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# **A.I.'s Impact on Jobs, Skills, and the Future of Work: The UNESCO Perspective on Key Policy Issues and the Ethical Debate**

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## **Abstract**

This article discusses how the principles, values, and actionable policy areas detailed in the UNESCO *Recommendation on the Ethics of AI* can help steer the impact of artificial intelligence (AI) on jobs, skills, and the future of work in an inclusive, accountable, transparent, and people-centered way, and in line with the rule of law. It also discusses the provisions contained in this normative instrument compared with existing evidence on the cognitive and socioemotional skills required in the digital era, and the way AI is shaping job tasks, employment dynamics, and occupational mobility-related needs. It examines the challenges and possibilities related to fostering inclusiveness in the AI era, with a special focus on how to fix gender-related gaps and address discrimination.

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**L**iving, learning, and working in the age of artificial intelligence (AI) will likely be very different from anything humanity has ever experienced. AI consists of “systems which have the capacity to process data and information in a way that resembles intelligent behaviour, and typically includes aspects of reasoning, learning, perception, prediction, planning or control.”<sup>1</sup>

It is expected that AI, if largely deployed and adopted, will lead to the much-sought productivity growth that the IT revolution was expected to produce, possibly putting to rest the long-lasting heated discussion about the Solow’s paradox.<sup>2</sup> Recent evidence, while still scarce, does show that adopting AI leads, under some conditions, to increases in productivity,<sup>3</sup> and that AI adoption relates positively with Tobin’s Q,<sup>4</sup> especially when AI is meant to augment the capability of a firm rather than automating processes or tasks. Self-learning algorithms and smart machines are playing an increasingly important role in our efforts to address the COVID-19 pandemic and recover from the crisis.<sup>5</sup>

While helping to keep our economies, schools, and societies going during the crisis and enhancing production processes and output, AI development and deployment has also brought under the spotlight the need for a profound ethical reflection on the impact of AI and societies’ ability to address current and future challenges.<sup>6</sup> The World Commission on the Ethics of Scientific Knowledge and Technology (COMEST), serving under the Social and Human Sciences Sector of UNESCO, defined these challenges in a seminal 2019 report that led to the elaboration of a global standard on the ethics of AI in the form of a recommendation.<sup>7</sup> The study considered the downsides of AI technologies, particularly the risk of advancing business models that contribute to an increase in the already high levels of inequality existing within and between countries and to a further narrowing of (also cultural) diversity.

The UNESCO *Recommendation on the Ethics of AI* (henceforth UNESCO AI Recommendation) was adopted in its final form, by standing ovation, at the 41st General Conference of UNESCO. It establishes a comprehensive framework, based on principles and values, including the full respect of human rights and fundamental freedoms, environmental sustainability, and gender equality, and on inclusive and fair outcomes. The UNESCO AI Recommendation calls for AI that is accountable and transparent and in line with the rule of law. It further calls for concrete actions in a wide array of relevant policy fields, including education, culture, communication, gender, data governance, and the labor market. The part that focuses on labor acknowledges the changing world of work and looks into issues such as workforce adaptability and skill upscaling, while also calling for economic and fiscal policies that will help new applications and business models based on AI flourish and contribute to economic performance but also to societal empowerment and inclusion.

The development, adoption, and deployment of AI is profoundly changing the (type of) tasks that workers need to perform on the job and the competences required to do so.<sup>8</sup> AI is also contributing to the emergence of new occupational profiles and work modalities, which may or may not be high skill or high quality, in terms of pay, tenure, training opportunities, and working hours.<sup>9</sup> “Gig” jobs, entailing the remote provision of digital services through online labor platforms, while often offering flexibility and autonomy, may result in low pay and irregular working hours and overwork and may lead to social isolation and exhaustion.<sup>10</sup> Because of the pervasiveness and widespread impact of these technologies, the UNESCO AI Recommendation calls for endowing individuals with a “wider range of core and interdisciplinary skills” and fostering the skill of “learning how to learn” over people’s lifetime.

AI is also changing the way we learn, how we acquire, select, and process information, and how we relate to each other. At times, AI helps us access information or make decisions that it would have been impossible in the past, while at other times it causes segmentation and creates disinformation and misinformation, constraining our ability to properly assess situations and problems and make informed decisions.<sup>11</sup> As the possibilities that AI offers multiply, so too do concerns that AI will amplify existing divides and inequalities, create new

ones, and be used to erode human rights and challenge fundamental freedoms and even democracy.<sup>12</sup>

The wealth of technological developments that AI encompasses and the breadth and depth of changes that this general-purpose technology triggers make it a game changer for societies and economies. But games need clear rules so players can participate and outcomes can be fair. In the digital space, however, winners take all (or most) dynamics, that is, a few companies take most of the market, thanks to scale economies and the network effects that often emerge.<sup>13</sup> The same is true for AI-related innovations. Evidence shows that about three-quarters of patent families related to AI belong to the top two thousand companies investing the most in research and development in the world.<sup>14</sup> Widening divides emerge in terms of firm innovativeness, performance, market share, and bargaining power, as well as who benefits from the value created by AI and the extent to which AI-leveraged systems such as platforms may erode social surplus.<sup>15</sup>

The structural transformations that AI entails call for policies that are inclusive by design and that rely on clear ethical principles that can be translated into implementable and effective policy actions. Such human-centered ethical values and principles are at the core of the UNESCO AI Recommendation. In this article, I discuss how this normative instrument and its implementation can help policy steer the impact of AI on jobs, skills, and the future of work, allowing individuals and institutions to leverage on the opportunities offered by AI while addressing the challenges that this new technological paradigm poses.

The UNESCO AI Recommendation, in addition to boasting provisions of unprecedented breadth and depth and universal coverage, is unique in its deployment ambition and possibilities. To ensure the effective implementation of the UNESCO AI Recommendation, when member states adopted it, they committed to helping UNESCO develop specific tools for deployment to materialize and consolidate. These tools are the readiness assessment (RA) methodology, designed to assist member states at different development stages, and the ethical impact assessment (EIA) methodology of AI technologies. The UNESCO AI Recommendation further attests to the importance of multilateralism in the era of technologies that know no boundaries or application limits in their possibilities. These technologies can do a lot of good but they can also cause harm and, if not developed, adopted, and deployed following clear ethical principles, may exacerbate inequalities, create new divides, and jeopardize any hope of having inclusive and sustainable societies and economies.

The UNESCO AI Recommendation is a powerful tool that can level the playing field for individuals and economic agents around the world. UNESCO member states committed to recurrently report on implementation progresses (every four years) and to build and enforce redressal mechanisms. These mechanisms are intended to ensure that human rights, fundamental freedoms, and the rule of law are respected in the digital world and in the physical world. This article highlights what the UNESCO AI Recommendation says about policies that address jobs, skills, and the future of work and seeks to make them more inclusive by design. I agree with Rodrik and Stantcheva that we need a new approach to regulation that is more collaborative and iterative and that is coupled with new institutional arrangements enabling synergies and strategic cooperation between different stakeholders, including governments, firms, and the civil society.<sup>16</sup>

## **Skills, Ethical Awareness, and the Role of Education**

AI and digitalization change the type and distribution of job tasks that workers are asked to perform and the skills required for the purpose.<sup>17</sup> Ensuring that nobody is left behind requires endowing individuals with the “right” skills for today’s and tomorrow’s increasingly digital and globalized world and making them aware of the possible ethical challenges that the use

and abuse of general purpose and pervasive technologies like AI may entail. This is key to ensuring that we have inclusive labor markets that are also conducive to innovation, growth, and well-being.

Recent discussions about policy and policy interventions have at times put too much emphasis on the importance of digital skills alone and the need for people to acquire these skills, as if other skills no longer matter or matter to a much lesser extent.<sup>18</sup> While having a sufficient ability to navigate the Internet, acquire and share relevant information, and appropriately use and manage information and communication tools (ICT) have become a must in the digital era, we have plenty of evidence that digital skills alone do not go very far. Analysis shows that, to navigate and thrive in the AI and digital era, individuals need to be endowed with a wide array of cognitive and noncognitive skills and must be able to learn and update their knowledge throughout their life.

Evidence from online job openings in several countries shows that, in addition to a set of generic skills, AI-related workers need communication, problem-solving, creativity, and teamwork-related skills.<sup>19</sup> Skills related to team work appear to have gained importance recently and now complement AI-specific competencies as well as software-related skills—which amount to about one-third of the skills required in AI jobs—though to different extents in different countries.<sup>20</sup> Overall, the analysis shows that, regardless of whether their job entails developing or adopting AI, AI workers are technically skilled people who need a set of AI skills related to machine learning, data mining, cluster analysis, natural language processing, and robotics.

Two interesting features further emerge that are relevant for policy, especially education and training policies. One is that, while AI technologies are rapidly evolving, the skills required for AI-related workers appear to have been relatively stable during the decade 2010–2020, suggesting that it is possible and desirable to identify and invest in the acquisition of sets of skills that will likely be needed also for the AI talent of the future.<sup>21</sup> Moreover, a significant number of socioemotional skills appear to be constantly demanded in combination with more cognitive skills. These include communication, teamwork, and problem-solving skills, which appear together with creativity and writing. Communication-related skills appear to be especially key in the United States as compared to the other countries in the analysis, possibly reflecting the need to communicate among and with the team developing or adopting AI.<sup>22</sup> Existing evidence points to the need to endow individuals with both technical skills and more socioemotional and “soft” skills if they are to work with AI and be able to benefit from the opportunities offered by the digital technologies’ paradigm. The need for both kinds of skills is becoming even more important in the light of the accelerated adoption and deployment of AI technologies triggered by COVID and the consequent increase in the demand for data scientists and AI experts in both advanced and developing countries.<sup>23</sup>

Along the same lines, drawing on a systematic literature review of more than fifteen hundred articles, Van Laar and colleagues argue that twenty-first-century skills are broader than digital skills alone and that they are not necessarily being underpinned by ICT.<sup>24</sup> The authors identify seven core skills: technical, information management, communication, collaboration, creativity, critical thinking, and problem solving. They also identify five “contextual skills”: ethical awareness, cultural awareness, flexibility, self-direction, and lifelong learning.

The need to couple cognitive and socioemotional skills with ethical awareness, for people to be protagonists and take center stage in the AI era, is well captured in paragraph 44 of the UNESCO AI Recommendation, “Awareness and Literacy.” It states:

Public awareness and understanding of AI technologies and the value of data should be promoted through open and accessible education, civic engagement, digital skills and AI ethics training, media and information literacy and training led jointly by

governments, intergovernmental organizations, civil society, academia, the media, community leaders and the private sector, and considering the existing linguistic, social and cultural diversity, to ensure effective public participation so that all members of society can take informed decisions about their use of AI systems and be protected from undue influence.

Moreover, Policy Area 8, “Education and Research,” calls on UNESCO’s 193 member states to

promote the acquisition of “prerequisite skills” for AI education, such as basic literacy, numeracy, coding and digital skills, and media and information literacy, as well as critical and creative thinking, teamwork, communication, socio-emotional and AI ethics skills, especially in countries and in regions or areas within countries where there are notable gaps in the education of these skills.

The importance of having a human rights–based inclusive approach to the development and adoption of game-changing technologies like AI is reiterated in paragraph 106 of the UNESCO AI Recommendation. This paragraph underlines the need to develop AI ethics curricula at all levels and in different languages, including, for example, indigenous languages. The recommendation further stresses the need to make education and skills policies inclusive by design by asking that these policies take into account the diversity of environments, and the needs of persons with disabilities. These provisions are empowering for individuals and economic agents alike because they foster inclusion and enhance outcomes and performance, in keeping with the evidence that has long shown diversity to be a key element in fostering innovativeness and enhancing performance.<sup>25</sup>

## **Jobs, Employment, and Occupational Mobility in the Era of Artificial Intelligence**

Studies of occupational groups for which AI-related jobs are advertised, as might be expected, reveal that many AI jobs are posted in the 2008 International Standard Classification of Occupations (ISCO08) categories of “Professionals” and “Technicians and Associated Professionals.” In terms of sectors of activity, studies found demand for AI-related workers in almost all sectors of the economy, though to different degrees. The sectors “Information and Communication” and “Financial and Insurance Activities” post the highest number of such online job openings, followed by “Professional, Scientific and Technical Activities.” Between 2012 and 2018, though, demand for AI-related workers emerges throughout all the sectors of the economy, in all countries that the authors consider in the study.<sup>26</sup> Overall, existing evidence highlights the pervasiveness of AI, which translates in a growing number of online postings of AI-related job openings (both in absolute and in relative terms, i.e., in relation to the overall number of jobs posted), in relation to all ISCO08 occupational groups, and throughout all sectors of the economy. This means that AI is not only something that professionals, managers, and technicians are asked to deal with but that is entering the life of, for example, sales workers as well as plant machine operators.

Figure 1 shows the progression in the number of AI-related jobs posted online in the United States for the period 2012–2018, for a select group of occupations. These are the occupations normally supposed to be medium or low skill and are the ones for which, in general, one would not expect AI skills to be a “typical” component of the skill set demanded in these types of jobs. As can be seen, though, the number of overall staff involved is relatively small and demand for AI-related workers in these occupations has been constantly growing and at a relatively faster pace in the later years considered in the analysis.

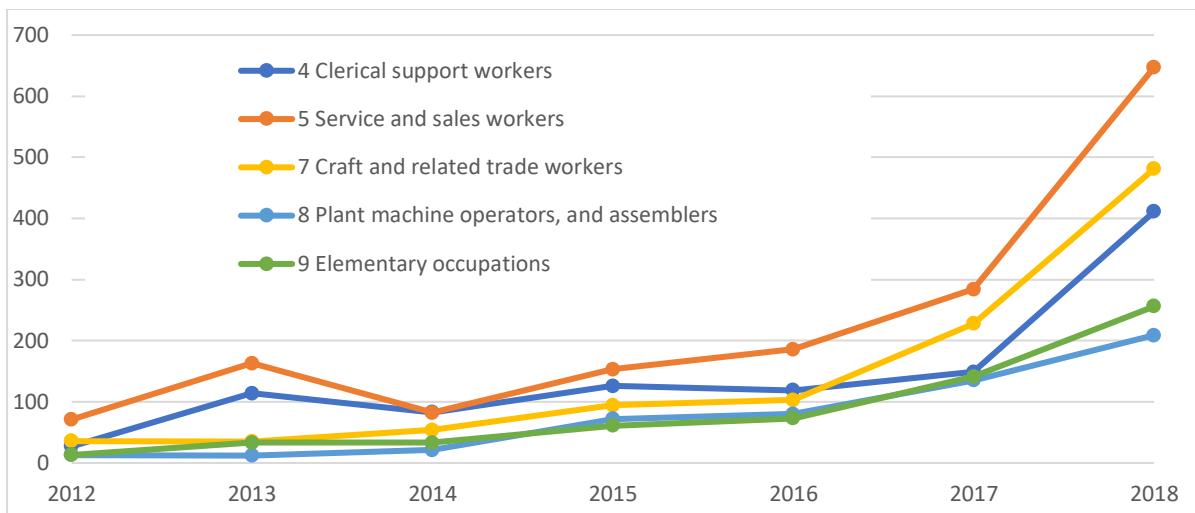


Figure 1. Number of AI-related jobs posted in the United States, by ISCO08 occupation, selected occupations (Source: Author’s own compilation based on Mariagrazia Squicciarini and Heike Nachtigall, “Demand for AI Skills in Jobs: Evidence from Online Job Postings,” OECD Science, Technology and Industry Working Papers, no. 2021/03, 2021, doi.org/10.1787/3ed32d94-en, table 6.3)

This fact, which likely mirrors greater or wider development and adoption of AI by firms, raises important questions for policy in terms of how to ensure that workers, especially low-skill workers, are endowed with the skills needed to work with AI. And, relatedly, if AI development and adoption picks up, as one would hope for performance reasons, questions remain about how to foster suitable matches in the labor market and how to ensure that those whose skills do not match can nevertheless find, stay with, or move to good jobs. Often the answer is education and training, and that upskill and reskill can go a long way.<sup>27</sup>

Upskilling and reskilling, however, take time and money, and, in two ways, those who need it the most may not benefit from it. First, evidence shows that workers who most need training are those less likely to receive it. Training, especially when sponsored by firms, is often used as a reward mechanism for the best performing and most skilled workers, because it pays off in terms of returns on investment.<sup>28</sup> Second, low-skill individuals are at times those who found it harder than their peers to engage in education or progress in the education system or who simply did not go to school and learn.<sup>29</sup> This is why the UNESCO AI Recommendation calls for governments to work with stakeholders to fill the gap of skill-set requirements. It also calls for including workers and unions in the discussions to ensure a fair transition for at-risk employees by, for example, “putting in place upskilling and reskilling programmes, finding effective mechanisms of retaining employees during those transition periods, and exploring ‘safety net’ programmes for those who cannot be retrained” (paragraph 118).

These workers are the ones who, because of the hollowing out of the labor market, are already suffering from comparatively low salaries and from relatively “low-quality” jobs conditions related, for example, to tenure or training.<sup>30</sup> On one hand, AI brings promises of enhanced performance and, consequently, relatively better salaries, because better-performing firms are normally those that pay workers better.<sup>31</sup> On the other hand, workers’ conditions may likely improve for workers who are able to stay and learn and for new workers hired for the purpose. But for those unwilling or unable to learn or for whom learning is impossible because they are too old or because they lack the relevant training opportunities, the introduction and use of AI may translate into dismissal and failure to find a different job. In general, the

introduction of AI can lead to greater inequality between those working with AI and those who do not or cannot do so.

Analyses of the tasks that workers perform on the job and on workers' skills endowment and learning possibilities show that the cost of moving to a different job (either within the same firm or elsewhere) is not trivial. Andrieu and colleagues estimate that, at the country level, the minimum cost of moving workers in occupations at high risk of automation to occupations in which they are not at such risk (which the authors call "safe haven") ranges between 1 percent and 5 percent of one year of GDP in the countries considered.<sup>32</sup> This amount, while not negligible, would not need to be disbursed in one only year, since the duration of the training envisaged may last several years. Still, it remains high and it may prove hard for countries and firms alike to sustain such costs and have the right incentives to do so. Moreover, if one considers that the overall cost of the estimated job-to-job transition depends on the occupation that workers may need to move to, and on how distant they are from the occupation of origin in terms of skills to be acquired, it becomes natural to fear for those that are already left behind. At the individual-worker level, the authors find that such costs increase in keeping with the level of cognitive skills of the workers in the occupation of origin, that is, the lower the level of initial skill endowment, the greater the training needed; the proportion of workers at high risk of automation in the manufacturing sector; and the average age of workers in the occupation.<sup>33</sup>

On one hand, these findings represent good news, in the sense that they dissipate the huge concerns triggered by Frey and Osborne and their argument that 47 percent of workers may be at risk of losing their jobs because of automation.<sup>34</sup> (This figure is 14 percent, according to Arntz, Gregory, and Zierahn).<sup>35</sup> Good news also comes from the fact that the analysis of Andrieu and colleagues based on skills (both skill endowment and skills required in the occupation of destination) shows that all workers, if duly trained, can move to a different occupation and to performing different tasks.<sup>36</sup> So even if AI-related jobs sometimes require that workers learn a new set of skills in order to accomplish the tasks that working with AI entails, unemployment is not inevitable. Conversely, in the absence of sufficient (also financial) support and of the "right" incentives (e.g., policies supporting employees' retention), the new technological paradigm that AI represents may further contribute to marginalizing workers who are already on the wrong side of the distribution in terms of income, skills, or tenure. This further marginalization would jeopardize their inclusion in the world of work and, more generally, in society.

Policy Area 10 of the UNESCO AI Recommendation, "Economy and Labour," addresses these concerns and calls member states to "assess and address the impact of AI systems on labour markets and its implications for education requirements, in all countries and with special emphasis on countries where the economy is labour-intensive" (paragraph 116). In the same area, paragraph 118 calls for coordinated multistakeholder action, including government, companies, the civil society, and workers and unions, to put in place "upskilling and reskilling programmes, finding effective mechanisms of retaining employees during those transition periods, and exploring 'safety net' programmes for those who cannot be retrained." It further calls for evidence-based policy making, by asking member states to

develop and implement programmes to research and address the challenges identified that could include upskilling and reskilling, enhanced social protection, proactive industry policies and interventions, tax benefits, new taxation forms, among others. Member States should ensure that there is sufficient public funding to support these programmes. Relevant regulations, such as tax regimes, should be carefully examined and changed if needed to counteract the consequences of unemployment caused by AI-based automation.



These provisions become all the more important in consideration of the fact that demand for AI-related jobs appears very concentrated geographically. Thus, the effect of AI deployment may be more intense in some places than in others, creating inequalities at the local level as well. Although the number of AI-related vacancies has increased in all parts of the United States, also as a share of total vacancies, a majority of those jobs continues to be located in California.<sup>37</sup> Also, more than one in ten (about 14 percent) AI-related jobs are advertised in manufacturing in the United States, which appears to be the second most AI-intensive sector (following business services). Compared with business services, manufacturing AI jobs put more emphasis on competencies related to robotics and computer/software engineering, suggesting that automation may progressively be taking place, though not necessarily to replace workers.<sup>38</sup>

Moreover, if one takes into account the fact that people may (have to) change jobs several times during their working life, the need for recurrent training and upskilling and reskilling becomes imperative. Data from the US Bureau of Labor Statistics, for example, show that the median years of tenure with the current employer varies substantially across occupations, ranging between less than three years for service occupations to more than six years for managers.<sup>39</sup> Turnover on the labor market contributed to the inclusion in the UNESCO AI Recommendation a general call for recurring action and support.

## **Being Inclusive in the Era of Artificial Intelligence: Key Challenges and Possibilities**

In addition to widening or narrowing down the possibilities of a worker's finding a job or remaining in a certain job or occupation and, relatedly, the need to exhibit or acquire a certain (set of) skills for this to happen, AI algorithms can be a source of disinformation, misinformation, and discrimination. The challenges related to this use of AI algorithms are so great that some are starting to question whether they might presage the end of democracy,<sup>40</sup> while others are leveraging machine learning to detect misinformation and disinformation in an effort to exploit the opportunities offered by AI to address the shortcomings that AI itself triggers.<sup>41</sup>

On the subject of the labor market and jobs, gender-based and racial discrimination is a big concern. Two famous (or rather, infamous) examples are Amazon's AI recruiting tool that showed bias against women<sup>42</sup> and Google's firing of Timnit Gebru after she posted, "Your life starts getting worse when you start advocating for underrepresented people."<sup>43</sup> Also, one study found that women account for only 12 percent of machine-learning researchers.<sup>44</sup>

Stanford University's Institute for Human-Centered Artificial Intelligence (HAI) shows that women accounted for less than 19 percent, on average, of all AI and computer science PhD graduates in North America over the past ten years and that, in 2019, 45 percent of new US-resident AI PhD graduates were white, compared with 2.4 percent African American and 3.2 percent Hispanic.<sup>45</sup> Looking at some of the figures contained in the Alan Turing Institute's report "Where Are the Women?," one sees that only 10–15 percent of machine-learning researchers are women in leading technology companies and that, on average, only 12 percent of authors who had contributed work to the leading three machine-learning conferences in 2017 were women.<sup>46</sup> As Young and colleagues explain, the fact that women and marginalized groups are underrepresented in data science and AI, compounded by algorithmic and data biases, is a source of concern today and for the future.<sup>47</sup> At present, the lack of diversity challenges fundamental ethical issues of social and economic justice and jeopardizes the value that diversity may bring. In addition, as AI becomes ubiquitous, the lack of diversity becomes engrained and to the extent that gender bias gets built into AI systems and AI-related products, thus making our future even more unequal.

The UNESCO AI Recommendation has an entire policy area dedicated to gender, Policy Area 6. This area begins by requiring member states to ensure that digital technologies and AI contribute to the achievement of gender equality. It goes on to underline the need for governments to ensure that human rights and fundamental freedoms and especially the safety and integrity of girls and women are not violated at any stage of the AI system life cycle (paragraph 87).

Once having set these general principles, the UNESCO AI Recommendation goes much deeper asks members states, in effect, to “walk the talk” by putting in place positive actions aimed at ensuring the full inclusion of girls and women in AI, in all spheres of life, including education and employment. Paragraph 88 states:

Member States should have dedicated funds from their public budgets linked to financing gender-responsive schemes, ensure that national digital policies include a gender action plan, and develop relevant policies, for example, on labour education, targeted at supporting girls and women to make sure they are not left out of the digital economy powered by AI. Special investment in providing targeted programmes and gender-specific language, to increase the opportunities of girls’ and women’s participation in science, technology, engineering, and mathematics (STEM), including information and communication technologies (ICT) disciplines, preparedness, employability, equal career development and professional growth of girls and women, should be considered and implemented.

The recommendation further stresses the need for member states to ensure that AI does not exacerbate already existing (and often wide) gender gaps. It also mandates that they put in place policies to reduce the gender wage gap and the unequal representation in certain professions and activities; to address the lack of representation, especially at top management positions, boards of directors, or research teams in the AI field; and to reduce the education gap, the gap in digital and AI access, adoption, usage, and affordability, and the unequal distribution of unpaid work and caring responsibilities (Paragraph 89). As can be seen, the prescriptions contained in the UNESCO AI Recommendation aim not only to ensure that AI technologies do not create new divides but that they actually leverage the opportunities offered by AI and the prescriptions contained in the document to help remove divides and gaps that already exist also in the analogue world.

Another societally enhancing prescription in the UNESCO AI Recommendation addresses gender stereotyping and discriminatory biases, with the aim of preventing these from being translated into AI systems. The recommendation further posits that member states need to identify and proactively redress any problems caused by AI technologies and systems. For gender-related problems caused by AI, the recommendation asks member states to avoid the compounding negative effect of technological divides in achieving gender equality and avoiding violence such as harassment, bullying, or trafficking of girls and women and other underrepresented groups, including in the online domain. It further calls for policies that ensure harassment-free environments and concrete actions aimed to promote diversity throughout the AI system life cycle.

Finally, paragraph 91 of the UNESCO AI Recommendation states the need for member states to

encourage female entrepreneurship, participation and engagement in all stages of an AI system life cycle by offering and promoting economic, regulatory incentives, among other incentives and support schemes, as well as policies that aim at a balanced gender participation in AI research in academia, gender representation on digital and AI companies’ top management positions, boards of directors and research teams. Member States should ensure that public funds (for innovation, research and technologies) are

channelled to inclusive programmes and companies, with clear gender representation, and that private funds are similarly encouraged through affirmative action principles.

One of the key principles stated by the UNESCO AI Recommendation is human oversight and determination, whereby member states need to ensure that it is always possible to attribute ethical and legal responsibilities and remedies at any stage of the life cycle of AI systems. Human oversight refers not only to individual human oversight but to inclusive public oversight, as appropriate. This and the principles of “Fairness and non-discrimination” stated in the document together become key pillars of gender inclusion, and, more broadly, help ensure nondiscrimination toward any human being “regardless of race, colour, descent, gender, age, language, religion, political opinion, national origin, ethnic origin, social origin, economic or social condition of birth, or disability and any other grounds, in terms of access to and participation in the AI system life cycle” (paragraph 28).

## **Conclusions**

The UNESCO AI Recommendation sets the basis for all relevant stakeholders to take action and ensure that the opportunities offered by AI are leveraged and that challenges are addressed, with the aim to help build more inclusive and cohesive societies and economies, including the world of work. The call for such an instrument stems from a realization that regulations often lag behind the market developments—as with AI technologies—and that regulations that are not apt for the digital age may lead to unfair, unethical, and eventually detrimental practices and outcomes.

Ethical issues arise with respect to AI systems throughout their whole life cycle and with respect to the way markets are structured and function and how they are regulated in the digital sphere. Thus, the ethics of AI must involve the laying out of norms and principles for AI development, adoption, and deployment that ensure the rule of law online.

Because the value-neutrality thesis, claiming that technology is morally and politically neutral (or otherwise neither good nor bad), has by now been widely rejected,<sup>48</sup> it is nearly impossible to claim value neutrality in the case of AI. People are making choices throughout AI systems, ranging from research, design, and development to deployment and use. Their personal ideas and those of their group constitute what is being passed down through the AI ecosystem. AI is not self-sufficient and relies on human-made classifications, decisions, and “mundane” tasks in order to function properly. For example, even in the development stage, teams who develop algorithms can translate their own values into an AI system, as shown by Conway’s law, which provides that in the absence of clear rules and instructions, the choices that teams make tend to reflect the implicit values of the group.<sup>49</sup> If to this tendency we add that AI methods rely on large amounts of data and that these data are never fully representative or may even come prepacked with value categories, it is easy to see how this may result in wide range of biases, harm, and discrimination.

We need to upgrade rules and regulations, laws and institutions to ensure that they can deal with AI, including by introducing relevant regulations, such as tax regimes, that aim to counteract the possible unemployment caused by AI-based automation. We also need to step up and ensure competitive markets and consumer protection and prevent the abuse of dominant market positions, including by monopolies. And we need to pay special attention to developing countries, because they are more exposed and vulnerable to changing labor landscapes and the abuses of market dominance.

And we must do so by putting people and their needs back at the center and endowing them with the skills to navigate and thrive in the AI era. Skills such as “learning how to learn,” communication, critical thinking, teamwork, empathy, and the ability to transfer one’s knowledge across domains should be taught alongside specialist and technical skills. And,

above all, we need to endow all individuals with ethical awareness so that they may question and make choices informed by key human-rights value, in the digital and in the analogue world.

## Notes

<sup>1</sup> UNESCO, *Recommendation on the Ethics of Artificial Intelligence* (Paris: UNESCO, 2021), paragraph 2, <https://unesdoc.unesco.org/ark:/48223/pf0000381137>.

<sup>2</sup> See, e.g., Erik Brynjolfsson, “The Productivity Paradox of Information Technology,” *Communications of the ACM* 36, no. 12 (1993): 66–77. A similar discussion is currently occurring in relation to data, which is considered “the new oil.” See, e.g., Peter Goodridge, Jonathan Haskel, and Harald Edquist, “We See Data Everywhere Except in the Productivity Statistics,” *Review of Income and Wealth*, 2021.

<sup>3</sup> Asta Bäck, Arash Hajikhani, Angela Jäger, Torben Schubert, and Arho Suominen, “Return of the Solow-Paradox in AI? AI-adoption and Firm Productivity,” *Innovation Studies* no. 2022/01 (Sweden: Centre for Innovation Research at Lund University, 2022).

<sup>4</sup> Taekyun Kim and Yejin Park, “Artificial Intelligence and Firm Performance,” *Academy of Management Proceedings* 2021, no. 1 (2021): 14361. Tobin’s Q is a measure expressing the relationship between market valuation and the intrinsic value of a firm.

<sup>5</sup> Afshan Hassan, Devendra Prasad, Shalli Rani, Musah Alhassan, “Gauging the Impact of Artificial Intelligence and Mathematical Modeling in Response to the COVID-19 Pandemic: A Systematic Review,” *BioMed Research International*, March 14, 2022.

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<sup>7</sup> SHS/COMEST/EXTWG-ETHICS-AI/2019/1, “Preliminary Study on the Ethics of Artificial Intelligence,” 2019, <https://unesdoc.unesco.org/ark:/48223/pf0000367823>.

<sup>8</sup> Mariagrazia Squicciarini and Heike Nachtigall, “Demand for AI Skills in Jobs: Evidence from Online Job Postings,” OECD Science, Technology and Industry Working Papers, no. 2021/03, 2021, doi.org/10.1787/3ed32d94-en; Lea Samek, Mariagrazia Squicciarini, and Emile Cammeraat, “The Human Capital behind AI: Jobs and Skills Demand from Online Job Postings,” OECD Science, Technology and Industry Policy Papers, no. 120, 2021, doi.org/10.1787/2e278150-en.

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<sup>11</sup> See, e.g., Lijia Chen, Pingping Chen, and Zhijian Lin, “Artificial Intelligence in Education: A Review,” *IEEE Access*, 8 (2020): 75264–75278; Christopher Whyte, “Deepfake News: AI-Enabled Disinformation as a Multi-Level Public Policy Challenge,” *Journal of Cyber Policy* 5, no. 2 (2020): 199–217; Sarah Kreps, *The Role of Technology in Online Misinformation* (Washington, DC: Brookings Institution, 2020); Peter K. Yu, “The Algorithmic Divide and Equality in the Age of Artificial Intelligence,” *Florida Law Review* 72 (2020): 331.

<sup>12</sup> See, e.g., Steven Livingston and Mathias Risse, “The Future Impact of Artificial Intelligence on Humans and Human Rights,” *Ethics and International Affairs* 33, no. 2 (2019): 141–158; Karl Manheim and Lyric Kaplan, “Artificial Intelligence: Risks to Privacy and Democracy,” *Yale Journal of Law and Technology* 21 (2019): 106.

<sup>13</sup> Flavio Calvino and Chiara Criscuolo, “Business Dynamics and Digitalisation,” OECD Science, Technology and Industry Policy Papers, no. 62, 2019, doi.org/10.1787/6e0b011a-en; J. E. Bessen, “The Policy Challenge of Artificial Intelligence,” *CPI Antitrust Chronicle*, June 2018, 18–16.

<sup>14</sup> OECD, *Science, Technology and Industry Scoreboard 2017: The Digital Transformation* (Paris: OECD, 2017), <https://doi.org/10.1787/9789264268821-en>.

<sup>15</sup> See, e.g., Kenney, Rouvinen and Zysman, (2019) Anton Korinek and Joseph E. Stiglitz, “Artificial Intelligence and Its Implications for Income Distribution and Unemployment,” in *The Economics of Artificial Intelligence: An Agenda*, ed. Ajay Agrawal, Joshua Gans, and Avi Goldfarb, 349–390 (Chicago: University of Chicago Press, 2018); Martin Kenney, Petri Rouvinen, and John Zysman, “Employment, Work, and Value Creation in the Era of Digital Platforms,” in *Digital Work and the Platform Economy*, ed. Seppo Poutanen, Anne Kovalainen, and Petri Rouvinen.

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- <sup>21</sup> See Samek, Cammeraat and Squicciarini, “Human Capital behind AI.”
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- <sup>23</sup> Quingpeng Zhang, Jianxi Gao, Joseph T. Wu, Zhidong Cao, and Daniel Dajun Zeng, “Data Science Approaches to Confronting the COVID-19 Pandemic: A Narrative Review,” *Philosophical Transactions of the Royal Society A*, 380, 20210127, 2021.
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