Reference to AI's environment: A few definitions mention this, as a nod to AI's interaction with the world around it. The OECD definition treats the environment as both a space observable through perceptions and influenced through actions. In a workplace environment, the data collection underpinning AI may change how workers are monitored and managed, for example.
- Reference to AI's autonomy: Some definitions mention that AI operates with some level of autonomy (and in the OECD's definition, with varying levels of autonomy). This could hint at some possible limitations of AI and a possible role for humans to control, guide or override AI in certain circumstances.

[2] For further discussion of attributing human-like intelligence to AI systems, see Waas (2022[49]).

AI use cases by sector

Even equipped with a definition, it can be difficult in practice to distinguish between what is and what is not AI. One of the main challenges is that AI often co-exists with, and is embedded in, other technologies with the result that its presence may be obscured. For instance, workers using AI-enhanced software may be completely unaware that AI is generating the recommendations they see on the interface. Without in-depth knowledge of how a technology operates, the existence of AI may need to be inferred based on knowledge of common applications of AI, for example: in software (e.g. voice assistants, image analysis, search engines, and face recognition) or systems embedded in hardware devices (e.g. robots, autonomous vehicles, drones or IoT applications) (Montagnier and Ek, 2021[7]). Another challenge is that the meaning of AI may change over time as new technologies emerge and others recede.[3]

Table 1 provides a snapshot of real-world applications of AI in a range of economic sectors. The table is not intended to be comprehensive nor to imply, to take one example, that all credit scoring within the financial sector is currently performed using AI. Instead, it is meant to demonstrate the variety of uses across the economy today and to provide concrete examples of how workers may interact with AI, in order to inform the identification of AI and the discussion in the remainder of this document.

Table 1. Illustration of AI use cases across various sectors of the economy

Sectors	Examples of AI use cases
Accommodation and food service activities	Revenue management systems (e.g. using forecasting technology for dynamic pricing) Self-service check-in (e.g. using chatbots and image recognition of ID and payment methods) Workforce management (e.g. using software to optimise scheduling and predict shortages)
Administrative and support service activities	Expenses (e.g. using image recognition to add receipts to expense reports) Hiring tools (e.g. using facial recognition software to analyse recorded interviews) Appointment scheduling (i.e. using natural language processing to manage schedules)
Agriculture, forestry and fishing	Agricultural robots (e.g. using robots to pick and inspect fruit) Crop and soil monitoring (e.g. using image recognition to identify soil defects) Predictive analytics (e.g. using satellite images to forecast weather and recommend harvest periods)
Education	Tutoring and coaching (e.g. using student data to personalise lesson plans) Translation (e.g. using speech recognition to translate and live-caption lectures) Content creation (e.g. using deep learning to compile study guides and tests)
Financial and insurance activities	Credit scoring (e.g. using non-traditional data to assign credit score) Wealth management (e.g. using robo-advisors to provide automated financial advice) Fraud detection (e.g. using anomaly detection to alert staff to block certain payments)
Human health and social work activities	Bed management (e.g. using software to streamline patient flow in hospitals) Health research (e.g. using biomarkers to predict potential drug candidates) Diagnosis (e.g. using image recognition to assess and characterise abnormalities)
Manufacturing	Training and support devices (e.g. using smart-goggles to train employees)

[3] The same challenges appear in the process of developing differentiated approaches to AI regulation and policy, such as those mentioned in Box 1. One proposed solution (Madiega, 2021[48]) is to steer towards a broader definition of AI (to cover computation systems that could generate similar risks) and a technology-neutral definition (in order to cover current and future AI techniques). However, drawing definitions too broadly could lead to legal uncertainty for developers and operators of AI systems and to over-regulation.

	Visual inspection (e.g. using image recognition to check items for flaws) Production planning (e.g. using software to predict demand and plan production) Predictive maintenance (e.g. using data to indicate when machines should be serviced)
Professional, scientific and technical activities	Scientific research (e.g. using image recognition to identify wild animals) Legal services (e.g. using machine learning to search contracts for inconsistencies) Architecture (e.g. using software to create digital representations of structures)
Public administration and defence; compulsory social security	Predictive policing (e.g. using crime data to guide where and when to deploy resources) Chatbots for municipalities and cities (e.g. using chatbots to answer citizens' questions) Tax administration (e.g. using anomaly detection to identify potential fraud)
Transportation and storage	Surveillance (e.g. using computer vision to ensure compliance with social distancing) Travel optimisation (e.g. using data to forecast traffic and plan efficient travel routes) Warehouse management (e.g. using cameras and scanners to track inventory)
Wholesale and retail trade	Sales (e.g. using wearable devices to connect employees to inventory information) Inventory management (e.g. using loyalty card data to tailor store merchandise) Customer service (e.g. using an in-store robot to answer customer questions)

Note: The categories in the table are illustrative rather than comprehensive.
Source: The table is based on a desk research exercise to compile use cases using sources such as information on the websites of AI developers and AI adopters, online newspaper and magazine articles, academic literature and other reports.

Part 2: Classifying AI according to its impact on the workplace

The overview of use cases presented in Part 1 of this document illustrates the wide range of technologies that come under the umbrella of AI—from fruit-picking robots to scientific research. These technologies are all likely to have a different impact on work which, in turn, will depend on how they are implemented, as well as the policies and institutions in place. AI technologies may automate jobs to different degrees, have a positive or negative impact on job quality, and affect some workers more than others. Thinking about the impact AI may have on workers may seem challenging but should be an important element in the decision to adopt these technologies, and how to implement and use them.

To guide stakeholders in this thinking, Part 2 presents a framework for classifying AI, consisting of a set of questions intended to help evaluate any AI application (a priori or ex post) from a workplace perspective and facilitate discussions about its adoption, implementation and use. The main intended users of the framework are: governments; firms; and workers and their representatives. The questions have been formulated so that they can be answered by these users, based on information observable to them about the characteristics of the AI under consideration and how it is deployed. Where stakeholders feel that they do not have sufficient information to answer the questions, they may need to request it from the developers and suppliers of the AI application.

Boxes scattered throughout the text provide examples of how particular AI applications might be assessed using the framework. The AI applications and companies described in these boxes are fictional but inspired by use cases presented in Table 1.

The framework is organised according to three dimensions of the OECD Jobs Strategy (OECD, 2018[8]): i) job quantity, ii) job quality and iii) inclusiveness. Job quantity and quality focus on the idea that there should be more and better jobs. More specifically, job quantity covers the labour market situation in terms of unemployment, working time and labour force participation. Job quality refers to earnings quality, labour market security and quality of the working environment[4]. Finally, inclusiveness focuses on the distribution of opportunities and outcomes across individuals; in this case, the idea that everyone should have the opportunity to benefit from AI, with no group excluded or disadvantaged due to their socio-economic background.

Key questions for job quantity

AI can be considered an automation technology, i.e. a technology that makes it possible to automate tasks that would otherwise be performed by humans, like industrial robots and software. This is what leads some to fear that AI could induce job loss and undermine humans' place in the workplace. While this is a valid concern, it is also advised to consider AI's potential to increase productivity and create jobs—within the adopting firm, within the AI industry, or beyond. Governments, firms, workers and their representatives are

[4] See the OECD Guidelines on Measuring the Quality of the Working Environment (OECD, 2017[41]).

encouraged to reflect on how all of these forces might interact, in order to understand whether the AI application under consideration ultimately reduces the need for labour, maintains or increases it.[5]

Does the AI application substitute labour?

To understand an AI application's propensity to substitute labour, stakeholders could consider the following indicators: job loss and changes in aggregate employment, reduced hiring and reduced hours worked, and the motivation for adopting AI.

Does the AI application substitute labour in particular tasks?

AI rarely automates jobs in their entirety. This is because most jobs consist of many varied tasks and, while AI today can perform certain tasks very well, it cannot yet mimic the full range of abilities innate to humans.[6] Thus, AI often automates parts of a job by substituting labour in certain tasks and thereby transforming that job rather than eliminating it.

Does the AI application reduce the need for labour?

It may be possible to retain staff and reallocate them to the remaining tasks, yet the ultimate impact may still be a somewhat reduced need for labour and lower job quantity than would be the case without AI. Governments, firms and workers and their representatives may want to track changes in hours worked, in addition to aggregate employment levels. OECD analysis (Georgieff and Hyee, 2021[9]) has suggested a positive link between exposure to AI and increased rates of involuntary part-time work in occupations where computer use is low, which indicates that these workers work fewer hours than they would like to.

Will the AI application reduce the need for labour in future?

Governments, firms and workers and their representatives should also think about how job levels and job growth may change in the future even if the use of AI does not result in immediate redundancies. Labour substitution may happen by attrition, as firms choose not to replace staff who retire or resign.[7] Case studies that the OECD carried out in the manufacturing and finance sectors of 8 OECD countries (Milanez, 2023[10]) found a few instances in which, although AI meant that fewer workers were required, there was an effort to retain staff until retirement or voluntary separation. Such a strategy may slow the decline in employment in the short term but is likely to reflect a lower need for labour in the long run. Governments, firms and workers and their representatives should thus take a long view of the labour substitution effect of the AI application under consideration.

What is the motivation for adopting AI?

[5] While empirical research to date has not found evidence of AI reducing aggregate employment levels (Lane and Saint-Martin, 2021[46]), it has detected signs of substitution (e.g. AI exposure associated with lower hiring, overall and in AI-related positions (Acemoglu et al., 2022[47])) and of employment growth (e.g. AI exposure associated with higher employment growth in occupations where computer use is high (Georgieff and Hyee, 2021[9]).

[6] See Lassébie and Quintini (2022[51]) for discussion of the bottlenecks that prevent AI from automating many jobs in full.

[7] OECD analysis (OECD, 2020[50]) found attrition to be a powerful driver of polarisation (i.e. the decline in the share of middle-skill jobs) in the period between 1994 and 2007, even before crisis-related layoffs reinforced the trend. Thus, the impact of automation may be more to reduce opportunities for workers to enter middle-skill jobs in future than to displace existing workers. Additionally, Georgieff and Milanez (2021[43]) showed that while OECD countries have typically experienced increased employment levels over the past decade, employment *growth* has been much lower in occupations at high risk of automation than in low-risk occupations.

Finally, another indicator that AI may substitute labour is if a firm states that the motivation for adopting AI is to reduce staff costs or to fill gaps caused by labour shortages. In the latter case, the AI application could substitute labour without any immediately observable reduction in employment.

Does the AI application boost productivity enough to create new jobs?

AI has the potential to boost productivity but one of the main questions for understanding the impact of any AI application on job quantity is whether it will boost productivity enough to counteract the negative effects of substitution. An AI application could boost overall productivity either by enhancing the productivity of workers, by improving products, processes and the productivity of capital, but also by substituting workers and thereby reducing firm costs. Productivity gains will be of clear interest to firms seeking to grow, compete and increase profitability, but governments and workers and their representatives will want to understand whether the AI application is boosting productivity enough to create new jobs and sustain job quantity. This understanding will also help firms communicate why they wish to deploy the AI application under consideration, to understand staffing needs, and to ensure that the application meets its pre-stated goals.

Does the AI application increase worker productivity without substituting labour?

In certain applications, AI may act as a tool that enables workers to work more productively or more accurately, without substituting them. For instance, AI is particularly well suited to prediction tasks, given its ability to process large amounts of data, identify patterns and make inferences. AI can complement workers by improving the precision and speed of predictions, which are used as inputs into decision-making tasks (2019[11]). In 2019, Stanford radiologists assessed an AI-enabled technology used to diagnose pneumonia on chest x-rays and found that a combined AI/radiologist approach was more accurate than either the technology or radiologists alone (Patel et al., 2019[12]). Such cases combine the analytical power of AI with human skills (such as the ability to deal with nuance and the ability to communicate the decision) and may increase productivity without necessarily substituting or reducing the need for workers.

Does the AI application increase productivity enough that it increases the need for labour?

In other cases, applications of AI can increase productivity through the substitution of labour, and the productivity increase may or may not be sufficiently large to counteract the negative impacts of substitution. In theory, if an AI application can complete tasks more effectively and cheaply than a worker, the use of AI could enable the firm to increase productivity and to improve their products and services. When consumer demand increases for these better and cheaper products, the firm can expand capacity, allowing workers to benefit in the form of more and better employment opportunities. In this case, the AI application would have boosted productivity sufficiently to create new jobs.

However, not all technologies are capable of generating such an effect. Acemoglu and Restrepo (2020[4]) warn about the “wrong kind of AI”, that is AI which is just good enough to substitute workers, but does not produce substantial productivity gains for the business, meaning that workers and society will ultimately lose out. The slowdown in the growth of labour demand over the last two decades could indicate that the “wrong kind” of technology has dominated most recently. It is not clear how or whether AI will change course.

Governments, firms and workers and their representatives will want to develop a full picture of how the substitution and productivity effects interact. If the AI application under consideration is boosting productivity enough, stakeholders might observe staff levels within the firm and/or being maintained or even increasing, as operations scale up and new jobs are created. Governments may also want to consider

whether the benefits of the AI-induced productivity increase are rippling beyond the firm and the sector in which the AI application was implemented, with benefits for the wider economy.[8]

Box 2. Example: AI-assisted shopping cart increases productivity but not enough to sustain job quantity

FirstMart, a national supermarket chain, introduces an AI-assisted self-scanning shopping cart with the aim of cutting staff costs, eliminating theft and reducing queues. The automation of scanning and payment leads to cost savings, which are passed on to customers in the form of lower prices, allowing FirstMart to increase sales and market share, and to open new stores and hire more staff.

As a result of the implementation of the AI-assisted shopping cart, the job of a FirstMart supermarket cashier changes and the overall composition of FirstMart's workforce also changes. Supermarket cashiers no longer scan items and take payments. Instead, the job is now more centred on helping customers who require additional assistance, dealing with customer complaints and rectifying potential errors. Only half the number of cashiers are needed to cover the new customer services so, despite the opening of new stores, the overall number of cashiers required decreases. Some cashiers retain their jobs but others lose them.

Although the AI-assisted shopping cart was developed for FirstMart by a large tech company, FirstMart's head office hires 20 AI experts to maintain the system. The 10 engineers who previously serviced the cash registers are retrained to service the AI-assisted self-scanning shopping carts.

In this case, AI has substituted labour leading to the partial automation of the job of supermarket cashier, transformation of that job, and job loss. It has also enhanced productivity within the company and has created new jobs in AI-system maintenance, but not enough to sustain job quantity.

Does the AI application create new jobs and tasks for workers?

Another important determinant of job quantity is whether the AI application creates new jobs and tasks for workers, effectively reversing the substitution effect. Most directly, AI will create jobs and tasks related to its own development and deployment. However, jobs and tasks could also be created in the process of task reorganisation, as AI takes over certain tasks and enables workers to focus on higher productivity ones. In an OECD survey of employers (Lane, Williams and Broecke, 2023[13]), around half of AI adopters in finance and manufacturing reported that AI had created tasks that were not previously done by workers, while over two-thirds reported that AI had automated tasks that workers used to do.

Does the AI application create jobs and tasks related to its own development and deployment?

The human element may not always be obvious in an industry built around the idea of intelligent and autonomous machines but, much like any technology, AI will need to be developed, bought and sold, maintained, operated, audited and regulated, all of which will create new jobs. To deploy AI successfully will require an understanding of what AI can and cannot do, and what applications align with the organisation's strategy, infrastructure and operations.

[8] If AI enables a firm to offer cheaper prices and improved products, consumer demand can rise, benefitting firms and workers in other sectors as well. For instance, in the example in Box 2, a large supermarket chain implements an AI-assisted self-scanning shopping cart, which leads to cost savings which are passed on to customers in the form of lower prices. Lower grocery bills may mean that consumers can increase their spending on other items, such as holidays or entertainment, which may increase employment in those sectors.

Governments can start by tracking the size of the "AI workforce", defined as those with the skills (in statistics, computer science and machine learning) to develop and maintain AI systems. Recent OECD research (Green and Lamby, 2023[14]) suggests that the AI workforce in OECD countries is relatively small (under 0.3% of employment in 2019) but growing rapidly, with this percentage having almost tripled over 10 years.

Does the AI model rely heavily on human assistance?

All AI models will require some human assistance but researchers may want to examine whether certain AI models have greater potential for job creation than others. For example, "symbolic" AI describes AI methods that follow human-written rules, ontologies and search algorithms to infer conclusions from a specified set of constraints or variables (OECD, 2022[6]). This higher reliance on human knowledge could mean that symbolic AI has greater potential for job creation.

Does the AI application enable workers to focus on higher productivity tasks?

Where AI substitutes workers in certain tasks, it may open up the opportunity for workers to spend more time on higher productivity tasks. These may be tasks that require skills that AI does not possess, such as creative and social intelligence, reasoning skills and critical thinking. For instance, Alibaba's chatbot handled more than 95% of customer inquiries during a 2017 sale, thereby allowing human customer representatives to handle more complicated or personal issues (Zeng, 2018[15]).

Key questions for job quality

Governments, firms and workers and their representatives will want to consider the impact of the AI application on job quality as well as job quantity. AI has the potential to alter job quality, by changing the content and design of jobs, and workers' physical and social environment. AI can change how work is monitored and managed, and how workplace decisions are made. Since AI relies on inferences from large amounts of data, it may encourage increased data collection within the workplace, raising issues of privacy and consent. Finally, any productivity gains generated by AI may or may not be shared with workers in the form of higher wages, another dimension of job quality. Firms, workers and worker representatives will want to be on a common page on these issues, in order to avoid or mitigate any adverse consequences.

Does the AI application change the quality of jobs by affecting their content and design?

Governments, firms and workers and their representatives should also consider whether AI-led substitution of tasks is likely to impact job quality by transforming the content and design of jobs. These transformations could make work more or less safe or fulfilling and could increase or decrease autonomy and learning opportunities. Other types of AI will have very little impact on the content and design of jobs – some workers may even be unaware that they are using it. While job loss is often the primary concern associated with AI substituting workers in certain tasks, it is also necessary to consider how substitution transforms the jobs of those who remain working.

Does the AI application improve/worsen job quality by substituting unpleasant/pleasant tasks?

If the AI application automates hazardous, repetitive or demeaning tasks and steers workers toward safer and more fulfilling ones, it is likely to enhance job quality. If the AI application automates safe and fulfilling tasks, job quality will deteriorate. For instance, as the supermarket cashier in Box 2 takes on new responsibilities to replace scanning items, perhaps the job overall becomes less repetitive and more interesting, although it could alternatively become more challenging and stressful. In response to an OECD survey of the impact of AI on the workplace (Lane, Williams and Broecke, 2023[13]), 65% of AI workers using in the manufacturing sector reported that AI had improved their physical health and safety, compared to under 10% who said it worsened it. This could be because AI has been used to automate dangerous

tasks.[9] OECD case studies of the impact of AI in the workplace (Milanez, 2023[10]) suggested that, in some instances, the need to take on new tasks and learn new systems could prompt stress.

Does the AI application remove autonomy and learning opportunities?

Increased complexity may require workers to acquire new skills and knowledge in order to cope, but may also provide additional autonomy and learning opportunities, both important aspects of the quality of the working environment. On the other hand, if the AI application takes over complex tasks and leaves workers with unstimulating ones, this is likely to lead to a general deskilling of the workforce, fewer learning opportunities and less autonomy. Take for example the more experienced workers in the older distribution centres in Box 3 who fear that their knowledge will no longer be valued in the workplace once AI is introduced.

A further example is when AI-enabled tools feed into decision-making processes. The more humans are asked to defer to AI in decision-making processes, the less autonomy and fewer learning opportunities they might have. For some AI applications, this could result in a de-skilling of workers who were previously decision-makers. The AI application may also frustrate workers when it produces recommendations that conflict with their own judgement, particularly when they do not understand how the AI came to that recommendation. In one study (Lebovitz, Lifshitz-Assaf and Levina, 2022[16]), radiologists struggled to figure out how to weigh AI's potential errors against their own and thus experienced doubt and ambiguity when working with the technology. For other AI applications, workers may find the input into decision-making very helpful. Indeed, there is some evidence that when digital systems assist employees with decision making, lower human autonomy could lead to lower "technostress" (Ulfert, Antoni and Ellwart, 2022[17]). Additionally, in surveys of workers about the impact of AI in the workplace (Lane, Williams and Broecke, 2023[13]), over 80% of workers assisted by AI in decision-making reported that they liked that AI this assistance.

Does the AI application have any noticeable impact on job quality?

Some applications of AI may enhance workers' productivity without reducing job quality or job opportunities, even as use becomes pervasive in business processes. For instance, many applications of AI take the form of minor improvements to existing software (e.g. AI improving an email client's spam filter). Workers using the software may see AI as a tool or may even be unaware that they are interacting with AI on a daily basis. Additionally, the AI application may only require a marginal change in skill set. For instance, in one survey (Bessen et al., 2018[18]), only 10% of AI-producing start-ups said that users would need to have expert coding or data skills in order to use their products. Most products just required general familiarity with computers.

Box 3. Example: AI robots make distribution centre work safer but more monotonous

Over a decade, e-retailer QuickM has been progressively deploying AI in robot task management, picking and stowing, and inventory management, in order to optimise the flow of inventory through its newer distribution centres. The newer distribution centres have been specifically designed to facilitate these technologies, with much of the space dedicated to automated mobile robots. These automated mobile robots pick products and deliver them to workers at stations on the other side of a safety barrier.

[9] The outcome may even be mixed, as suggested by the same surveys. Around three-quarters of workers who use AI reported that AI had increased their pace at work (which could be a sign of increased work intensity), however the same workers were overwhelmingly positive about the impact of AI on their job satisfaction. A survey of workers in Japan (Yamamoto, 2019[40]) showed similar results, and the author theorised that AI allowed workers to concentrate on more complex tasks that could only be performed by humans, which intensified work-related stress but possibly also provided a greater sense of satisfaction once accomplished.

Workers in the newer distribution centres do not need to walk to the products and do not need to push heavy carts long distances. Accidents caused by falling products and tripping are lower in the newer distribution centres.

However, the work is still physical. Workers at the stations are on their feet all day long and have to work quickly to keep up with the pace of the robots. Work at the newer distribution centres is more productive but also more repetitive for workers. To break up the monotony of a full day's work and thus stem staff attrition, some site managers have started allowing workers to rotate to another activity after their lunch break.

The newer distribution centres place items so that the location is recorded in the AI-enabled inventory management system and easily accessible by the robots. To workers, however, the location of items appears random and illogical. Whereas experienced workers in the older distribution centres could guess where an item would be located, this type of knowledge is not relevant in the newer centres. More experienced workers in the older centres worry that if the new technologies are adopted in their centres, QuickM will regard them as less valuable and more replaceable.

Does the AI application change the physical and social environment of workers?

AI can have a physical presence when combined with machinery and can change the way workers interact with machinery and one another. For governments, firms and workers and their representatives considering an AI application, the impact on workers' physical and social environment may be more tangible and visible than other impacts. They are encouraged to consider whether the AI application enables distance or proximity from machines, and whether the overall design of the workspace changes to accommodate AI-enabled machines.

Workers could have very different experiences working with AI, depending on whether the AI application under consideration enables distance or proximity to machines. Due to the risk of serious accident, businesses have long been required to take specific technical and organisational measures to ensure the safety of workers working with machinery, such as sectioning off robots from human workers in industrial environments.

Does the AI application allow workers to perform tasks from a distance?

When AI substitutes workers in certain tasks, this may be done in such a way that it effectively creates separate work environments for humans and for machines (such as in the distribution centre in Box 3) or gives workers the opportunity to step away from the machine during dangerous tasks, while still enabling coordination between worker and machine. Combined with complementary technologies such as virtual reality, AI could even enhance workers' ability to be able to interact with machines from a distance. For instance, virtual reality welding training simulators let students practice welding safely while physically holding a fake soldering iron and wearing a headset that simulates a welding experience. One example comes from case studies the OECD carried out about the impact of AI in the workplace (Milanez, 2023[10]) in which accidents in a steel product factory have reduced as workers no longer need to straighten the rods. Instead, this work is now performed by a machine, controlled by AI software and monitored by workers behind a barrier.

Does the AI application enable workers and machines to work in close proximity?

In other cases, advances in AI may encourage humans and machines to work in close proximity. Collaborative robotics is founded in the idea that this can enable even better coordination and productivity. However, even with advances in AI, safety remains the main challenge for developers of these cobots (2018[19]). For example, collaborative robotic assembly tasks have been shown to produce mental strain as evidenced by the monitoring of psychological and physiological (e.g. sweating) responses, which are

more pronounced when the cobot is within two metres of the worker and moves quickly and without warning (Arai, Kato and Fujita, 2010[20]). In addition, if the AI-enabled machines can be operated by workers with less pre-existing training or knowledge than those doing the job before, this could lead to injuries (Moore, 2018[21]).

Does the AI application change the social environment of the workplace?

The social aspect of job quality should also be considered. The workplace may become a lonelier place if interactions with colleagues are replaced by interactions with machines or software. Although this may suit some workers, social support from colleagues typically improves job quality by acting as a buffer against the negative consequences of extensive work demands (OECD, 2017[22]).

Does the AI application change how work is monitored or managed?

AI's presence in the workplace and in work processes and systems can also change how work is monitored and/or managed. Firms might be attracted to the idea of using AI to monitor and assess workers, on the basis that this offers a more data-driven and time-efficient approach to people management. However, they will also want to take account of any potential negative consequences for job quality, induced either by the sense of being monitored or the sense of one's privacy being invaded. Governments and workers and their representatives will want to ensure that such tools are accurate and being used correctly, avoiding excessive monitoring and data collection.

Does the AI application monitor or schedule tasks?

AI-enabled monitoring and scheduling tools can negatively affect job quality by increasing work intensity and stress (Moore, 2018[21]). If scheduling tools push workers to repeatedly meet specific efficiency targets, they may experience work intensification or reduced autonomy over decision-making. Similarly, if the tool is used for quality assurance, it may raise the stakes for making mistakes, which would increase stress and anxiety for workers. These feelings may be exacerbated if the tool is used to support important decisions regarding promotion or dismissal.

The use of AI-enabled monitoring tools could be viewed as the automation of a particular management task, and a complement to managers' other tasks. For example, AI-enabled software can be used to monitor workers' desktop, calendar and webcam while they are working remotely. If these tools make monitoring cheaper, more accurate and more effective, this may allow managers to delegate more (or more complex) tasks to non-management staff (Tirole, 2017[23]). This could enhance autonomy and learning opportunities among non-management staff, thus improving their job quality.

Does the AI put workers' privacy at risk?

As AI-enabled monitoring tools are often reliant on the collection and processing of worker data, firms that choose to use them may find that they need to collect more and more data, which can introduce some separate issues with a possible impact on job quality. One of these is privacy.

In the workplace, it can be difficult to ensure meaningful consent of workers to data collection and processing (Moore and Weizenbaum Institute, 2020[24]) and for workers to ensure that employers are securing and processing personal data appropriately. For instance, workers may provide consent in their employment contracts or when they log in to internal systems, where workers have no choice but to consent. "Function creep" describes the case in which the purpose of data collection is expanded or changed after consent is obtained, as illustrated in Box 4. In instances where workers are unable to provide meaningful consent or access the worker data used by their employer, they may experience worsened stress or anxiety stemming from a feeling of powerlessness over the collection and use of their data. Management can enhance worker trust if they are open about what and why the data is being collected when asking for consent, establish an environment where trust already exists and offer accountability (Felzmann et al., 2019[25]).

Even where there is consent, it is important that data are sufficiently protected, in order to respect legal and fundamental rights, but also to diminish privacy infringements and cybersecurity breaches (and fears thereof), which can also increase stress. OECD surveys of AI use in the workplace (Lane, Williams and Broecke, 2023[26]) show that, among workers who report that their employers' use of AI involves the collection of data on workers or how they do their work, more than half expressed worries regarding their privacy and more than half said that they worried that too much of their data was being collected.

Box 4. Example: A smart wristband leads to function creep

Hinch Tax Services gifted each of their workers AI-enabled smart wristbands to participate in a company-wide walking challenge. The purpose of the competition was to encourage healthy habits and team building in their offices. Participation was voluntary and employees were enthusiastic to participate. They agreed to health- and activity-related data collected by their watch being shared with the HR team for the competition.

Two years later, Hinch Tax Service's Head of Procurement was renewing the company's health insurance policy. He asked the HR team whether the data collected as part of the walking challenge could be shared with prospective providers in order to get a reduced quote. He wanted to show that the majority of employees were physically active and that only five employees could be considered at risk of health complications due to inactivity. The HR team declined his request, explaining that it would be inappropriate to use the data for a purpose that the participants had not explicitly consented to and had no knowledge of, even if this would lead to savings. The HR team also pointed out that if the workers discovered that their data was used for a purpose they had not explicitly consented to, they could experience distrust, stress and anxiety.

Data protection principles of 'purpose specification' and 'use limitation' should prohibit these practices in the European Union. However, it is difficult to enforce the regulations if workers are unaware that the data transfer has taken place.

Are the gains of the AI application shared with workers in the form of higher wages?

While there are many factors that determine wages (including the demand for and supply of labour, minimum wage legislation and collective agreements), there is one feature of an AI application which has particular relevance: whether the AI application increases or decreases the importance of labour in the production process and/or the wider economy. In the latter case, workers are unlikely to see the productivity gains of AI reflected in higher wages.[10] In fact, the last two decades have seen a decoupling of productivity and wages in many OECD countries, with wages growing more slowly than productivity. Schwellnus et al. (2018[27]) attribute this mainly to technological progress, which means that AI (or certain types of AI) could continue the trend.

Does the AI application increase or decrease the importance of labour in the production process?

[10] To understand why, it is necessary to consider the interaction between the substitution and productivity effects discussed in the previous section. When AI substitutes labour, this reduces labour demand and puts downward pressure on wages, in the same way as substitution puts downward pressure on job quantity. It might be expected that the productivity gains of AI could then put upward pressure on wages, restoring or even increasing them. However, as long as the AI application reduces the importance of workers in the production process, then workers' wages will get a reduced share of any productivity gains. In this case, the productivity of the firm and of individual workers may be increasing, but wages are not increasing at the same rate.

The link between productivity and wages can only be maintained if AI creates new high-productivity, labour-intensive tasks for workers and thereby reinstates the importance of labour in the production process (Acemoglu and Restrepo, 2020[4]). Not all AI applications will satisfy this criterion.

To assess whether the use of AI within a firm is weakening the link between productivity and wages, firms, workers and worker representatives can consider whether the firm's labour costs are declining as a share of total value added. To understand the economy-wide effect, governments may want to track worker productivity and average wages at aggregate level and in occupations and sectors which are particularly exposed to AI.

Key questions for inclusiveness

Inclusiveness will be a key concern for governments, 46 of which have already adhered to the OECD AI Principles, which call for trustworthy AI in pursuit of beneficial outcomes for people and the planet, such as advancing inclusion of underrepresented populations and reducing economic, social, gender and other inequalities. Inclusiveness may deteriorate if the AI application under consideration reinforces existing disparities and biases. Firms and worker representatives are encouraged to ensure that the AI application does not leave certain groups behind.

Does the AI application benefit some groups more than others?

Not all sectors and subgroups experience AI equally and some may be more capable or better positioned to adapt to a reorganisation of tasks and use AI in a way that is complementary to their work. Governments, firms and workers and their representatives can start by considering which groups are most likely to benefit from the AI under consideration and which groups are most likely to lose out.

Since technological progress can increase productivity and drive economic growth, it is worth exploring whether and how AI can be implemented in an inclusive way, without increasing inequalities and societal resistance to technological progress. One of the biggest concerns is that increased use of AI will continue or even exacerbate negative economic trends such as the declining labour share (which shifts the economic gains of AI away from workers) and the fall in real wages of lower-paid workers. The former can only be mitigated if governments, firms and workers and their representatives and society as a whole favour the use of AI applications that create new high-productivity tasks for workers and thereby reinstate the importance of labour in the production process, as discussed previously. The latter can be addressed by ensuring lower-skilled workers and lower-paid workers are not left behind or further disadvantaged.

Are certain groups more capable or better positioned to adapt to AI?

Just because certain groups are highly exposed to AI, this does not necessarily mean that these groups will bear the brunt of negative impacts from AI. For instance, many high-skilled occupations[11] involving non-routine cognitive tasks are judged to be highly exposed to AI. These higher skilled workers may be better positioned to adapt and be complemented in their work by AI, due to their greater ability to learn new information and adapt to new technologies, as well as their tendency to possess skills that cannot be easily automated (Fossen and Sorgner, 2019[28]). Firms may be more willing to retain and retrain workers with specialised skills who would be more difficult to replace. In an OECD survey of workers about the impact of AI on the workplace (Lane, Williams and Broecke, 2023[13]), AI users with a university degree were more likely to report that AI had improved their productivity and working conditions than those without a university degree. Other OECD research shows that exposure to AI is linked to higher employment

[11] Georgieff and Hyee (2021[9]) show that Science and Engineering Professionals, Business and Administration Professionals, and Legal, Social and Cultural Professionals are highly exposed to AI.

growth in occupations where computer use is high and lower growth in average hours worked where computer use is low (Georgieff and Hyee, 2021[9]).

Are certain groups overrepresented in the "AI workforce"?

Governments can also consider the types of jobs that are being created to support the development and deployment of AI, and who obtains these jobs. Recent OECD analysis (Green and Lamby, 2023[14]) reveals that the "AI workforce", defined as those with the skills to develop and maintain AI systems, is confined to a narrow demographic segment of the population, which is primarily male and with a tertiary degree. Additionally, OECD surveys of the impact of AI on the workplace (Lane, Williams and Broecke, 2023[13]) showed that male AI users were more likely than female AI users to report positive impacts of AI on productivity, working conditions and wages.

Does the AI application create poor quality jobs?

At the other extreme of the AI sector is the "ghost work" (Gray and Suri, 2019[29]) – so-called because of its invisibility – often involved in labelling data, flagging X-rated or violent content and checking the outputs of AI. This work is typically associated with challenges such as low pay, limited access to benefits and training, and little job security.[12] The workers performing it often have few alternative employment options and thus little power to negotiate better conditions. The working conditions associated with "ghost work" contrast starkly with those secured by the more visible and higher skilled "AI workforce".

Are certain groups overrepresented in poor quality jobs?

These divisions not only work against the principle of inclusiveness but could exacerbate and perpetuate existing inequalities if workers from already vulnerable populations are more likely to be exposed to poor working conditions. For instance, data-labelling jobs may be targeted at women and individuals in lower wage countries under the promise of flexible work, which can be combined with household and care work (Altenried, 2020[30]). Additionally, evidence from the United States showed that Black and LatinX workers in big-tech companies in Silicon Valley are more likely to be employed on temporary contracts than permanent contracts, despite amounting to a disproportionately low share of the big-tech workforce (Working Partnerships USA, 2016[31]). Box 5 illustrates how temporary and permanent contracts can co-exist and create divides even among workers performing similar work.

Does the AI application assist workers who lack certain skills or who have disabilities?

Governments, firms and workers and their representatives may also want to question whether the AI application can enable or assist workers who lack certain skills or who have disabilities. AI could help to increase inclusiveness and diversity in jobs where there is traditionally a strong bias towards individuals with specific physical or mental capabilities, e.g. high levels of physical strength, or manual dexterity, or visual acuity etc. For instance, there are AI-powered technologies that describe people, text and objects to accommodate workers with low visual acuity (Henneborn and Eitel-Porter, 2020[32]). Could the AI under consideration also make the workplace more inclusive for workers with disabilities, by supplementing and complementing their skills, by helping firms to put reasonable accommodations in place more easily and cost-effectively, and by creating an accessible work environment and helping workers with disabilities to interact with that environment?

When the OECD (Lane, Williams and Broecke, 2023[13]) asked employers how different groups might experience AI in the workplace, employers saw workers with disabilities as a group that could benefit most,

[12] This data-labelling work can be associated with precarious working arrangements such as micro-work (mediated by online labour platforms), temporary contracts, offshoring and domestic outsourcing. Precarious working arrangements can enable unscrupulous employers to skirt labour laws. Due to the complexity of the supply chain, even well-meaning firms, consumers and end-users may be unaware of the degree of "ghost work" or other human involvement in developing AI applications.

whereas other groups such older and low skilled workers were seen as facing more harm. A forthcoming OECD paper will examine opportunities and challenges associated with using AI for labour market accessibility. On the other hand, if workers with disabilities instead faced barriers to using AI-enabled technologies, this would work against inclusiveness. For example, speech recognition systems have been shown to perform badly when processing deaf speech (Fok et al., 2018[33]).

Box 5. Example: Tribulations of temporary work arrangements in Intelligent Tools Inc.

Intelligent Tools Inc. is a big-tech company specialising in AI-enabled technologies for smart home systems. In 2019, Intelligent Tools Inc. hired dozens of workers on 6-month contracts, many of whom with doctorate degrees in linguistics, to annotate and structure data for its AI-enabled speech-recognition technology used within their smart speakers. The company saw this project as a short-term staffing need, which would be suitable for workers seeking flexibility and the opportunity to work in the tech industry.

However, the temporary employees faced barriers to advancing in their careers. Although temporary employees were performing the same tasks as permanent employees, only permanent employees could attend internal meetings and training that would have allowed them to take on management responsibilities and understand the greater context of smart speaker technology. The temporary employees found that they had developed very specific skills that had little transferability to other occupations, thereby limiting opportunities to obtain new employment opportunities.

Given their specialised skills and experience, the workers hired for the project hoped that they would be able to obtain permanent employment before the conclusion of their six-month contract. Many of the temporary workers who contributed to the project reported that managers would pressure workers to work longer hours than agreed to or make subtle promises of conversion to permanent status that never materialised. Given the stress caused by the instability of the arrangement, temporary workers were reluctant to take vacation days or speak out against injustices. After two years of contract extensions, only one of the two dozen remaining employees managed to secure permanent employment for Intelligent Tools Inc.

Does the AI application increase or decrease bias?

Questions of bias are particularly relevant when AI is used in hiring and worker monitoring and evaluations, as well as in promotions and potentially terminations, where decisions may have important implications for individuals' careers and livelihoods. A government that wants to promote the acceptance and use of trustworthy AI may want to prevent AI-enabled tools that increase bias from reaching the market and/or to set standards for specific AI applications to meet. Firms, workers and worker representatives too will want to ensure that any AI-enabled hiring and monitoring tools work accurately, inclusively and without any unforeseen consequences, to attract and retain the best talent.

Is the AI application a tool used in hiring or worker monitoring?

While firms may be attracted to the idea of a data-driven approach to hiring and monitoring, they should be wary of any assertion that these tools are necessarily free of human bias just because they are data-driven. Such AI-enabled tools rely on data about past decisions and may therefore mimic decisions and biases of humans in the past (Moore, 2018[21]). For example, Google was found to advertise highly-paid jobs less frequently to women (Datta, Tschantz and Datta, 2015[34]) while Lambrecht and Tucker (2019[35]) found that STEM jobs were less likely to be shown to women. Setting pay or predicting the success of future employees based on current or past employees risks entrenching past biases and countering any ambitions to improve inclusiveness in the workplace.

Further, AI is reliant on large amounts of data to increase precision in its decision-making. Since there is often less available training data for workers from underrepresented groups, the AI-enabled technology may require more information to form a decision with the same level of precision as workers from the majority group. By imposing standardised profiles, they may work to the disadvantage of underrepresented groups and undermine inclusiveness, as in the example provided in Box 6.

Does the AI application detect and compensate for possible biases?

Bias in AI-enabled hiring and monitoring tools may not even be obvious to the firms using them, least of all governments and workers and their representatives. Even in cases where the algorithm does not request sensitive data (e.g. union status, race, religion), it may be able to infer sensitive information using seemingly innocuous variables, such as postal code. For example, hiring algorithms have been known to discriminate against union workers based on applicants' answers to questions correlated with union activity (TUC, 2020[36]; Todolí-Signes, 2019[37]). Independent and reliable "AI audits" or "algorithmic audits" may help shine a light on the workings of AI-enabled hiring and monitoring tools and ensure that those that increase bias and undermine inclusiveness are avoided.

Firms that wish to use AI solutions to improve hiring and monitoring can also ask themselves whether the AI tool actively compensates for these biases. A recent study shows that, to find the best workers and simultaneously overcome bias, hiring algorithms must find a balance between selecting from groups with proven track records and selecting from under-represented groups to learn about quality (Li, Raymond and Bergman, 2020[38]).

Are certain workers more exposed to AI-enabled hiring and monitoring tools?

Firms may want to consider too whether certain groups will be exposed to the use of AI-enabled hiring and monitoring tools and to any potential biases, while others will be shielded. For instance, would firms be comfortable using the same monitoring tools to assess the performance of management and non-management staff alike? Will AI-enabled recruitment tools only be used to assess applications to higher volume, lower paid, entry-level positions, thus mostly affecting younger applicants with limited experience? Where exposure to these tools aligns with existing vulnerabilities, it may be impossible for affected individuals to provide meaningful consent to the use of these tools, due to their lack of bargaining power.

Box 6. Example: Road safety tool brings unforeseen consequences

CGP Logi, a logistics company, uses computer vision combined with dashboard cameras to monitor when drivers are looking away from the road or exceed the speed limit, with the aim of improving road safety. Within the first six months of use, the number of collisions and speeding violations decreased compared to the previous year.

Drivers, on the other hand, are less enthusiastic about the devices. Management consulted drivers prior to implementation and obtained consent. However, drivers found that specific details about the technology (e.g. inability to turn the camera off for privacy) had not been discussed. Drivers feel increased pressure to perform deliveries quickly, anxiety stemming from constant surveillance and diminished trust from their employer. Drivers are uncertain whether the data could be used to terminate their employment.

Initially, the AI-enabled technology did not treat all drivers equally. While the cameras were able to identify instances where men and taller drivers were driving dangerously with precision, women and shorter drivers were more likely to receive alerts out of error. To improve accuracy, CGP Logi audited the technology and identified that the technology was trained on mostly taller male drivers. Experts resolved this issue to ensure that all drivers are protected.

Concluding remarks

The framework presented in this paper is intended to help stakeholders consider the characteristics of any AI application from a workplace perspective. However, the impact of an AI application on the workplace depends not only on the characteristics of the system, but also on how and in what context the AI application is implemented. This concluding section highlights some factors related to context and implementation, which may modify or mitigate the impact of an AI application on job quantity, job quality and inclusiveness.

When considering the impact of an AI application on job quantity, stakeholders may want to take into account the relative costs of labour and capital, influenced by national factors such as the minimum wage and applicable taxes. The country's employment regulations and the involvement of unions and other worker representatives may determine whether dismissals occur and in what form. Workers' ability to weather the changes in the labour market as a result of AI can be bolstered by firm-level incentives to retain and retrain staff, by institutional factors, such as the general infrastructure for training and access to social protection, and by the involvement of unions and other worker representatives (including in the design and provision of training programmes).

Worker consultation (along with other forms of social dialogue) may also offer advantages when it comes to ensuring that job quality is maintained and even enhanced by AI and that the gains of AI are shared with all workers. When management engage with workers,[13] they can become more aware of workers' concerns, benefit from workers' understanding of the workplace and of their own jobs, and develop shared views on how to ensure safe and effective deployment of AI. Co-design describes a process that allows all

[13] Firm-level case studies carried out by the OECD in the finance and manufacturing sectors (Milanez, 2023[10]) provide one example of consultation, in which an Austrian automotive contract manufacturer consulted their works council in the early stages of AI development. The works council provided input into worker training programmes, encouraged workers to engage in training and provided guidance on the type of training each worker should do. The involvement of the works council also served to reassure workers of the firm's interest in maintaining job stability.

stakeholders who will be affected by the technology (e.g. include direct users, engineers, field experts) to provide feedback on design choices and decisions. When workers impacted by the technology are able to contribute to the design, the AI-enabled technologies should be better aligned with their needs and preferences.

Where AI requires the collection of worker data (e.g. to monitor performance), there may be reason to include worker representatives in discussions at all stages of the process, i.e. from initial considerations of proportionality and necessity, to co-design of the packages, and regular checks and updates once implemented (Moore and Weizenbaum Institute, 2020[24]). Regulations, principles and guidelines concerning data privacy and the use of algorithms may also play an important role in ensuring the proper use of worker data.

When consultations incorporate a wide range of workers, including those from traditionally marginalised groups, inclusiveness may improve as a consequence. Collective voice may be particularly important for workers with lower bargaining power (due to few alternative opportunities for work) who fear reprisals if they raise concerns about AI with management.

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Annex A. Influence on the OECD surveys of employers and workers

The questionnaires used for the employer and worker surveys (Lane, Williams and Broecke, 2023[13]), on the impact of AI in the workplace were heavily influenced by elements of this paper, in particular by the use cases presented in Part 1 and the questions comprising the framework in Part 2.

The areas of the questionnaires most directly influenced were (i) the definition of AI provided to workers and employers before they were asked whether their companies use AI and (ii) the subsequent question which asks in which functions AI is used. The examples and response options presented for each sector were based on the uses cases presented in Part 1. These questions, as they appeared in the worker questionnaire, are shown below. Virtually identical questions appeared in the employer questionnaire.

Table A.1 maps the questions comprising the framework presented in Part 2 to closely related questions in the employer and worker surveys.

(i) Definition of AI

No matter how familiar you are with the term, please have the following definition in mind when answering the subsequent questions: Artificial intelligence - or AI in short - is what enables smart computer programs and machines to carry out tasks that would typically require human intelligence. Some examples where AI can be found in your everyday life include:

- Siri, Alexa and other smart assistants,
- Netflix or YouTube recommendations, and
- Self-driving cars

[Shown only to respondents in the finance and insurance sector]

Some examples where AI can be found in the finance and insurance sector include:

- Robo-advisors,
- Chatbots used for customer service, and
- Fraud detection software

[Shown only to respondents in the manufacturing sector]

Some examples where AI can be found in the manufacturing sector include:

- Robots that use cameras to check items for flaws,
- Software used to predict prices and demand, and
- Technology that predicts when machines should be serviced.

(ii) Questions asking in which functions AI is used

[Shown only to respondents in the finance and insurance sector]

You will find possible uses of AI in your sector below. Does your company use AI for ...

- Data analytics?
- Risk management?

- Fraud detection?
- Trading and investment?
- Administration?
- Customer service and advice?
- Reporting?
- Human resources?
- Other areas?

Yes No Don't know

[Shown only to respondents in the manufacturing sector]

You will find possible uses of AI in your sector below. Does your company use AI for ...

- Product design?
- Planning and scheduling?
- Production processes?
- Maintenance tasks?
- Human resources?
- Other areas?

Yes No Don't know

[Shown only to respondents who reported use in production processes]

You reported that your company uses AI for production processes. Is this for ...

- Quality control?
- Digital twins and simulation?
- Robotics?
- Worker assistance?
- Autonomous vehicles?
- Other areas?

Yes No Don't know

Table A.1. Mapping of the framework to questions in the employer and worker surveys

Dimension	Key questions in the framework	Worker survey included questions on…	Employer survey included questions on…
Job quantity	Does the AI application substitute labour?	Whether AI has automated any tasks that the worker used to do Worries about job loss due to AI Awareness of job loss in the company/sector because of AI Whether the worker feels that AI has made their skills less valuable Trust in the company to attempt to minimise job loss due to AI	Whether the motivation to adopt AI was to reduce staff costs or to address skill shortages Whether AI has automated any tasks Whether AI increased or decreased employment Whether the company has responded to changing skill needs through attrition or redundancy
	Does the AI application boost productivity enough to create new jobs?	Whether AI has improved or worsened job performance	Whether the motivation to adopt AI was to improve worker performance Whether AI increased worker productivity Whether the company responded to changing skill needs by hiring new workers
	Does the AI application create new jobs and tasks for workers?	Whether AI created new tasks for workers Whether the worker has specialised AI skills and whether they are enthusiastic to learn more about AI Whether the worker feels that AI complements their skills	Whether AI created new tasks for workers Whether the company responded to changing skill needs by retraining or upskilling existing workers Whether AI has made it more important to have specialised AI skills
Job quality	Does the AI application change the quality of jobs by affecting their content and design?	Whether the tasks automated/created were mostly repetitive/complex/dangerous Whether AI assists the worker with decision-making and how they feel about this	Whether the tasks automated/created were mostly repetitive/complex/dangerous
	Does the AI application change workers' physical and social environment?	Whether AI has improved or worsened the worker's enjoyment of job, physical health and safety, mental health and well-being and how fairly their manager treats them	Whether the motivation to adopt AI was to improve worker's health and safety Whether AI has improved or worsened the worker satisfaction, health and safety and managers' ability to measure worker performance
	Does the AI application change how work is monitored or managed?	Whether AI has increased or decreased the worker's pace/control Whether the worker worries about taking instructions from an AI-powered robot or	Whether workers' data is collected for AI Whether the use of data has been discussed in consultations with workers or worker representatives

		software Whether the worker's data is collected to assess performance and how they feel about this	
	Are the gains of the AI application being shared with workers in the form of higher wages?	Whether the worker expects wages in their sector to increase or decrease due to AI	Whether the impact of technology on wages has been discussed in consultations
Inclusiveness	Does the AI application benefit some groups more than others?	Worries about being left behind due to AI Trust in the worker's company to use AI in a way that benefits all workers Demographics of the worker	Whether the impact of technology on specific groups of workers has been discussed in consultations Whether particular worker subgroups are more likely to be helped or harmed by AI
	Does the AI application increase or decrease bias?	Worries that collection of the worker's data will lead to decisions biased against them	

Note: Questions have been synthesised to fit in the table. The full questionnaires can be found in the Annexes of the full report (Lane, Williams and Broecke, 2023[13]).

Annex B. Expert workshop on classification of AI according to labour market impact

One of the first steps in the development of this framework was an online expert workshop hosted by the OECD on 14 December 2020, the main aim of which was to elicit early feedback on how to ensure relevance of the framework for a wide range of stakeholders, to identify gaps in the framework and to test the framework using real-world use cases.

Invitees included academics, business representatives, union representatives, namely:

- Frank Fossen, Associate Professor of Economics, University of Nevada
- Julie Shah, Associate Professor and Head of Interactive Robotics Group of the Computer Science and Artificial Intelligence Laboratory at MIT
- Phoebe Moore, Associate Professor of the Futures of Work, University of Leicester School of Business
- Marko Grobelnik, AI Researcher & Digital Champion, CTO IRCAI/UNESCO and Jozef Stefan Institute
- Gina Neff, Professor of Technology & Society, Oxford Internet Institute and the Department of Sociology at the University of Oxford
- Victor Bernhardtz, Ombudsman for Digital Labour Markets, Unionen
- David Barnes, V.P. of Global Workforce Policy, IBM Corporation
- Nicole Primmer, Senior Policy Director, Business at OECD (BIAC)
- Anna Byhovskaya, Senior Policy Advisor, TUAC OECD
- From the OECD: Luis Aranda, Stijn Broecke, Alexandre Georgieff, Andrew Green, Raphaela Hyee, Mark Keese, Alistair Nolan, Tiago Oliveira Hashiguchi, Karine Perset, Glenda Quintini, Nora Revai, Annelore Verhagen and Ann Vourc'h

The feedback provided by the experts was invaluable in refining the framework and ensuring its relevance for different stakeholders and sectors. Some of the main takeaways of the workshop were as follows:

- The experts recognised the value in creating a framework which could be used by individuals without technical knowledge of AI models. On the other hand, some cautioned against an overly simplistic checklist.
- There was discussion around the jobs and tasks that could be created by AI, and whether this could counteract automation.
- Some experts highlighted the importance of human input to AI models, not just in development but also throughout the life of the AI application.
- The experts provided examples of AI-enabled software which worked towards the principles of job quality and inclusiveness, as well as those which risked undermining job quality and inclusiveness, and those with minimal risk and impact.
- The experts saw the importance of considering the context and policy environment in which an AI application was used as well as choices around implementation. Some experts provided examples of successful co-creation and other practices to engage workers.

Annex C. Summary of the framework for classifying AI according to its impact on the workplace

Table A C.1. Summary of the framework for classifying AI according to its impact on the workplace

Dimension	Questions	Subquestions
Job quantity	Does the AI application substitute labour?	Does the AI application reduce the need for labour? Will the AI application reduce the need for labour in future? What is the motivation for adopting AI?
	Does the AI application boost productivity enough to create new jobs?	Does the AI application increase worker productivity without substituting labour? Does the AI application increase productivity enough that it increases the need for labour?
	Does the AI application create new jobs and tasks for workers?	Does the AI application create jobs and tasks related to its own development and deployment? Does the AI model rely heavily on human assistance? Does the AI application enable workers to focus on higher productivity tasks?
Job quality	Does the AI application change the quality of jobs by affecting their content and design?	Does the AI application improve/worsen job quality by substituting unpleasant/pleasant tasks? Does the AI application remove autonomy and learning opportunities? Does the AI application have any noticeable impact on job quality?
	Does the AI application change workers' physical and social environment?	Does the AI application allow workers to perform tasks from a distance? Does the AI application enable workers and machines to work in close proximity? Does the AI application change the physical and social environment of workers
	Does the AI application change how work is monitored or managed?	Does the AI application monitor or schedule tasks? Does the AI put workers' privacy at risk?
	Are the gains of the AI application being shared with workers in the form of higher wages?	Does the AI application increase or decrease the importance of labour in the production process?
Inclusiveness	Does the AI application benefit some groups more than others?	Are certain groups more capable or better positioned to adapt to AI?

		Are certain groups overrepresented in the “AI workforce”? Does the AI application create poor quality jobs? Are certain groups overrepresented in poor quality jobs? Does the AI application assist workers who lack certain skills or who have disabilities?
	Does the AI application increase or decrease bias?	Is the AI application a tool used in hiring or worker monitoring? Does the AI application detect and compensate for possible biases? Are certain workers more exposed to AI-enabled hiring and monitoring tools?