4 Opportunities and risks of human labor automation from an ethical perspective

Advancements in the automation of human labor will be considered in the context of enabling humans to live a life with human dignity. Subsequently, the opportunities and risks associated with a dignified life are evaluated, encompassing several dimensions and topics. This will ground the understanding of human labor automation from an ethical perspective and facilitate the elaboration of further guidance. In alignment with the research question, the focus will be on work-related capabilities; however, other relevant capabilities will also be included when an ethical impact is identified in association with the absence of humans from work processes.

4.1 Complete replacement of manual human labor by machines

Certain industries are becoming increasingly automated, and it is possible in these industries that robots could completely replace human labor and create a value chain that is close to being run independently by machines, with only a few jobs, such as rare supervision tasks, performed by humans. This chapter evaluates these specific developments from an ethical perspective whereby human beings could become close to—or even completely—redundant.

Human labor is messy and expensive: not only might human workers be lazy or unpredictable, but they might also demand a living wage. Capitalism's aim of creating surplus value leads to the application of technology to the labor process, with machines displacing as many human workers as possible and moving those who remain into supervisory or auxiliary roles[493]. Thus, from a capitalist perspective, labor automation helps to eliminate this "human factor", with a general suspicion toward human workers lying at the very root of the automation drive. Furthermore, in this drive toward automation, humans are not valued for their creativity or originality but are rather perceived as an organic collection of potential

493 Reeves 2016: 153

errors, in contrast to the machine's cold efficiency[494]. Manual labor is traditionally targeted in attempts to eliminate the human factor, and thus ethical evaluation is more essential than ever as machines are currently outperforming humans to an unprecedented extent. Perhaps more open and creative work modes will arise in the future[495], giving rise to the "social individual" or even the decline of capitalist exploitation[496] when less human labor is concentrated in manual jobs.

4.1.1 Manufacturing and supply chain

The effect of automation by "classical robots" is unsurprisingly concentrated in manufacturing[497], and their introduction into the production process has had various effects on workers[498]. Robots can, for instance, eliminate harsh, unhealthy, or even dangerous tasks. A good example of this is welding in car manufacturing; this is a risky activity for workers to perform, with potentially harmful short- and long-term effects, such as irritations of the eyes, nose, or chest, or, even more seriously, pulmonary infections, heart disease, or lung cancer. The robot-based welding that is increasingly employed in car manufacturing has significantly reduced the health problems associated with human-performed welding. Moreover, thanks to AI, the procedure is now even more precise. From an ethical perspective, this represents an opportunity to promote a dignified life given that harmful working conditions substantially reduce well-being[499]. In that respect, automation can improve bodily health and—given that increased manual or physical labor has taken a considerable toll on human life in the past[500]—greater capability to life.

Meanwhile, however, several ethical issues arise in relation to the use of robots for tasks that have previously been performed by humans, as the workers who performed these tasks throughout the entire production process become increasingly redundant. This can have multiple negative impacts on the individuals affected. For instance, they could be laid off,

494 Ellul 1967
495 Smith/Anderson 2014
496 Marx/Nicolaus 1993
497 Brown 2020
498 Pham et al. 2018
499 Robone et al. 2011
500 Coenen et al. 2018

which historically has been a common practice since the nineteenth century and the industrial revolution. Salary reductions may be another negative effect, as the machine becomes an increasingly efficient competitor with the human worker. Layoffs are becoming increasingly common, despite the implementation of workers' protection measures and efforts to invest in workers' education[501]. When a company introduces new automation technology, the management is typically unconcerned with improving workers' welfare, liberating them from dangerous labor, or enhancing their capabilities; rather, they are simply concerned with profitability, and if the human workers are rendered redundant by machines, it makes little economic sense to keep them on the payroll[502]. This may jeopardize one's material control over one's environment, as income becomes scarce for humans who are directly dependent on the availability of manual jobs. Furthermore, the capability to build meaningful relationships based on mutual recognition may be at stake when the interests of management are increasingly characterized by a hunger for automation.

It is not always the case that working conditions will be improved by the use of automation technology in the context of manual work[503]. The consistent and fast pace at which robots function in warehouses may be imposed onto the conditions and the pace to which human workers need to respond. In such situations, the robot would not be serving the humans but vice versa; human staff would be increasingly bound to serve robots[504]. This constitutes an ethical risk whereby humans would lose control over their environment and become subject to leadership by robots[505]. In such cases, their work would no longer be perceived as "human", which would diminish their ability to work as humans and exercise control over their environment. For instance, an increased work pace would likely lead to fewer safety precautions and greater physical strain for workers, whereby "the machine tells the body how to work"[506]. The associated higher work intensity, moreover, is not compensated by higher salaries or shorter working hours. Low- and middle-skilled labor, largely concentrated in manufacturing or warehouse jobs, in that sense effectively suffer a salary reduction with the

501 Stefano 2018
502 Pham et al. 2018: 126
503 Holzer 2022
504 Selby 2017
505 Dzieza 2020
506 Denby 1971: 12; 17-19, cited in Resnikoff 2021: 38

introduction of robots[507], a development that is highly problematic from an ethical perspective in terms of the capability to receive a sufficient income.

Advancing automation in the manufacturing industry through the introduction of new technologies is affecting increasing numbers of people and leading to regional mass unemployment, reducing the employment to population ratio along with workers' wages[508]. This has been the case particularly in former strongholds of industrialism, such as Detroit in the USA, and has created a belief that workers' destinies have been taken out of their hands, either by elites or by the technology itself[509]. This is fundamentally different from the automations based on technology that occurred in the postwar period, when it was largely believed that technocratic management of the economy could solve the problems of capitalism by overcoming poor working conditions. Political and social institutions no longer appear to be in charge, as is the democratic will. Corporations and executives can determine the fates of billions, supported by an efficiency creed. The new automation technologies, largely affecting manufacturing, aim to conceal labor so that it will cost less, through the use of dispassionate technics. From that perspective, for those humans who remain, industrial progress is not aligned with the improvement of working conditions; on the contrary, the rise of unremunerated labor is undoubtedly affecting increasing numbers of people. This is also exemplified by an increasing "shadow work force"[510], which includes temp workers who outnumber companies' full-time staff by tens of thousands. This impeded access to work illustrates the ethical risks related to the capability of political affiliation and the ability to participate in political decisions that affect one's life, which is relevant when the ability to voice deteriorating working conditions is endangered owing to the overwhelming power of corporations.

In the long term, manufacturing will have ever-reduced job opportunities with the advancement of automation technologies, and, in the process, the focus should be on the nature of work and functional description of tasks. The augmented collaborative workforce, whereby diverse technologies such as virtual reality, computer vision, and exoskeletons are used to provide a human-centric vision of manufacturing[511], will likely have

507 Graetz/Michaels 2018
508 Acemoglu/Restrepo 2017
509 Resnikoff 2021: 191-192
510 Wakabayashi 2019
511 WEF 2022

a considerable impact on employment in the automation age, redefining relations between workers, their crafts, and their working environments. It is important that workers are able to incorporate aspects such as creativity, social skills, and emotional intelligence to avoid the dehumanizing effects that may ensue if workers' activities are subjugated to robotic behavior and work[512] with these developments. This would be also relevant when workers transfer out of the industry and seek new jobs, taking advantage of the ethical opportunities brought about by the replacement of humans with machines. The ethical risks are obvious, as the augmented workforce not only denies social interaction with other humans but also significantly reduces the human factor of work. In that sense, the capability of senses, imagination, and thought must be strengthened for those workers who remain in the manual labor sector, increasing their cognitive skills and education in anticipation of the time when their job is no longer available. Thereafter, this would strengthen their capability to exercise the right to work.

In terms of supply chain, a salient feature of late capitalism is its growing reliance on logistics infrastructure to manage economic processes[513]. Logistic infrastructure possesses profound circulatory powers that have a bearing on human subsistence and, most crucially, the basis for supply chain capitalism[514], incorporating principles such as reliance on outsourced labor, an emphasis on just-in-time delivery, faith in data-driven decision-making, and the pursuit of economies of scale[515]. The COVID-19 pandemic provided additional potential for the automation of human labor in infrastructure, and accordingly, logistics and supply chains. This would lead to an "automated infrastructure, an all-encompassing infrastructural framework marked by primacy of virtualized transactions that promoted a mainly technocentric productive future"[516]. Such transformations generate profound uncertainties around the future of work. In times of crisis, such as during COVID-19, the use of automation technologies improvises and reimagines economic circulations and enforces the effect of moving toward an automated infrastructure in supply chain capitalism[517]. Automated in-

512 Pham et al. 2018: 127
513 Lin 2021
514 Tsing 2009
515 Burrington 2020
516 Lin 2021: 463
517 Lin 2019: 14-15

frastructure involves productivity in a certain self-service set-up that creates unstable economic configuration for workers and enrolls customers in platform logistics. Self-operating systems without the involvement of humans appears to be even more convenient in a crisis, and new technologies, even when unstable or unfinished, may be explored during crises to reduce labor-intensive work in logistics. Automation has therefore left numerous vocations insecure, with employees struggling to reskill in time. In a race to the bottom, technology has done more to relegate labor to the lowest value denominator in supply chains—for instance, by using gig economy workers for "pre-automation"[518]—than to reorganize logistics for the better in terms of working conditions. This reveals a practice whereby a lack of respect for the capability to exercise the right to work threatens not only dignity but also all other capabilities, because "gig economy" workers are known to not receive a sufficient income from the work they perform[519].

This development has also largely affected the retail business already, with a rapidly shifting landscape: in the United States, it is anticipated that around 50 percent of the retail workforce may be automated in the coming years[520]. Retail traditionally also employs a higher percentage of women who work part-time and who may lose their jobs as automation efforts negatively impact the affected communities; this might also reinforce the gender pay gap[521]. Many retailers have no clear strategy in place for their workers, and in the mid-term there may be a shift toward creating employment in fulfillment centers. Even more worryingly, the tendency shows that these new jobs are likely to be offset by job losses in other industries[522]. In any case, the increased automation of retail positions, such as cashiers, and manual labor in the supply chain place increasing pressure on the wages of the affected workers. This poses substantial ethical risks to dignity for increasing numbers of individuals, particularly those individuals who are trying to make ends meet with those jobs, such as students or single parents.

The same may be said for low-skilled manual labor in transport, which is also highly vulnerable to automation and job replacement[523]. Jobs that

518 Vertesi et al. 2021
519 Zipperer et al. 2022
520 Scarano 2017
521 McKinsey 2019
522 Jones/Zipperer 2018
523 Han et al. 2019: 338-339

require problem-solving will remain in the industry; primarily supervisory roles and educational programs appear to be key in ensuring workers a future in the labor market. Moreover, autonomous driving will put drivers out of work[524]; however, autonomous driving also offers substantial ethical opportunities, particularly considering the harm caused by accidents and/or distracted driving[525]. In addition, autonomous driving could promote bodily integrity, as free movement could be enhanced for many individuals owing to lower costs, aside from the capability for life (as accidents cause numerous deaths), and thereby improve bodily health.

4.1.2 Mining

Commodity trading and, relatedly, mining has traditionally been viewed critically from an ethical perspective owing to numerous human rights violations, particularly regarding the use of child labor in developing countries[526]. Therefore, human labor automation can also have a significant impact on dignified life for of the individuals involved in these industries.

The mining industry operates in the form of global production networks that involve the peculiarities of national "space economies" and "hyper-mobility" of globalized capital[527]. This means that there is a significant discrepancy between the working situations of those who control the capital flow and those who are affected within the local communities engaging in manual production. In that regard, employment relations are geographically marked, despite the global value chain, and the spatial dimension is important in understanding the specific employment relations. In general, mining companies have been quick to adopt labor automation technology, which has affected not only simple workers but also the management, which increasingly uses automation processes to distribute work within the existing departments but also to contractors[528]. In this regard, a phenomenon similar to that of outsourcing work in the "gig economy" in manufacturing occurs, while simultaneously reducing the number of individuals employed. Owing to the lack of job alternatives in the mining region, this will reduce the capability to work as well as all other capabilities for an increasing

524 Shladover 2022
525 Talbott 2021
526 Aytin 2016; Paré/Chong 2017
527 Ellem 2015: 1-2
528 Abou-Abed 2021: 1

number of humans and their family members in these regions, as these families rely on the industry.

In essence, mining is a capital-intensive industry, and its employment creation in local regions is generally praised as a benefit to justify extraction projects[529]. However, labor substitution as a result of automation is affecting a wide range of modern mini processes, and labor replacement is expected to increase in the coming years owing to technology cost reductions. In the mining industry, just as in manufacturing and logistics, the COVID-19 pandemic led to an increased aim to rely less on human interaction for critical operational processes[530]. These developments are expected to have a substantial impact on mining communities, regions, and nations.

The automation of human labor in mining has serious consequences, particularly in relation to its capital-intensiveness, and it generates challenging scenarios for local prosperity. Lower labor demand is among the consequences, as is lower governmental revenue from the income taxes provided by the workers[531], based on the fact that mining companies are typically registered in tax havens[532]. This is likely to increase inequality between and among cities and to prevent more people in mining regions from receiving any form of governmental support.

Several automated mining trucks may now be operated by a single worker in a city office, illustrating a new level of automation. Given this rapid evolution of automation technology, in the mid-term, mining activity will be operated and managed by fewer humans and by multiple machines and algorithms. This will have real-world implications for many mining countries and regions, including probable negative socioeconomic impacts associated with automation. However, some positive effects may also be identified, such as increased safety and the opportunity for work force diversification if educational opportunities are available.

Nonetheless, a rise in robotic productivity is more likely to negatively impact the welfare of young workers and current generations than that of the current workforce[533], an impact that is also affecting mining communities. New mining operations will thus likely employ fewer people, offering fewer employment opportunities for new generations. This intergenerational

529 Paredes/Fleming-Muñoz 2021
530 Burto 2020
531 Widana 2019
532 Readhead/Lassourd 2021
533 Sachs et al. 2015

impact is alarming with respect to the future of those working in mining, raising doubts over whether there will be enough miners in the future to sustain mining towns and regions, including the families affected. In that regard, it will likely be practically impossible to establish new human settlements in association with the opening of a mine, and the modern mining industry thus requires serious social, urban, and regional planning, political deliberation, and, in particular, stakeholder consultation[534] as the entire ecosystem that sustained governments and families in mining areas is on the verge of collapse as a result of automation. In that regard, ethical risks arise when increased automation in communities remains unmanaged—that is, when employment disappears, and no alternatives are offered.

Ethical opportunities are provided when automation leads to a reduced environmental impact in these communities, which may be seen on a global level as worldwide mining industries move toward introducing significantly more automation with the aim of enhancing productivity and safety[535]. This can be observed, for instance, in copper mines, which rank as the third most important metal for society, technology, and infrastructure; only iron and aluminum are considered more important from a mining perspective[536]. Copper extraction is expected to continue for many years, and this will have a significant impact, including in terms of greenhouse gas emissions, owing to the industry's high energy and diesel consumption. In this sense, automation can significantly support the alleviation of environmental impacts and, at the same time, enhance the safety of the human workforce[537], particularly in terms of the potential for human toxicity, potentially reducing it to between 16 and 20 percent in the coming years. Thus, harmful emissions that damage human health may be reduced, including cancerous and non-cancerous effects, thereby increasing bodily health. Emissions can also affect animals and water distribution in the mining area[538], offering potential opportunities from an ethical perspective. Accordingly, advancement in the automation of mining processes could increase the capability to live with nature and plants for individuals living in mining regions, given the assumption that automation is reducing the mining industry's environmental impact. In addition, given that mining is

534 Paredes/Fleming-Muñoz 2021: 193
535 Moreau et al. 2021
536 Sverdrup et al. 2014
537 Moreau et al. 2021: 1153-1154
538 Oluwoye et al. 2017

known to be dangerous, with increased death rates associated with heart disease, cancer, and unintentional injuries[539], the capability for life may be strengthened when humans' harmful interactions with mining machinery are reduced.

4.1.3 Agriculture

For communities dependent on agricultural employment, automation will largely have a significant impact on their ecosystems[540]. Shifts in the agricultural value chain will lead to the availability of fewer jobs in a trajectory similar to that witnessed in the mining industry. Improved design, more capacities, and reduced costs of agricultural robotics have led to greater automation potential[541] in the transition from a skills-based to a digital and knowledge-driven agriculture. Automation now covers tasks such as navigating difficult terrain, identifying crops, diagnosing crop maturity, and generally operating in non-routine environments[542]. In addition, the number of employees in the agricultural sector has declined radically over the past century[543], and supervisory roles—which might involve overseeing multiple robots working in a field, for example—are becoming increasingly important[544].

Generally, the agricultural sector consists of a larger percentage of individuals whose jobs are at risk as a result of automation[545]. This would result in increased competition in cases of displacement, where similarly skilled workers fight for the relatively few alternative jobs available in the region. Thin labor markets mean that alternative employment within the same region is difficult to find and unemployment necessarily leads to growing mobility[546]. The related displacement that arises then usually results in difficult re-market entry at the worker's new location, so individuals whose jobs are at risk of automaton face potentially long commutes, or may even have to migrate[547]. Those who will not be able to relocate, such as older

539 Arif/Adeyemi 2020
540 Rijnks et al. 2022
541 Graetz/Michaels 2018
542 Legun/Burch 2021
543 Autor 2014; Schmitz/Moss 2015
544 Werkheiser 2018; Bechar/Vigneault 2016
545 Frey/Osborne 2017; Nedelkoska/Quintini 2018
546 Findlay et al. 2000; Stockdale 2006
547 Hoogstra et al. 2017

people, might face a so-called "spatial trap"[548], defined by low growth rates and lack of opportunities in the specific agricultural region. Analogous to the mining sector, many individuals in these regions will not be able to exercise their right to work as a result of such developments.

In the past, rural regions have faced more challenges in applying the infrastructure and technology that would allow for job automation[549]. However, recent developments in robotics have incorporated more remote-controlled and self-running technology or infrastructure[550] and this, in tandem with the lower costs of robots[551], means that automation in agriculture is advancing. Machine learning concepts have significantly improved the automation of agricultural tasks[552] by enhancing automatic feature extraction, while the adaptive nature of deep learning helps to achieve greater human-level accuracy in various agricultural applications. Prominent examples include plant disease detection and classification, weed/crop discrimination, fruit counting, land cover classification, and crop or plant recognition. In many of these activities, the automation technology outperforms human labor—for example, plant/leaves recognition and classification may be performed between 30 and 270 times faster by machines than by humans[553]. This illustrates the vast potential associated with replacing humans with machines, and even larger impacts from an employment perspective are expected in terms of harvesting activities, which have traditionally required considerable human labor[554]. Likewise, in terms of forest harvesting, humans will increasingly take on monitoring roles for the sake of cost-effectiveness as part of so-called teleoperation[555]. Increased data will enable the more effective use of farm equipment and can also be shared with centralized servers[556] to optimize resources and expenditure[557] through automation. For instance, autonomous tractors and harvesters, which are GPS-enabled and teleoperated[558], might considerably reduce the need for low-skilled labor while increasing the need for skilled laborers to operate

548 Iammarino et al. 2019
549 Salemink et al. 2017
550 Legun/Burch 2021
551 Greatz/Michaels 2018
552 Saleem et al. 2021
553 Baweja et al. 2018
554 Visser/Okey 2021; Colmenero-Martinez et al. 2018
555 Visser/Okey 2021
556 Paul et al. 2019
557 Himesh et al. 2018
558 De-An et al. 2011; Redit et al. 2016; Kayacan et al. 2015

and monitor these machines. However, even this can growingly be performed remotely.

In addition, automation across the entire food production and agriculture supply chain could significantly reduce the need for low-skilled human labor[559], with food handling, processing, and packaging performed by robots. This also relates to the use of automated milking stations and dairies[560]. Autonomous trucks for haulage might also affect jobs and tasks for farmers or in agriculture[561]. Furthermore, as new jobs are created, for example in building and maintaining robots, these jobs will not be available in the same locations as those that were eliminated. Moreover, the introduction of robots is often connected to the significant deskilling of labor, and machines' increased autonomy is often connected to a loss of autonomy for those who supervise them[562] as robots become more independent and better equipped with information and data. Moreover, robots often put employees, even those in supervisory roles, under greater surveillance owing to their data-gathering capacities and associated automation systems[563] as employers have greater power to dictate wages and conditions[564].

In developed countries, typically in the Global North, which have higher levels of non-farming employment and agricultural mechanization, automation benefits large-scale farming[565]. In transition economies, larger-scale farming backed by automation has become an effective instrument with which to resolve land fragmentation, enhance food security, and counteract rural decline[566]. From an ethical perspective, these global regions benefit from automation by enhancing the capability of bodily health through greater food security, increased interactions with other species, and—owing to the revitalizations of rural decline with new jobs—strengthening the ability to exercise the right to work.

In developing countries, by contrast, where large populations still derive their income from agricultural activities rather than the service sector[567] the impact of automated large-scale farming may be more detrimental. Farmers

559 Caldwell 2013
560 Halloway et al. 2014; Schewe/Stuart 2015; Hansen 2015; Bergman/Rabinowicz 2013
561 Meech/Parreira 2011
562 Carr 2015
563 Stefano 2018
564 Sparrow/Howard 2021: 824
565 Li et al. 2021: 8
566 Juergenson 2016; Long et al. 2019; Zhou et al. 2019, 2020
567 Chinoracký et al. 2019

in the Global South may easily be outcompeted in particular markets if robots are successfully adopted in wealthier countries[568]. This will lead to some groups, such as famers in wealthy Northern nations, being advantaged over their peers from the Global South[569], as the shift from traditional family-based farming to more corporate, large-scale farming[570] comes with an increased necessity for capital.

Thus, capital is important[571] in making automation in agriculture beneficial[572]. Currently, farm equipment manufacturers are focused on automating the largest and most expensive products; therefore, cheaper, mobile robots that would be applicable to smaller farms are of little interest. This development may lead to the disappearance of smaller enterprises, and the concentration of ownership under large-scale global enterprises[573]. Moreover, automated agriculture would likely enhance the general well-being of animals in intensive livestock facilities by optimizing slaughter practices and improving individual animal treatment[574], thereby supporting the capability of other species. This would be beneficial from an ethical standpoint.

Nevertheless, although robots are becoming an integral aspect of modern farming, it is not realistic to expect an entirely automated farming system without human involvement in the near future[575]. Nonetheless, modern farms' operational processes may be expected to generate lower expenses with reduced dependence on the human labor force, and the nature of farming will likely change from traditional field activists to high-tech industrial tasks that attract investors, professional engineers, and companies[576]. Nonetheless, this development will probably impact the working conditions of those few who are competing for jobs in agricultural regions owing to employers' enhanced power, and this constitutes a risk, particularly in the Global South.

Aside from the eradication of jobs, however, automation also has positive implications for improved food production, including in the Global South,

568 Fleming et al. 2018
569 Sparrow/Howard 2021: 823-824
570 Ramin Shamshiri et al. 2018b: 7
571 Sparrow/Howard 2021: 821
572 Bergman/Rabinowicz 2013
573 Key 2019; Sheng/Chancellor 2019
574 Jukan et al. 2017
575 Ramin Shamshiri et al. 2018b
576 Duncan et al. 2021

and therefore for nutrition opportunities worldwide, thus representing an ethical opportunity by improving bodily health on a global scale. In that sense, it can not only help to make work safer for those who remain in the agricultural sector, but can also help limit the squandering of agricultural resources[577]. There is also an argument that automation is vital, as it is necessary to increase food production by 60 percent by 2050 to satisfy global food security demands: the COVID-19 pandemic and the growing global population constitute key examples[578] of uncertainties in this regard. It is thus crucial that food production and distribution systems be improved to combat hunger and address the double burden of malnutrition, whereby smart vertical farming and other automation technologies could help. The employment of automation technology for food production so that the maximum number of crops can be attained while reducing human effort is relevant here.

Moreover, more people are now living in built-up urban spaces that require a supply of fresh and high-quality food[579]. Therefore, as land resources remain constant with more people living in urban areas, there is an ever-increasing need to improve agricultural productivity, and automation can support all parts of the food supply chain, from agriculture to transportation[580]. Another ethical opportunity offered by automation is the more efficient handling of resources and byproducts such as water and wastewater, oil and gas[581], which would enable more individuals in agricultural regions to enjoy a healthy natural environment. Specific applications include water control and automated watering, robots/drones for spraying pesticides and plowing, harvesting machinery, or machines for monitoring health conditions[582]. Accordingly, automated farming has the advantage of reducing the use of water, pesticides, herbicides, and fertilizers, as well as facilitating production for longer periods of the year with increased control over food safety and biosecurity. Moreover, the use of automation technologies could result in improved washing procedures with fewer infectious diseases from bacteria and pathogens[583]. Automated farming can thereby also positively impact bodily health and the environment (i.e.,

577 Bac et al. 2014; Visser/Okey 2021
578 Saad et al. 2021
579 Lezoche et al. 2020
580 Lu et al. 2020; Ramin Shamshiri et al. 2018a
581 Saad et al. 2021: 2
582 Gorijan et al. 2022; Ju/Son 2018; IDTechEx 2018; Lakhiar et al. 2018
583 Saad et al. 2021; Al-Kodmany 2018

other species). Another example is the replacement of heavy tractors and machinery that cause soil fertility to deteriorate over time[584], which is a serious threat in Europe at least, as compacted soil requires more than a decade of expensive treatment to recover its fertility. This may be resolved by using small vehicles, guided by a human operator, whereby technology can help a single farmer to operate a team of automated vehicles as part of a human–robot collaboration. In addition, automation has led to greater control over temperature, humidity, and fertilizer in agriculture in the context of high-tech controlled environment agriculture systems[585]. This could also improve food quality by improving the sustainability, nutrition, and locality of food. However, consumer perceptions appear to play a significant role in decisions to pursue specific types of sustainability farming and ethically beneficial operating models, as they largely rely on value-oriented food consumers to meet economic, social, and environmental sustainability goals[586].

Nevertheless, ethical risks may arise when food production and smart farming fail to take into account the situation in the specific agricultural community, as with fewer employment opportunities as a result of automation, issues such as water shortages, lack of cultivable land, and food with high chemical residues may occur when environmental standards are not adequately met[587]. The potential for robots to affect this dimension depends on economic and political choices[588] regulating the degree of human involvement—for instance, the application of pesticides could easily spiral out of control if not carefully monitored by human workers. In addition, soil compaction may become an issue when human workers are replaced by heavier robots, potentially exacerbating the current situation in which heavy machinery already negatively affects soil, as discussed above. Moreover, the outcome of precision agriculture may be regarded as highly dependent on economies of scale when robots are used, where in the short term only marginal improvements are expected[589] owing to the currently poorly performing available robots in unstructured environments.

584 Ramin Shamshiri et al. 2018: 8
585 Broad et al. 2012
586 Vågsholm et al. 2020; Sackett et al. 2013
587 Baerdemaeker 2013
588 Sparrow/Howard 2021
589 Schimmelpfennig 2016; Sheng et al. 2015; Sheng/Chancellor 2019; Key 2019

For communities in agricultural areas, the social and cultural implications of automation should not be underestimated, as they can also result in significant ethical challenges. Rural populations may be affected heavily in the long-term in terms of their social fabric[590] when their jobs vanish only to be recreated elsewhere[591] as teleoperated jobs that could easily be executed by employees who are situated thousands of kilometers away[592] and who have no connection with the local population. In that sense, significant demographic shifts may be anticipated.

In addition, inequalities in the distribution of wealth in rural areas may rise owing to the further consolidation of land in the agricultural sector. These class-related changes may cause social decay connected to underemployment[593] and diminish the quality of life in rural areas. This stands in complete contrast to the positive developments that might ensue for those who benefit from the application and teleoperation of bots—for example, increased flexibility of work, reduced labor intensity, or more family time[594].

Automation also affects the relationship between nature and humans and how they think about food and farming[595], which might fundamentally alter local nutrition practices[596], thereby endangering the rural individual's self-image and identity associated with living off the land[597] and the related work in the subsistence economy. This would endanger several capabilities of individuals in these communities: first, their traditions, which have been passed on for generations over hundreds of years are regarded as "truly human", as the activities directly involve their culture, creativity, or religious practices. In this regard, the capability to senses, imagination, and thought is at stake for individuals in these communities. Second, emotions would be endangered as a result of the threat to the basic human interaction that guides the development of individuals in their formative years. Third, the planning of people's lives become challenging, when the fundamental aspects of their everyday lives and identities, even food and nutrition, are at stake.

590 Sparrow/Howard 2021: 825-826
591 Rotz et al. 2019
592 Cheein et al. 2013
593 Howard 2017; Fineman 1987; Kates et al. 1990
594 Schewe/Stuart 2015; Stræte et al. 2017; Mathjis 2004
595 Sparrow/Howard 2021: 825-826
596 Horrigan et al. 2002
597 Stock/Forney 2014

In certain regions, this may widen the disconnect between rural communities and other areas[598], analogous to mining. Another issue with automation in agriculture coheres around the existing gender gap in employment, which may become increased[599] as new jobs favor people with technical backgrounds, a group traditionally dominated by males[600]. Women might thus become even more excluded from the workforce in the agricultural sector, a violation of the capability to affiliation in terms of non-discrimination. Regarding the deployment of agricultural bots, legal guidance as to what types of work will still require human supervision is lacking[601]. There is a substantial ethical risk that rural society will be left behind by the introduction of automation technologies without including the broadest possible community into the discussion[602]. These discussions are essential to combating social inequality and forced migration through joblessness, which could further weaken the social and political situation in these communities when traditional manual labor becomes replaced.

To summarize, the complete replacement of human labor comes with diverse consequences from an ethical perspective. On the one hand, opportunities arise for bodily health and capability to life, when dangerous tasks can be delegated to machines and no longer need to be performed by humans. In addition, opportunities arise through improvements in food production and more efficient and environmentally friendly processes, which also supports the well-being of animals and nature. On the other hand, challenges arise as individuals increasingly lose their access to work, as regions that are economically dependent on mining or agriculture risk being left behind. Moreover, if the deployment of automation technologies is not appropriately guided by environmental norms, it may even be harmful. In addition, as humans are increasingly obliged to compete with robots, this may negatively impact the working conditions of those who remain, particularly when labor standard enforcement is not possible in the affected regions.

598 Bell et al. 2015; Klerkx et al. 2019: 4; Werkheiser 2018: 186
599 Liepins 2009; Pini 2022
600 Smith 2011
601 Basu et al. 2020
602 Eastwood et al. 2019; Rose/Chilvers 2018

4.2 Education and skills in the context of advancing automation

Access to education plays an important role as part of the ethical point of reference with respect to a dignified life, as having the relevant skills in times of digital transformation is increasingly becoming the decisive factor in the ability to access paid work. In addition, it is an integral part of the capability to senses, imagination, and thought to become truly human. Moreover, educating oneself may also be perceived as work—for example, if paid work is no longer available. The first part of this section focuses primarily on a labor market or employer perspective, assessing ethical risks and opportunities when the labor market changes as a result of advancing automation with reduced job availability and higher expectations toward employees in terms of education and skills. The second part focuses on the work of educators and the impact of new forms of education.

4.2.1 Labor market requirements and access to work

The current generation of learners faces unparalleled uncertainty in terms of how they anticipate and prepare for emerging skills and jobs, owing to the impact of automation and constant technological disruptions[603]. Skills mismatches are increasing to the point that many graduates are unable to get jobs, while employers are often unable to fill vacancies owing to the changing nature of skills and jobs. The current conventional schooling systems, which were founded around 100–150 years ago to enhance the efficiency of the first and second industrial revolutions, are no longer adequate for people to thrive and prosper in today's world, which is increasingly driven by AI, automation, and innovation. This illustrates that the need for new skill sets in light of digital transformation and automation is relatively recent, and different contributors will be discussed below with respect to the skill sets that will be required in the future labor market. A general consensus in the associated discussion is identified and subsequently assessed from an ethical perspective. The COVID-19 pandemic intensified the influence of digital technologies on human labor. As emphasized above, access to technology enhances productivity, and the use of digital technologies is closely related to the ability to adapt to new technologies. Below, certain approaches to the required skills are discussed, outlining the generic skills that employers in the future labor market may demand owing to their rele-

603 Panth/Maclean 2020: 1-5

vance to the ability to exercise one's right to work as part of the capability to having control over one's environment.

For instance, four different skill clusters have been outlined identified[604] as likely to become increasingly salient owing to the changing nature of work. The first cluster comprises "change-handling skills", which include a mindset of adaptability, flexibility, and openness to change. They also relate to cognitive skills as an important aspect of adaptability and the capacity to "grow alongside the technology advances". The second cluster contains skills for continuous improvement, among them curiosity, enthusiasm, and lifelong learning, with enthusiasm and lifelong learning posing a mutual dependency complemented by curiosity. The third skill cluster focuses on interaction skills that include empathy, communication, and collaboration. All of these also reflect important leadership qualities that become even more important in light of the increasing diversity in teams with different educational backgrounds. The ability to conduct meaningful conversations and communicate value propositions are becoming even more salient, and teamwork is undergoing a "(...) new paradigm away from the classical linear and hierarchic functions to increasingly flat hierarchies". The fourth and final skill cluster is defined as "out-of-the-box thinking" skills that include innovation capacity, creativity, and critical thinking. Creativity in this sense means "to escape the borders of the norms and their structures", as only applying something in a different context that also can be part of creativity can be taken over by automated processes. Another crucial factor here is critical thinking aimed at challenging existing processes and routines and potentially contributing to becoming an early mover with respect to changes in the market environment. Similar competences are defined as "twenty-first century skills"[605] at work and primarily include soft skills, such as "critical thinking, creativity, communication, collaboration, problem-solving, cross-cultural competencies, work ethic, empathy and social, emotional and digital intelligences", summarized as "multiple intelligence". There tends to be a general mindset shift[606] from an employer and social partner perspective, whereby a "skills-oriented learning (...) instead of qualifications-focused education upfront" is required and key contributions on their part are necessary to provide broad and transferable upskilling or training opportunities. All these skills outline how education

604 Danuser/Kendzia 2019: 470-471
605 Panth/Maclean 2020: 3
606 Schleicher 2018

increasingly relates not only to the capability to senses, imagination, and thought, but also to emotions and practical reason, when critical thinking becomes more important.

Talent shortages may impact high-skilled labor owing to automation[607]. The activities of certain professions will change substantially as a result of digitization and automation, with new job profiles becoming radically different. Correspondingly, humans will increasingly perform jobs that are not easily automatable, and communication technology will shape the nature of jobs and their handling. Further aspects of this dimension are discussed in the section below on the automation of communication. From that perspective, high-skilled jobs will increasingly demand high-level cognitive and complex skill sets that include advanced written and oral expression capacities, reasoning, and complex problem-solving. This leads directly to the significance of social interactions and adaptation skills. Correspondingly, social skills, such as teamwork and communication skills, may constitute one of the future labor market's core demands. Such skills are needed irrespective of whether tasks change in the light of new technologies and are aligned with the evolving importance of soft skills, even in technology-related jobs.

Similarly, considering the goal of a thriving digital economy[608], it is no longer sufficient to have just IT or technology-related skills, and other complementary skills are necessary. These additional skills range from good literacy to socio-emotional skills to facilitate collaborative and flexible working. In this respect, generic skills are required to use digital technologies with "soft skills, such as leadership, communication, and teamwork skills, required for the expanding number of opportunities for IT-enabled collaborative work".

Automation can not only alter the types of jobs available but also the number and perceived value[609] of jobs and work. Replacing workers' routines, machines can create a comparative advantage with employees who possess the relevant soft skills, such as problem-solving, leadership, emotional intelligence, empathy, and creativity. Workers who perform tasks that cannot be "cracked" by automation become increasingly critical by virtue of their creativity, adaptability, collaboration, innovation, imagination, and design skills. According to this study, employers will prioritize such skills.

607 Kofler et al. 2020: 35-51
608 OECD 2016
609 PwC 2018: 30-31

Maximizing the benefits of automation complemented by these skills is an ongoing goal of business leaders worldwide, as a global CEO survey revealed[610].

Other impacts relating to skills in the context of advancing automation may be measured in terms of graduate employability[611]. This also provides certain indications regarding the availability of paid jobs in the future. Although employability is a complex and vague concept, this perspective outlines "key transferable soft skills" and competencies that enhance employability: professionalism, reliability, the ability to cope with uncertainty and pressure, to plan and think strategically, to communicate and interact with others, either in teams or networking, good written and verbal communication skills, information and communication technology skills, creativity and self-confidence, good self-management and time management skills, and a willingness to learn and accept responsibility. These soft business-related skills and competencies tend to be remarkably homogenous in terms of employers' requirements and are recognized as important in the various studies mentioned so far.

Likewise, the European Union (EU) in the study "A new Skills Agenda for Europe"[612] reveals the types of skills that might be required in the future from a market perspective. The EU has proposed new indicators of digital competence with its Digital Agenda for Europe (DAE) and a methodology of digital skills was developed by Eurostat in 2015. Those are just a few activities based on the acknowledgment of the European Parliament in 2006, which defined digital competencies as "essential". Digital skills that will be particularly relevant for the future include the following: the ability to organize relevant digital information, communicate, or interact in digital environments (for example with co-workers); problem-solving and software handling that involves the ability to create, edit and re-elaborate new content; and the ability to produce media outputs as well as programming. Further skills that are mentioned include entrepreneurship, language competencies, and a sense of initiative when it comes to employers' needs in the digital workspace or future labor market. The EU study additionally includes indicators of training and upskilling that relate to the field of lifelong learning.

610 PwC 2018
611 Andrews/Higson 2008: 411-414
612 Soldi, et al. 2016: 11-15

The ILO[613] discusses the issue in a report about digitization and skills systems. Future qualifications and skills are expected to encompass both technical and personal aspects[614]. From a technical standpoint, IT competence, data analytics, statistical knowledge, organizational and processual understanding, and the ability to interact with modern interfaces are imperative. The study reveals that German and American industries, for example, consider the following personal skills to be essential: self- and time-management, adaptability/ability to change, teamwork abilities, social and communication skills, continuous improvement, and lifelong learning. Furthermore, other skills are recommended but not mandatory ("should"), among them an awareness of IT security and data protection protocols, as well as general interdisciplinary knowledge about technologies.

The Future of Jobs 2020 report[615] highlights the top 15 skills predicted for 2025. The top 10 comprise (in descending order of importance) of, for example: analytical thinking and innovation, active learning, problem-solving, creativity, leadership and social influence, technology use (including monitoring, control, design, and programming), and reasoning. An interesting outcome of the study is the ranking of the top skills compared with the previous years (2020 and 2019). Soft skills, such as writing, strategy, mindfulness, meditation, gratitude, or listening, are becoming increasingly important, whereas technical competencies, such as Python programming, deep learning, or algorithms are declining in importance. The results cover the in-focus or required skills for both employed and unemployed individuals. Nevertheless, for those who are unemployed, Python programming remains the top required skill, indicating a persistent market need for such technological acumen. This may change, however, as the considerable decline in knowledge about artificial neural networks, regression, or deep learning for 2020 indicates. In general, it appears that the technical skills required by employers are subject to rapid change.

A similar view is expressed in a publication about the fourth industrial revolution[616]. Creative and social skills are "low-risk jobs in terms of automation". However, those jobs can also change. For example, creative writing may be affected by automated narrative generation whereby sophisticated algorithms can create narratives tailored to particular audiences. In

613 ILO 2020: 29
614 Gehrke et al. 2015
615 WEF 2020: 36-39
616 Schwab 2016: 43-48

an experiment by the *New York Times*, readers were unable to differentiate texts written by a robot from those written by a human. Therefore, for all stakeholders and people seeking paid work (i.e., the vast majority of humanity), the ability to anticipate future employment trends and required skills becomes a critical survival mechanism. These trends may vary in the short term according to industry and geography. However, requirements for problem-solving, social, and system skills are generally on the rise, whereas physical abilities or content skills appear to be declining in importance.

Consideration of the various parties' positions clearly indicates a certain development or compromise between the discussed positions of academic research, institutions, companies, and governmental bodies. Soft skills are generally recognized as increasing in importance in connection with the digital and technological advancements, in which the increased automation of human labor plays a crucial role. Nevertheless, adaptability is also necessary and can encompass technical skills in response to the demands of technology and the connected market. Interestingly, none of the parties are particularly espousing a specific technology that might represent an important future skill set, attesting to the rapidly changing relevance and short-term applicability of tools and a dynamic that is evolving as a result of swift replacements on the market. In this respect, this also influences whether labor is demanded for the referring tools. Only a few studies[617] to date have included specific technologies in their position or research, indicating that it is rare to rely too heavily on the success of specific technologies (such as AI and robotics). The results of the WEF report also showcase how demand for technologies that were highly relevant the previous year can rapidly decline from a labor market perspective. This is also applicable in the context of automation-supporting technologies that embody different kinds of digital tools.

In general, automation as part of digital transformation can affect the capacity for human achievement in workplace[618]. Achievements here may be defined as coordinated human activity in such a way that those outcomes are linked to the efforts of individual human agents. Achievement may be part of the above definition of meaningful labor, particularly given that the linking of efforts can arouse a certain pride within an individual. Having the capacity in life to have achievements appears to be part of a desire when

617 e.g., WEF 2020
618 Danaher/Nyholm 2021

it comes to workplace necessities, represented in the capability to develop mutually recognized working relations. Achievements may be linked to identity and self-worth[619], and the lack of opportunities for achievements in the workplace must be considered.

If human workers are wholly replaced by a machine, the workplace will clearly be devoid of any human achievement[620]. This negates the very possibility of achievement, and while other talent outlets have yet to emerge, humans are currently interacting and collaborating with machines in the pursuit of achievement.

The developments and studies mentioned above indicate that soft skills may be regarded as permanent in the context of demand from the labor market, as technical skills tend to change rapidly and become quickly outdated. These changes have accelerated considerably with current technological advances. The consideration of soft skills is even more relevant, because they seem *prima facie* harder to automate and are especially relevant for human beings (of course, this may change if AI chatbots are imbued with "soft skills"). In this context, certain traditional soft skills can also be automated (such as writing, as illustrated by the *New York Times* example cited above).

To summarize, problem-solving, creativity and critical thinking, and teamwork or social skills were emphasized as relevant in all of the accounts evaluated. This reflects ethical opportunities, when automation requires higher levels of education for those who are able to stay in the labor market and access education, since the required soft skills not only enhance access to work as an aspect of control over one's environment capability and ability to work as a human alongside other humans but also support the development of capabilities such as sense, imagination, thought, emotions, and practical reason, all of which are related to these capabilities. This demonstrates that skill set requirements increasingly prioritize skills that transcend specific work processes to interact with other capabilities, such as emotional intelligence or doing this in a truly human way which distinguishes the human even more when competing against the machine. From an ethical perspective, the evolution of these skill sets reveals an increasingly demanding labor market, in which labor that involves manual work is becoming obsolete. Mental or cognitive abilities become critical which could support the capability to bodily health when, for example, awareness for mental health is improved. Nonetheless, these skills are always relevant

619 Smides et al. 2020
620 Danaher/Nyholm 2021: 232

in interactions with technology in which only a certain group stands to benefit from improved education—namely, those who are still able to work.

In this regard, as the labor market is rapidly changing always faster and required educational skill sets might change faster with this, ethical risks continue to emerge. Verification of educational level will likely become increasingly important as the labor market for the highly educated is becoming increasingly narrow and competitive in tandem with greater demand as manual labor becomes scarce, forcing many workers to invest more in education. This is linked to an ever-growing pool of potential candidates that may or may not be able to satisfy the requirements for a given job. The future labor market will thus likely become more unstable, which poses challenges from an ethical perspective. Correspondingly, learning abilities might decline in older job candidates. Thus, mental and emotional aspects may be threatened by fear and anxiety when jobs and job availability are constantly under scrutiny. In this sense, "automation anxiety"[621] poses a considerable risk. Correspondingly, the job automation likelihood has been linked with workers' unfavorable health outcomes[622] and poorer job security as a result of increased exposure to automation risk, leading to negative health outcomes[623]. Moreover, the ability to exercise practical reason is increasingly threatened by automation when it is work related, as in the capability to control over one's environment. The rapidly changing labor market can make it difficult for employees to identify with their work and find mutual values with their colleagues. This also affects the meaningfulness of relationships with other workers, which are becoming more short-term and labor market-oriented as professions and jobs undergo changes, as team members may be shuffled among teams while becoming increasingly project-based in an agile working environment[624]. In addition, the capability to life covers the "the idea that a human life can be understood as an unfolding story, displaying a kind of unity, analogous to narrative unity. We can view the moments of our life as a meaningful whole, something that we can make sense of"[625]. In the narrative of a human life, work plays an important role as a key means by which people may find meaning. A constantly changing labor market and the alteration

621 Estlund 2022
622 Cheng et al. 2020
623 Patel et al. 2018
624 Maheshwari 2019
625 Jecker 2021a: 28

of professional profiles can cause stress from the perspective of the "meaningful whole". Human identity can also be affected if the automation of labor obliges humans to continually change their narrative unity. Moreover, practical reason, which relates to a "person's ability to reflect on and choose a plan of life that expresses authentic values and ends"[626] may be negatively affected as automation may result in the frequent alteration of career plans in terms of an unsafe labor market, with a direct impact on work values and ends.

For those who are educated and in receipt of high salaries as a result of their high productivity levels, automation of labor may reduce working hours and thereby lead to increased free time and more recreational opportunities. Moreover, the quality of recreational activities will increase if the demands of physical work are alleviated. Given technology's ability to enhance productivity, automation may free up time for workers and thereby enhance their opportunities for recreation.

To conclude, education is crucial in that it supports not only access to paid work but also supports all other capabilities in that context, because without work, most people will find the other capabilities difficult to fulfill without any income. In addition, promoting these automation-complementing skill formations is key in reducing wage equality[627], which in turn promotes freedom of political expression. This emphasizes the importance of an adequate education policy that takes into account automation's ability to reduce manual labor while increasing the importance of skills relating to the senses, imagination, and thought. Their relevance on the labor market has been thoroughly discussed above. In this regard, automation of manual labor presents an ethical opportunity for this capability to enhance access to education, as this simultaneously elevates "truly human" skills. In addition, higher education generates increased opportunities to use one's mind creatively in political and artistic expression. Furthermore, as advanced education tends to improve health and well-being[628], the focus on human skills as a result of automation can lead to a reduction in physical or mental pain and enhanced pleasurable experiences.

626 ibid.: 30
627 Bentaouet Kattan et al. 2021
628 Zajacova et al. 2020

4.2.2 New ways of education

Automation has affected education by altering the ways in which knowledge is provided and thereby changing the nature of the work in which education professionals engage. Access to education, as an important factor for enabling capabilities and labor market access, is crucial from an ethical perspective, and automation can generate opportunities by facilitating human development while also representing a risk, if the pace of the required education is too high with too few jobs available (as outlined in the section above) or if education is becoming increasingly biased through the influence of automation technologies. Nevertheless, the threat of complete automation of the teacher profession is comparatively low[629]. Automation technologies such as AI are "reasonable to expect that the recent advances (...) will have profound impacts on (...) competence requirements, as well as in learning and teaching practices" and "it may also enable new ways of teaching and learning"[630]. In addition, the increased interconnectedness facilitated by education platforms may result in global classrooms[631], eliminating certain differences in educational standards, which would represent an ethical opportunity in terms of access to knowledge on condition that certain groups are not discriminated against, as they have been in the past[632]. The capability for senses, imagination, and thought may thus be enhanced and adequate education may be a possibility for more individuals, particularly if the education costs are reduced thanks to automation technologies.

Correspondingly, in its "Beijing Consensus on Artificial Intelligence and Education", UNESCO[633] articulated the potential to address educational challenges and innovate teaching and learning, with an emphasis on ensuring that the core principles of inclusion and equity are respected. The consensus calls for a human-centered approach to AI, whereby AI's role is redefined to address inequalities in terms of access to "knowledge, research and the diversity of cultural expressions and to ensure AI does not widen the technological divides within and between countries", stating that there must be a promise of "AI for all". In that sense, it calls for the inclusion

629 Study International 2020
630 Cabrera et al 2018: 2
631 Malik et al. 2019: 408
632 Hacker 2018
633 UNESCO 2019

of AI in planning education policies by considering certain uses of AI—for example, in education management and delivery, to empower teaching and teachers, for learning and learning assessment, and to develop values and skills for life and work in the AI era while offering lifelong learning opportunities for all. These opportunities should also promote the equitable and inclusive use of AI in education. From a monitoring perspective, UNESCO calls for measures to ensure ethical, transparent, and auditable use of education data and algorithms. In that respect, plenty of ethical opportunities with educational work automation seem to exist, while at the same time, access to education and biases in AI systems are a risk to use those potentials. Nonetheless, the technical perspective must be considered, given that the use of automation in education has accelerated in recent years, with the pace becoming even faster as a result of the COVID-19 pandemic[634].

Initially, AI took the form of computer technologies for education before transitioning to web-based and online intelligent education systems and finally evolving to the use of humanoid robots and web-based chatbots to perform instructor duties and functions, potentially with or without a personal human operator on the other side[635]. This allows teachers and instructors to more efficiently and effectively perform administrative roles, such as reviewing and grading, thereby allowing them to deliver higher quality teaching. Another advantage of using automation technologies, such as machine learning, is the increased customization and personalization that they facilitate, aligning the curriculum and content with student needs. However, risks may emerge when AI is also biased, as the distribution of information—even within academic institutions of higher learning—is directed by technology corporations, who monopolize control over the relevant algorithms[636]. Moreover, for teachers to assume their new role in education, they must focus on conveying other skill factors, such as creativity, imagination, innovation, and skills that machines cannot perform. Educational policies must increasingly consider humans who are teaching other humans "human"-specific values, as other tasks, such as administrative work, can be increasingly automated. This is particularly crucial given that schools play an important role in students' socialization, as environments in which human associations form and influence cognitive development. The use of

634 Saadé et al. 2020
635 Chen et al. 2020: 75264
636 Fahimirad 2018: 114-115

automation technologies in educational work can thus jeopardize children's healthy maturation processes, particularly if AI is increasingly permitted to determine what content is covered. Moreover, if AI is permitted to influence examination content, a lack of accountability may ensue when test results[637] are based on algorithms. This may generate fear and anxiety at the prospect of a coldly rational machine that increasingly serves as a gatekeeper and "instance of authority". In addition, fewer instances of human recognition and social interaction may hinder the establishment of empathy, as school children will be exposed to the virtual world not only in their free time through social media but now also in their compulsory schooling, which may reinforce the effect of, for example, the inability to live in relation to the world of nature when playing with others. This poses a risk from an ethical perspective.

As mentioned above, automation technology is unlikely to lead to job losses for teachers in the near future; nevertheless, as robots become increasingly sophisticated, this may exert pressure on teachers to improve their efficiency, potentially diminishing their collective bargaining rights[638]. Moreover, teachers may become deskilled as work becomes increasingly automated, with robots making decisions and teaching classes. This is also relevant to the political sphere, as automation technologies may lead to a decline in political awareness when the nature of work is subject to change and identification with one's specific profession declines. This could go on to affect the collective bargaining power of specific professional groups, such as public-school teachers, a development that would be problematic from an ethical standpoint.

Teaching in higher education institutions will also necessitate a reconsideration of the teacher's role, given the displacement of jobs by advancing automation[639]. For example, the rise of software designed to detect plagiarism raises the question of agenda-setting with regard to teaching and learning. Given that technology corporations have a quasi-monopoly on how they use data, their impact on how research is conducted is increasing. This highlights the importance of privacy, since these corporations could use plagiarism software to overhaul higher educations by stealing research and investigation results in advance. Furthermore, AI software based on complex algorithms may assume responsibility for certain teaching practice

637 Li/Wang 2020: 591
638 Dandalt 2021
639 Popenici/Kerr 2017: 10-11

tasks in higher education, and programmers may design such software under the influence of their own agendas and biases. Universities must be able to remain independent of these influences in maintaining civilization and promoting knowledge and wisdom[640]. This is also relevant, as automated decision-making (ADM) technologies are increasingly instrumental in preselecting job candidates, deeming students to be "failing", and, crucially, allocating school resources[641].

The already fragmented academic labor market in higher education may be affected by automation as the acceptance of large student numbers while keeping faculty numbers static is becoming increasingly common[642]. In that regard, the ethical risk occurs if critical and creative agent role of the teacher is endangered when automation increasingly takes over the process of deliberation, whereby the teacher begins to adapt to technology rather than vice versa. The standardization of educational processes and platforms poses a further threat to deliberative diversity, as the knowledge conveyed is based on information selected and sorted by technology corporations' algorithms. This would also jeopardize universities' academic freedom.

In that regard, automation far exceeds the advertised "automation of repetitive tasks"[643], which would liberate teachers from administrative work, enabling them to focus on building "meaningful relationships" with their students. Although the deployment of AI is regarded as a "win" in terms of facilitating increased time for personal human interaction, the digitalization of education also poses a risk to the development of cognitive skills outside the digital world[644]. In that case, an additional risk may emerge, as individuals may become increasingly dependent on these tools, which have been developed by technology corporations who may lack transparency in terms of how these algorithms function. This also demonstrates that there is no "judgment free environment for education"[645].

An ethical opportunity, aligned with the agenda, may be perceived as lifelong learning becomes more accessible[646]. This must be strengthened by preserving the integrity of higher education, while teachers must focus on conveying human skills, such as imagination, creativity, and innovation.

640 Awbrey/Scott 1994
641 Selwyn et al. 2021: 2
642 Gallagher/Breines 2021
643 Sealfon 2021
644 Jha/Arora 2020
645 Malik et al. 2019: 408
646 Popenici/Kerr 2017: 11

This may help avoid and critically reflect on the ways in which automation seeks to influence future outcomes of education, as educators shift their focus from experience to future events[647]. In this context, it is also important to demand that designers, developers, and vendors be held accountable for their products so that they are built to serve pedagogical values and not to diminish or undermine key aspects, such as social relationships with people. In that regard, educational professionals should be more engaged in shaping the development and not leave it in the hand of those who provide these products, which are purely guided by commercial interests. Correspondingly, the technology deployed in education must be strictly controlled to ensure that it does not prevent individuals from expressing themselves and freely developing a conception of good, which is related to the capability of practical reason. Critical reflection might be at stake if algorithms assume responsibility for education, making sure that certain views and positions are avoided by those who seek knowledge from knowledge and e-learning platforms, which are increasingly personalizing the way in which humans perceive education. This individualization of education further threatens the development of political affiliation with other humans and jeopardizes social connections, which are required for participation in political life to ensure that concerns regarding the political system can be freely voiced.

More broadly, automation in education requires universities to re-think their role both in terms of technology, and also in terms of their role in society as a whole[648]. For example, universities should consider the structure of their educational models to foster qualities such as self-reflection, conflict resolution, creativity, or choice-making skills[649], which will be important for students entering an increasingly more automated job market. This is also relevant as the demand for AI-based education platform is set to increase in the coming years, also thanks to its growing personalization[650]. The availability and quality of continuing education counts for more than simply the education of younger students, as "seeking this sort of midcareer intervention should be as natural as choosing to go to college after high school"[651].

647 Selwyn et al. 2021: 8
648 Cabrera et al. 2018: 32-33
649 Malik et al. 2019
650 Qu et al. 2022
651 Sundararajan 2017: 10-11

Moreover, AI may strongly affect how wealth is distributed in society as level of education becomes a determiner of whether one will have a job or not in an automated job market. If algorithms in university programs are used to decide whether a certain student passes an exam or not, this so-called "intelligent examination system has very important practical significance for promoting the socialization and modernization of education"[652]. The same applies to whether someone is admitted to a school or university and reflects another critical dimension besides teaching when automation technologies are applied in educational work.

In summary, the deployment of automation technologies in education in the short and medium term is unlikely to jeopardize the availability of jobs for teachers. Nevertheless, it affects how education is perceived and how teachers work as they face the increasing threat of being controlled by algorithms that determine what content is presented to pupils or students, which places various capabilities at risk, as stated above. To avail of the opportunities offered by advancing automation in the educational field, teachers should focus on conveying human values and knowledge, such as critical thinking and social skills, and demands for transparency on the part of technology providers must be reinforced to ensure that pedagogical standards are maintained and a diverse range of knowledge is provided. This would ensure that those who are willing to receive further education do not become a target for the opaque agendas of technology corporations or other providers, designers, or developers of educational software systems.

In conclusion, automation is leading to rapid changes with respect to the in-demand skill sets on the labor market, giving rise to ethical challenges as job security declines. In addition, social interactions and social skills, despite being demanded from a market perspective, are increasingly shaped by automation technologies that influence human interactions. This is also related to changes in the professional environment, as greater access to information with fewer direct interhuman teachings poses a threat from the ethical perspective; this is particularly relevant if human skills can no longer be learned and educational tools are based on biased algorithms.

652 Li/Wang 2020: 591

4.3 Automation of communication

Modern digital communication tools alter the ways humans express themselves and interact with each other, an area where automation technologies are increasingly deployed. On the one hand, human jobs in traditional media are increasingly replaced by robots, and on the other hand, social media offers automation technologies opportunities to manipulate and control human behavior while exploiting their creativity, time and needs without providing remuneration for their work, at least in most cases. Their usage urgently requires an analysis from an ethical perspective, especially since the topic traditionally is not thought of in terms of human labor automation and related impact. First, it will be elaborated how communication is affected by automation technologies from an ethical perspective and how automation shapes communicative work. Second, it will be analyzed how the "automated press" steers the political discourse, which has largely shifted to social media. Third, the problematic nature of unremunerated work on selfhood, which is caused by advancing automation technologies that manipulate users through social media with serious impacts on socialization, will be outlined. Fourth, it will be highlighted how this development has resulted in new forms of unpaid work—that is, data slavery.

Traditional forms of communicative production—namely, speech and writing—have been increasingly affected by the consequences of automation[653] in recent years. This, in essence, is caused by the increased perception of virtual reality as genuine reality that also affects the nature of human labor, specifically traditional communicative work, such as journalism. Moreover, as technology becomes more sophisticated, the social and political implications of machines' abilities to accelerate the production of written and oral discourse is visible. This not only threatens material livelihoods by reducing job availability but also jeopardizes the values of deliberative struggle and social reciprocity that are embodied in everyday communication. In that regard, in contrast to the industrial automation, immaterial human labor, which is largely based on communication, is undergoing heavy alternation. Work of this nature may be regarded as the defining activity of human community and political life as well as the key to human development[654]. The economic consequences may be felt by many who work in fields that rely heavily on communication, such

653 Reeves 2016: 151-154
654 FAO n.d.

as psychotherapists and personal assistants or even teachers, professors, and media professionals, all of whom increasingly face sophisticated digital technologies that would do their jobs at a minor cost[655]. This poses an ethical risk in terms of the ability to exercise the right to work for the increasing number of individuals who are engaged in producing or creating immaterial goods. This is reinforced as the automation of communicative labor affects all individuals, whether it pertains to ordering food, learning about political candidates from automated campaign calls or social media posts, or attempting to reach customer service agents. Regarding new media and digital rhetoric, economic and cultural life is increasingly affected by the machines' displacement of human workers. In essence, the automation of communication will not only influence human labor as a source of income but will also affect the culture of human labor as a whole, particularly in the context of what defines paid work[656].

Besides the fact that digital transformation has enhanced the potential for interpersonal human communication by facilitating connections across cultures and continents[657], which can positively strengthen capabilities for affiliation, digital capitalism must reconcile its desire to profit from human communication with its historic aim of eliminating unpredictability, possibility, and temperamental and political volatility on the part of the human worker[658], which is aligned with the increasing commodification of information in the digital economy[659]. Immaterial labor is most saliently distinguished from its material counterparts by its social purpose, in that the production of communication affects relationships and knowledge, in contrast to manufacturing a car or other material goods[660], which has a lesser direct impact on immediate human relations. Therefore, the "biopolitical" dimension is directly affected when automation technologies are increasingly deployed in communication, owing to the fact that human communicative labor produces a constitutive surplus that positions the human subject and its communities—at least traditionally—beyond the power of capital[661] and represents a cornerstone in the capability of political affiliation.

655 Carlone 2008
656 Resnikoff 2021
657 Ruben et al. 2020
658 Schiller 1999
659 Terranova 2000
660 Hard/Negri 2005: 114
661 Greene 2004: 15-16

AI and its automation drive have thus facilitated a rule of communicative culture where humans before by tradition realized this biopolitical potential in communities through interaction[662]. As this can only be lived through common human experience, automatic communication reduces the opportunity and impulse for cooperative human efforts when AI is used to monitoring human communication, analyzing, and subsequently mechanizing human interactions. These pursuits are additionally connected with the vast amounts of data that are collected and then used as part of a new media ecosystem[663]. The standardization or machination of communication in that sense limits the opportunities for local, harmonious passion in the virtual world and reduce the prospect and impetus for humans to organize, struggle, co-operate, and empathize with one another[664]. The socially essential work of human communication is therefore transformed and drained of its freedom, eventuality, and politically creative ability, which threatens to skim the biopolitical surplus from human communication, posing a high risk from an ethical perspective. Further issues in this respect include the question about authorship and, consequently, accountability and responsibility for communication content[665] created through algorithms. The intention of automating communication is similar to that of industrial processes from a capitalist standpoint; immaterial products relating to human communication, such as curiosity, care, or intimacy, can be reproduced more reliably, precisely, and cheaply than humans facilitate when it comes to providing communicative labor, aiming to define or influence cultural norms, consumer norms, or public opinion[666]. These developments represent an ethical risk in terms of affiliation and political rights, as social interaction between humans is increasingly controlled by distributed information based on opaque algorithms, and news media lack transparency[667] with respect to their specific use.

Machines have developed a competency in interpreting and producing discourse and have taken over several domains of social life in which communicative labor is vital[668]. Accordingly, humans are increasingly turning to machines for knowledge and information about what would traditionally

662 Reeves 2016: 154
663 Ali/Hassoun 2019: 40
664 Reeves 2016: 155-156
665 Montal/Reich 2017
666 Lazzarato 1996
667 Diakopoulos/Koliska 2017
668 Reeves 2016: 155

have been products of a human relationship, as scientists and corporations are increasingly using AI to create replacements that exceed human abilities[669]—for example, being more reliable or tailored to clients. Examples include chatbots or other machine facilitators that provide support services that would traditionally have been provided by humans. In addition, when searching for information, individuals usually receive sorted content that is directed by bots[670] rather than humans. Critically, this automation of communicative labor provides conditions of human sociality that deny the fact that care and conversation can occur only between humans[671], which poses an ethical risk with respect to the capability of being truly human.

Humans' political possibilities and potential to possess genuine personal opinions are diminished as content production is increasingly performed with, by, and between machines, as machines occupy roles that were formerly human[672]. In this sense, the deployment of automation technologies will further restrict the domain of human-produced culture by forcing people out of communication-oriented professions, replacing ineffective paid human labor with machines' imitated effective creativity and care—for example, chatbots[673]. One approach to finding an answer to these challenges would be AI literacy so that individuals are "empowered to interact with and treat mass-personalized content in a way that promotes individual and social good while preventing harm"[674].

Automation of communication not only threatens blue-collar workers in manual jobs, as mentioned above, who certainly bear a large burden in terms of automation technology innovation[675], but also affects white-collar professionals, including artisans, lawyers, or accountants. Although new complex non-routine work may emerge, the gains at the top of the labor market will not be offset by losses in the middle and bottom of the job market[676], as reflected by the decline of full-time professional editors[677]. In addition, the automation of labor affects human assistance or administrative jobs, for which big data are more efficient, again with the assistance of

669 Signorelli 2018
670 O'Brien 2022
671 Moskowitz 2013
672 Lewis et al. 2019
673 Gehl 2014
674 Hermann 2022: 1258
675 Bessen 2016
676 Smith/Anderson 2014
677 Thurman et al. 2017

chatbots or natural language bots[678] which are also used, for example, for screening of job applications[679]. In this regard, working conditions and the availability of work may deteriorate, as jobs are completed by machines, affecting individuals' ability to maintain control over their own environments in terms of their material and political well-being.

Text customization through AI raises further ethical issues with respect to information availability and the right to information. Through big data, readers might be presented with different views derived from their Internet history[680]. In that sense, automated communication has also led to a rationalization of social communication traditionally pursued by human beings. The adaptation of these technologies may be explained by rational interests and greater efficiency[681], as illustrated by radically new media-related properties and network ideas[682]. This also has resulted in a greater dependency on efficiency-driven automation communication by the mere necessity to manage the information overload[683], which can be aligned with a "digital rationalization"[684], whereby automated communications feature elements of interactive communication and allow for individualized mass communication[685] with content that has been wholly developed by machines. This poses a risk to the ability to, for example, imagine others' situations, since only certain elements of information are made available to intended receivers of a message, diminishing the quality of communication rather than improving it, which opposes the promises of more efficient modes of communicating.

4.3.1 Social media

Social media has affected human social life considerably, particularly with respect to communication. It has facilitated, but also automated, the ways in which we interact and work in the digital world. On the one hand, with an increasingly automated press involving fewer humans in public political discourse, it is necessary to reflect on how political rights and

678 Reeves 2016; Kolhatkar 2013
679 Azulai 2017
680 Morozov 2012
681 Papsdorf 2015
682 Castells 2005
683 Blair 2010
684 Papsdorf 2015: 1000
685 Papsdorf 2013: 72

affiliations are affected by social media platforms that involve automated communication tools.

On the other hand, social media exerts underlying effects on human behavior and socialization, including with respect to the labor market and remunerated work. The automation of communication in that regard affects different spheres, especially through the means of social media. While increasing numbers of workers are struggling to find regular employment, others "work" unpaid and unwittingly for technology corporations at all hours, at home, in bed at night before falling asleep, never out of reach and continually providing private data. This "surveillance capitalism"[686] has found ways to commodify and trade in some of the most intimate aspects of daily life. By harvesting the data produced by an individual's often unremunerated interaction with a machine, these technology corporations seek to trade in the labor of mere selfhood and, more remarkably, to shape it. Everywhere, human labor remains of the utmost importance in the creation of value; rarely, however, is it recognized or paid as labor. As long as this labor remains invisible, those who profit from it will not need to pay for it[687]. This development is highly problematic from an ethical perspective and will be further outlined below.

In addition, the algorithms used in social media have a known history of exhibiting racist tendencies when gathering data, and there is a fundamental lack of transparency regarding how the technology works[688], amounting to an ethical risk in terms of equal treatment when no human worker or author can be openly held accountable for such practices. Moreover, social media influences users by fabricated "norms", which are created by algorithms that serve commercial platform monetary benefits[689] by not treating humans *as such* but rather as objects based on private data. In that regard, humans are simply a means, objects in the service of these corporations, whereby "liking", "friending", and "sharing" undermines the sanctity of human dignity and merely serves as a manipulative tool[690]. Withdrawal from social media, on the one hand, can leave humans feeling lonely and isolated, reinforcing the susceptibility to radical or extremist pursuits that is already provoked by the use of these communication tools in democratic systems; on the other hand, social isolation and emotional distress are

686 Zuboff 2019
687 Resnikoff 2021: 192; Burns 2019; Henwood 2019; Klein 2020
688 Sandvig et al. 2016
689 Kamir 2020: 146
690 Dijck 2013

becoming increasingly common owing to the constant manipulation by algorithms. Both aspects are highly relevant from an ethical perspective, because they take advantage of basic human needs to force individuals to work without payment, thereby threatening other central capabilities.

4.3.1.1 Automated press and political discourse in democracy

Automation of communication affects how democracies work and operate, particularly because automation technologies change the ways in which humans work and interact in relation to the political discourse in a democracy. Cross-cutting communication spaces may be regarded as key to a functioning democracy[691] and addressing issues that are relevant to citizens. Social media, for example, can improve awareness with respect to working conditions[692] and rally affected individuals for political reasons[693] if necessary, allowing for joint action irrelevant of distance. In facilitating direct communication with leader figures, social media can support the creation of political identities[694] without relying on human opinion leaders, such as journalists or political commentators. These developments represent an opportunity from an ethical perspective.

However, rationalization of communication can also lead to a loss of meaning, freedom, and reification[695]. This can be also seen in terms of effects in social media[696], as content appears to be increasingly similar across cultures and individuals in terms of how communication is effected, which also has a political dimension. In this context, highly subjective acts of communication are transformed into objective categories, rendering communication predictable and controllable[697] by machine-based influence that remains limited to specific content without any underlying human input. This may be interpreted as a form of "dehumanization", where the human actually becomes simply a means and no longer represents an end. Coincidence and open-ended outcomes become rare when being guided by the machine, which endangers discourse. Politically relevant human

691 Bozdag 2020
692 Barnes 2020
693 Bunse 2021
694 Penney 2019
695 Habermas 2019
696 Bakardjieva 2014
697 Papsdorf 2015: 1001-1002; Horkheimer 2013: vi

beings become increasingly objectified, connected to a loss of contingency and reflexivity. In addition, political communication is becoming more vulnerable to disinformation, which is increasingly spread as automation of communication offers new possibilities[698]. Paired with automated journalism, this jeopardizes freedom of information[699] and diminishes the ability to politically affiliate in a truly human way, which is an ethical issue.

This development verifies that human political activity may come to be entirely rendered by machines, and there is a very real threat that humans will become wholly irrelevant in the political process, as opinion-formation becomes increasingly influenced by automated communicative tools. Social media is becoming a primary news source, where new alternative online media polarize narratives and increase the potential for extremist news[700] through the creation of "echo chambers"[701], with news bots playing an important role in leading people into a certain narrative based on their historic search preferences[702]. For example, in Europe today, only half of citizens born after 1980 believe that it is crucial to live in a democracy[703], and this is likely connected to a loss in confidence and trust in political parties and governments. A key issue in this context is the denial of responsibility by platforms and algorithm operators who profit from broadcasting political information, thereby providing ideological extremists with media power to distort democracy[704], an issue that generally relates to public relations through social media[705] when companies operate in the political arena. This again highlights the lack of accountability associated with reduced human work and involvement in politically relevant discourses. As these developments fundamentally threaten democracy, they pose a direct ethical risk to human dignity, as political rights are essential in a liberal democracy, and protection of the quality of democracy becomes crucial[706]. One approach would be to use trusted webpages (e.g., those affiliated with government agencies); however, greater policy guidance and regulatory

698 McKay/Tenove 2021
699 Monti 2019
700 Schulze 2020
701 Bail et al. 2019
702 Cho et al. 2020
703 Beaufort 2018
704 Entman/Usher 2018: 306
705 White/Boatwright 2020
706 Colomina et al. 2021

frameworks are required to protect public discourse[707]. It is further necessary to boost AI literacy and knowledge regarding how social media and communication to allow people to participate in political activities while understanding how these tools affect free speech.

Another key challenge is the increasing loss of political influence in certain sectors, as fewer people are employed and are therefore less able to raise their voices politically. In that sense, workforce automation is likely to create political upheaval[708]. Historically, industrial revolutions have given rise to non-market mechanisms[709], such as new political movements that have the potential to culminate in global warfare[710]. The current digital transformation has led to a rise in populism, with economic change and insecurity among the contributing factors[711]. At this point, workplace digitalization matters for voting behavior[712], however, technology appears not to have been blamed but rather misattributed by voters to topics such as migration or international trade. When people misperceive the source of an economic problem, they are more likely to support inadequate remedies that fail to strike at the root of the issue. Worse, the policies could be inefficient or even damaging. In that sense, policy must generally take this issue into account, especially since certain sectors might be losing influence in politics, which may go hand in hand with a deterioration in working conditions for the remaining employees. This will likely be paired with the anger of the supplanted individuals and voters, who may seek radical—if not fascist—solutions to their unfavorable economic situations.

To summarize, social media is becoming a decisive factor in social status and affiliation between humans. Political sentiment and opinion today largely depend on information distributed via these channels with reduced direct human communication and less human media work shaping political positions. The algorithms that control the flow of information and are increasingly biased toward a certain political ideology—for example, in the case of TikTok[713], which suppresses any critique of the Chinese communist party—indicate that there are risks, for example, with respect to political and social inclusion. The capability to affiliation is thus threatened if auto-

707 Ouchchy et al. 2020: 934-935
708 Gallgo/Kurer 2022: 470-472
709 Caprettini/Voth 2020
710 Eichengreen 2018; Boix 2019
711 Rodrik 2018
712 Gallego/Kurer 2022: 473
713 Feuer 2019

mated communication harms institutions such as the press, in which robots are increasingly merely reproducing content based on a user's history[714]. As political social interaction become increasingly dependent on digital means, the use of AI threatens democracy by diminishing the roles of human individuals and replacing them with robots that are subject to opaque algorithms with unknown biases. The attack on the US Capitol on January 6, 2021, illustrates this increasing extremism caused by closed "echo chambers", whereby humans are manipulated based on their opinions. Access to political information is thus increasingly predetermined, which also reduces the opportunity to revise or overthink one's own political opinion, which poses a direct threat to the "nourishing"[715] of political affiliation.

This non-involvement of human work directly relates to the capability to be treated as a dignified being and non-discrimination, as the use of AI in the political arena heavily discriminates in favor of information based on socioeconomic, racial, or ethnicity-based criteria[716]. In this sense, automated communication disrespects and humiliates humans by treating them as products and using political opinions to profit from the human need for political affiliation. Moreover, it becomes increasingly difficult to imagine oneself in others' situations—especially one's political opponents.

4.3.1.2 Socialization and the work on selfhood

Social media has had a range of effects on socialization, particularly with respect to the increasingly automated character of communication led by commercial interests, which affects the nature of work. On the one hand, the future of work has been largely affected by narratives conveyed via social media. For example, job applications and operational work are becoming increasingly virtual, altering how humans receive appreciation, whether through direct messages or "likes". The younger generation in particular and the population more generally are affected by the idealized images that dominate social media platforms such as Instagram, LinkedIn, or Facebook in terms of professional socialization[717]. The comparison of working conditions and benefits via social media increases transparency

714 Arnold 2022
715 Nussbaum 2011: 32-34
716 Peters 2022
717 Jong et al. 2021; Zhao et al. 2021

surrounding working conditions and salaries, as increasingly illustrated by the so-called "Generation Z"[718], representing an ethical opportunity. In addition, social media can have a positive impact by means of connection, support, and discussion forums where issues relevant to individuals can be raised[719], such as health issues at work.

On the other hand, the use of social media is associated with considerable challenges in other aspects of socialization, driven by potent commercial interests and enacted through sophisticated and hidden algorithms[720], whereby work is performed without payment, enforced by the fact that human attention is increasingly "mined" by technology corporations[721]. Finding one's identity can also be seen as an increasingly important task requiring dedicated time and creativity in today's world. Social media use is associated with dependence and reliance that may culminate in addiction, particularly for young people, for whom it represents a primary social arena that socializes and indoctrinates them into new forms of culture through technologies that aim to control the "culture of connectivity" and manipulate humans by gathering data[722]. This is related to the ever-increasing quantification and measurement of our social and everyday lives[723]. The desire for connectedness and sociality has induced over 4.5 billion individuals to join virtual social media networks[724] and make the sphere a crucial part of their social lives. As it initially appeared, in the first five years of the new millennium, the virtual social world served as an arena for the exploration of individual personal growth in a democratic, individualistic, friendly, and respectful environment. Soon, however, it became overtaken by corporations who enforced their interests, profit-seeking ideologies, and a utilitarian and competitive mindset[725]. Wikipedia, as a noncommercial provider, in many ways represents the last survivor of the old spirit of the virtual world. The new virtual world of connective media is structured by automated technologies to manipulate users' needs to increase commercial profit, an aspect further outlined in the chapter on data slavery.

718 Schmid 2022
719 Popat/Tarrant 2022
720 Kamir 2020: 142-146
721 Horgan 2020
722 Resnikoff 2021
723 Dijck 2013
724 Chaffey 2022
725 Dijck 2013: 4-15

The "popularity" of the virtual world is accompanied by real-world impact. For example, the technological pressure to select the most connected person or idea may lead to real-life pressure reinforced by one's peers, and social media may become an indicator for symptoms of mental ill-health[726]. Peer pressure has become a hybrid social and technological force, as connections between humans inform automated connections and vice versa[727]. The ideology pursued by the technology giants are defined by principles such as popularity, hierarchical ranking, competition, rapid growth, large traffic volumes, and fast turnovers. Moreover, social activities are inextricably connected to economic pursuits in a culture of automated "personal" recommendations, traded for "work" based on private data that is largely unpaid.

However, users are largely unaware that they, thanks to their search for connectedness, become part of a large underlying commercial interest on the part of the platforms facilitating this virtual sociability (Facebook, Instagram, Twitter, Google, etc.) through manipulation. Intensive connectivity—or coded "popularity"—is extremely profitable, and so these corporations employ technology to construct the kind of "popularity" that serves their purpose and stimulate users to pursue these profitable types of "popularity". They are lured by the promise of achieving commercially promoted "popularity", believing that they are advancing their own statuses and prestige "spontaneously"[728]. The underlying mechanization or automation is also evident in online dating, which differs fundamentally from the "traditional" approach whereby relationships developed out of mutual friends, situational links, or personal instinct[729]. Now, algorithms match people rationally based on information and interests, character traits, or socio-structural characteristics.

Manipulation of language in social media is an essential element in the pursuit of automation. New meanings have arisen around terms such as "sharing", "friends", "followers", or "likes". For example, the meaning of "sharing" has been transformed from user-to-user information exchange, to sharing personal and private data with anyone in the world. The application of the terms "friends" (Facebook) or "followers" (Instagram or Twitter) to networks on social media represents a social badge of honor informed by

726 Beeres et al. 2021
727 Dijck 2013: 157
728 Dijck 2013: 62, cited in Kamir 2020: 144
729 Cacioppo et al. 2013: 10136

the popularity principle, has also found their new meanings[730]. In addition, the concept of "liking" imbues popular ideas or things with a high degree of emotional value, arguably at the expense of rational judgments for which there are no buttons in the online social environment. This manipulation affects all corners of culture and sociality[731], paired with the increase in mental distress and the normalization of self-harm and suicidality among the youth[732].

These efforts to secure "popularity" as a mark of personal status, prestige, or precedence in a search for "virtual honor" have very real consequences for people's emotional lives and self-perceptions. Social dynamics that are connected with an "honor game"[733] relate to competition, hierarchical thinking, and among other behaviors, exposure of competitors and shaming, particularly when mental health problems arise in relation to social media addiction[734], particularly cybervictimization or social comparison. This all comes at the expense of privacy, authenticity, and other features of the universe of dignity and respect[735].

Social media reinforces bullying behavior by making it difficult for the victim to leave owing to their dependency on the platform[736]. For most, opting out is not an option, because it would mean leaving sociality altogether, since the virtual activities are wholly intertwined with people's offline social lives[737]. Fear of missing out is a real anxiety affecting young people and it keeps them constantly hooked up to multiple virtual groups, including while they sleep. It interferes with their ability to create intimacy, to choose freely, to simply be with any human activity that might give rise to respect. All these developments lead to negative effects on cognitive control, academic performance, and socioemotional functioning[738], which represent an ethical risk with respect to bodily health. Moreover, emotional development is blighted by fear and anxiety as social media leads to increased opportunities for sociopaths and other antisocial personalities to further engage in emotional abuse through manipulation tactics such

730 Kamir 2020
731 Dijck 2013: 65-55
732 Abi-Jaoude et al. 2020
733 Kamir 2020: 145
734 Boer et al. 2021
735 Dijck 2013
736 O'Reilly 2018
737 Dijck 2013: 173-173
738 Abi-Jaoude et al. 2020: 136

as "love-bombing"[739] or intermittent reinforcement[740] that modern communication allows and enforces through AI. This is directly linked with the increased opportunities to maintain and direct global sex trafficking rings[741] and other forms of work that represent heavy violations of human dignity. In this respect, automation has led to more emotionally abusive communication methods, which go beyond the traditional channels used to communicate with individuals elsewhere, which even might be reinforced by activities on social media. Furthermore, younger people may be negatively influenced by social media while developing their emotions and increased digital expression of feelings. In this respect, forms of human attachment are directly threatened, as the automation of communication through biases and guided misinformation may cause rifts between family members or erect barriers between generations, as direct communication between those who are supposed to love and care for each other is increasingly separated and individualized through the use of technology. Furthermore, the process of grieving may be negatively influenced by social media as notifications of birthdays or other important days continue despite the individual's death[742].

Social media and the increased pace at which values are communicated with a lack of human absence, guided by AI, causes various issues for young people as they mature[743], negatively affecting practical reasoning and the attempt to form a conception of the good is treated by constant alteration, and critical reflection on how best to plan life becomes difficult. The increased value of pluralism additionally makes it more difficult to form a stable conception of the good, directly linking to the expression and development of authentic values. In the long term, this may threaten the basic values of a society, diminish solidarity, and promote egoism[744]. In addition, family values are at stake as values become relative and short term-oriented. The very *raison d'être* of the nation state may be called into question if its existence is no longer a factor of stable value perception, where "for the first time in human history, we have given up autonomous

739 Archer 2017
740 Wilding 2017
741 Anthony 2018
742 Andrews 2019
743 Saiphoo/Vahedi 2019; Charmaraman et al. 2022
744 Andreassen et al. 2017

control over our social relationships and interactions, and we now allow machine learning and artificial intelligence to make decisions for us"[745].

Similar aspects apply with the even deeper integration of humans into the virtual world through so-called "metaverses", which first surfaced with the so-called "massively multiplayer online role playing games (MMORPGs)", in which large numbers of players, extending into the millions, come together in a virtual world[746]. The result often is a re-creation of real-world activities. Some virtual worlds, such as *Second Life*, even have their own currency that can be converted into real-world money. This provides a strong incentive for entrepreneurs to seek commercial opportunities in metaverses by also using automation technologies to collect more data, giving rise to questions surrounding ethical design[747]. Given that humans can also be employed or paid for work in such virtual worlds, the development also effects human labor, where substantial risks may be found from an ethical perspective, as these virtual realities almost entirely eliminate the "human factor". In the long term, the metaverse will likely offer lucrative opportunities for certain individuals and organizations[748]. It may become a future source of wealth creation and employment opportunities. How this might impact the automation of real-world jobs requires further evaluation. From an ethical standpoint, however, it certainly supports an increasingly efficient value chain, though it may represent a parallel value chain with a transparency threat when the provider's business model remains opaque in terms of privacy and how algorithms work. Moreover, significant threats may also apply to the loss of individuals' cognitive skills as they spend more time on these platforms and lose the capability to relate to nature and the environment. Furthermore, human affiliations may be steered and guided by machines and opaque interests.

4.3.2 Data slavery as a new form of unpaid labor

AI requires vast amounts of private human data if it aims to create value, data that are largely gathered by "surveilling" communication between humans. Hidden from public view and organized on a gig basis for extremely low or even no pay, human beings are completely essential for assessing

745 Abrams 2022
746 Papagiannidis et al. 2008: 610-613
747 Fernandez/Hui 2022
748 Papagiannidis et al. 2008: 616-618

content, verifying decisions, and tailoring results based on the collected data. This invisible labor, also called "ghost work"[749], is closing the gaps in AI and powers the systems of profitable technology corporations. New machines or applications, advertised as innovations in convenience, extend the reach of the workplace into hitherto unreachable regions of an individual's life so that one is never off the job or never stops providing data. While this work is unpaid, technology corporations are profiting from this data[750], an issue that is especially salient in social media. In this context, technology corporations transform humans into products based on collected private data that they then sell on to vendors for the purpose of targeted advertisement[751] using their work of self-ness. In this regard, data or digital slavery involves traditional "chattel as well as "modern" slavery[752], where, on the one hand, humans are becoming increasingly a property or legally owned object as such ("chattel) and in addition, an object of actual control of the slave ("modern") through automation technologies. The latter definition includes practices such as sex trafficking, bonded labor, and forced child labor[753].

This has become particularly salient with the rise of social media but also in relation to other technologies or "services" that surveille communication[754]. More users generate more private data, resulting in higher profits for the respective technology corporations. Users are not valuable to these corporations by virtue of their inherent universal merit, human dignity, or unique individual characteristics. Their virtual contributions are not valuable for the merit of their contents. Rather, users are valuable as extras that constitute masses, as items in a collection that derives its value from size[755]. In addition, not all users are similarly valuable, some are more valuable than others; the differentiation in value depends on a user's connectivity with masses of other users. A user's value depends on its "popularity": the more users it relates to, the more valuable it becomes. Unlike sociality and connectedness between humans in the real world, this leads to quantification through connectivity. The creation of data slaves through automation technologies is a devastating threat to human dignity

749 Gray/Suri 2019
750 Meier 2022
751 Resnikoff 2021
752 Chisnall 2020
753 United States Department of State 2022
754 Zuboff 2019
755 Dijck 2013: 152-170

as it creates a system in which human labor is not remunerated at all, and skills, time, and creativity are exploited. In the long term, this threatens not only control over one's environment through work that is unremunerated but also other capabilities, since people do not receive the income they require to augment their education owing to their addiction to selfhood nurtured by automation technologies.

This development is relevant, as new forms of unpaid labor occur in the context of advancing automation, specifically as humans on the labor market are increasingly competed by machines and driven out of jobs through the deployment of automation technologies. This not only violates a dignified life in terms of lack of access to paid labor but also negatively impacts one's security in being treated as a human when technology treats humans as products that are sold. As the products are based on opaque categories, "digital data commodity is both gendered and racialized" (Fuchs 2018), and unpaid forms of labor are differently exploited to waged labor in that "they form superexploited milieus of primitive accumulation". This can be observed in how AI is aiming to maximize screentime, to make people addicted to the use of social media, which is another violation of dignified life relating to the definition of "modern" slavery.

In this regard, data production in the digital era offers a "solution to the contradiction between two imperatives of capital: the maximization of unpaid labor time versus the necessity to preserve reproductive time. The more time we spend surfing, the more labor we provide, and the more we reproduce our labor power, both for paid and unpaid work"[756].

In addition, pathologies arise from spending excessive leisure or free time in the digital world, as lack of physical exercise, inability to concentrate for long periods, and memory loss bring considerable social and personal costs[757]. These skills converge with the forms of work that are required on the labor market in terms of certain digital skills, and so leisure time and work time have begun to align[758]. These developments are highly critical from an ethical perspective since they also reduce the capability for recreation as unpaid work in the form of data gathering continues during individuals' free time. Pairing these developments with new forms of "entrepreneurship" in the sharing economy, where work is highly unstruc-

756 Frayssé 2017: 15
757 Carr 2011
758 Frayssé 2017

tured for the sake of "flexibility" and "decentralization"[759], accounts for the growing inequality, which becomes increasingly structural as part of digital capitalism, dividing "gig workers", who are bound to provide private data in their free time, from those who control the capital flow and markets and therefore determine labor regimes. This illustrates a "real subsumption from labor to capital"[760].

To conclude, the automation of communication is ongoing, not only affecting "traditional" dimensions of human labor automation—for example, by reducing the opportunities for individuals to obtain adequate income—but also undermining the nature of human communicative interactions with the different consequences outlined above. On the one hand, information distribution is increasingly shaped by the deployment of automation technologies, whereby humans are no longer an essential part of the communication process (e.g., when content is created by AI). On the other hand, communication between humans is used for heavy data collection, with no remuneration offered. In this regard, the ethical risks of communication automation substantially outweigh the opportunities associated with the growth of automation.

4.4 Digital finance

In this section, different automation tendencies in the financial industry that are used to reduce traditional or labor-intensive work are evaluated. Also, the role that wealth distribution plays in times of digital transformation is discussed, particularly when the sector employs fewer humans while robots increasingly control automated financial streams while financial services become increasingly standardized. Financial literacy may also be playing a key role if there are less jobs available in general for humans to receive a certain income.

In 2016, financial services and insurance represented approximately 5.1% of the total European GDP with approximately 2.6 million people employed across European economies[761]. For several decades, or at least until the 2008 financial crisis, this industry has been conventionally known for its corporate stability and secure employment. However, new forces of

759 Ahsan 2020
760 Raposo 2020: 10
761 Gomber et al. 2018: 2

innovation and process disruption have substantially altered the nature of financial services. In addition, a strong drive for standardization as part of service automation has increased the potential for capital gains at lower costs[762].

4.4.1 Robo advisory

One particular development in the automation of the banking industry is the emergence of so-called robo advisory, which aims to significantly reduce human labor. Financial advisory—a work activity that represents a substantial part of employment in the industry—becomes increasingly robotized thanks to digital transformation[763]. Existing banking models have faced considerable challenges in recent years, prompting a shift toward smart services based on algorithms and intelligent software, which have increased the potential for job replacement[764]. This has led to a considerably higher interest on the part of banks and insurance companies in digital financial advisory—or "robo advisory"—services.

These digital platforms comprise interactive and intelligent[765] user assistance components and leverage information technology to guide customers through an automated investment advisory process[766]. They differ from other online investment platforms on the conceptual level. Firs, they offer a customer assessment that allows the user to analyze their risk appetite, which, second, determines how the customer portfolio is managed. This is completed without any direct human interaction. Hitherto, the term "robo advisory" has been almost exclusively applied to financial services; however, it is possible that the technology will be extended to healthcare or the real estate industry for portfolio management[767].

Robo advisory is aimed at fundamentally transforming the traditional, human-to-human advisory process into a digital, human-to-computer procedure. Traditional investor profiling, conducted by means of an in-person interview and bilateral interaction, is replaced by online questionnaires and self-reporting techniques. Owing to cost savings facilitated by the auto-

762 Boute et al. 2021
763 Kuzela 2016
764 Alt/Puschmann 2016; Praeg et al. 2015; 2016
765 Maedche et al. 2016
766 Sironi 2016; Ludden et al. 2015
767 Jung et al. 2018: 81

mated profiling and management of the customer lifecycle, robo advisors tend to target the retail customer or non-professional segment, regardless of actual wealth. The use of products that requires less active portfolio management, such as exchange-traded funds (ETFs), further lowers the cost structure and the combination of instruments used in risk allocation, and also fund trading leads to a fully automated process, thus significantly reducing management costs[768]. As the service is delivered online, this again diminishes the need for personal asset costs while simultaneously allowing more customers to be served. The low complexity of the financial products involved also means that an even larger audience—that is, potential customers—can be addressed. This would represent an ethical opportunity in allowing more individuals to better control their environments.

This development has accelerated in recent years, particularly with respect to the reduction of human face-to-face banking encounters as a result of digitalization[769]. The scale of automation has made it possible to provide higher quality and more transparent financial advice to more people at lower costs than is possible with human financial advisors[770]. Studies have investigated whether the investor or customer can distinguish between robo and human advisors and whether the advisor becomes "humanized" if given a name[771]. Humans are more likely to rely on the advice of named human advisors than unnamed human advisors; by contrast, they are less likely to rely on advice given by a named robo advisor than that given by an unnamed robo advisor.

Task complexity also plays a key role in determining how customers react to humanized technology. When a robo advisor performs a task perceived as relatively simple, humans are more likely to rely on a named robo advisor than an unnamed robo advisor. When a robo advisor is performing a task perceived as relatively complex, humans are more likely to rely on an unnamed than a named robo advisor. Combined, these results suggest that task complexity is an important factor affecting how humans perceive named robo advisors. A named robo advisor would thus suggest a rather more "human" interaction than an unnamed advisor. This has prompted discussion[772] as to whether it is critical to assign names to robots to "hu-

768 Jung et al. 2018: 81-82
769 Sironi 2016
770 Baker/Dallaert 2018: 713-719
771 Hodge et al. 2021: 783-786
772 Wells 2021

manize" automated work processes by suggesting some sort of "human" interaction.

Robo advisors can target users or customers irrespective of age or gender[773]. However, a culture of uncertainty and avoidance in a given context can deter people from using robot advisors, indicating that there is still a lack of trust in human–machine interactions when it comes to financial services. Subjective norms may play an important role in the adoption of this particular technology and decisions regarding its adoption appear to be heavily dependent on the influence of public opinion. From an ethical perspective, robo advisers can represent opportunities as well as challenges. Given the lower costs and removal of barriers to access, humans may enjoy easier access to capital markets—that is, investment to gain an income that will cover their needs, particularly if work is no longer available to provide further income. It may also increase incentives for financial literacy when people are obliged to interact with machines to gain access. In the past, expensive human advisory has proved to be an impediment, diminishing financial inclusion, thereby contributing to poverty[774]. Meanwhile, control of financial markets may decline if increasingly fewer humans are part of the value chain and deriving an income from the financial services industries, which could render more humans vulnerable or dependent on a smaller group of people[775]. Moreover, the high salaries paid to financial service workers have been subject to debate, in addition to whether they even have a positive influence on society as part of the controversial trickle-down effect[776], where high incomes for the upper classes are said to ultimately benefit those on lower incomes. Nevertheless, when labor generally becomes scarce, lower financial service costs may improve the lives of many individuals. This participatory effort, which favors individuals' financial literacy, may also reinforce their ability to exercise their political rights[777].

4.4.2 Accounting

Accounting is a repetitive task that is heavily related to traditional paperwork and has typically furnished well-paid work in industrial nations,

773 Belanche et al. 2019: 1423-1425
774 Pomeroy 2022
775 Coeckelbergh 2015; Beltramini 2018
776 Amadeo 2021
777 Khalil 2021

particularly those with strong financial sectors. The accounting profession is now undergoing significant changes owing to transformations in technology and the markets, where transversal skills seem to be more important than technical competencies or so-called "hard skills"[778]. This may include cognitive skills, such as inductive and deductive reasoning, when automation risk for accounting is increased[779].

The employment landscape is thus becoming increasingly challenging as automation has led to the softening of labor markets caused by economic uncertainty[780]. Traditional core responsibilities are increasingly taken over by machines that automatically check numbers, which affects the nature of work and availability of jobs in the accounting labor market. This could lead to greater prevalence of weak full-time and short-term employment or casual working. Nonetheless, new knowledge, which is required in accounting, surges when new technologies such as distributed ledger technologies (DLTs) are emerging[781]. Traditional accounting knowledge thus becomes obsolete, as new approaches are necessary to design effective real-world distributed systems through which accountants can support value creation and governance. Finance leaders have begun to redesign business processes to receive "continues accounting", whereby the data are extracted, transformed, and automatically added into accounts daily[782]. This would save considerably on management time and reduce human error while simultaneously improving the ability to make decisions regarding resource distribution, which have traditionally been made on a monthly basis, as data were only sorted and made available in a presentable manner at monthly intervals.

Moreover, accounting work has traditionally been tedious, repetitive, and time- and effort-intensive[783]. In the early ages, reconciliations were printed out and stored in binders; now, thanks to automation technology, accounting teams need only deal with exception handling. The result is that only an exceptional accountant is required to work alongside continuous accounting practices and provide only high-value services, such as fraud detection, compliance, technology strategy, and business advice. In

778 Cunha et al. 2022
779 Business World 2017
780 Jackson 2020
781 Gietzmann/Grosetti 2021
782 Alexander 2018
783 Parcells 2016: 42-43

that sense, substantially fewer hours are spent on searching manually for errors, and time is saved as the need to manually transfer data is reduced. Accountants' work, therefore, has shifted its focus toward more analytical processes—for example, benchmarking or identification of business trends. In that sense, automation can complete unskilled tasks and foster continuous improvement by allowing accountants to use their skills to enhance robots and liberate themselves from repetitive work to become more forward-looking and focus on providing strategic services. As part of an educated digital workforce, the level of errors in auditing would be reduced, and productivity and efficiency are expected to bring benefits to human workers, which will be advantageous if—as in the case of robotic process automation (RPA) as the main automation technology applied in repetitive accounting tasks—no additional data need to be stored in its execution as such[784]. This would be comparatively advantageous from an ethical perspective, since no private data are involved in the deployment of this type of automation technology. Moreover, it would be preferable to applications such as AI in medicine, where additional data are invariably required for decision-making. In RPA however, decision-making is still in the hands of humans and only the repetitive "robotic" tasks are automated. The "rule-based" process is thus automated, and the workflow processes accounting transactions, such as travel claims or labor reporting, which can speed up internal controls. Nevertheless, in the area of accounting, trends indicate that new automation technologies and AI are increasingly capable of learning decision rules, handling variations and new conditions, and ultimately performing the analytical and judgmental tasks currently executed by humans[785].

Uncertainty surrounds the roles that human employees might take in working alongside bots[786]. Skills expansion is required in relation to, for example, business process and improvement, exception analysis, and robotic software development. Further changes are expected, since, hitherto, repetitive tasks have mainly been affected. Sophisticated cognitive technologies, such as AI, will further shape the human labor involved in accounting.

784 Ansari et al. 2019: 4
785 Brands/Smith 2016
786 Kokina/Blanchette 2019: 12

4.4.3 Mobile banking applications

Studies discussing the effects of banking applications on employee productivity have tended to approach automation as beneficiary, in terms of reducing errors and frauds and elevating the employee workload by saving time[787], an ethical opportunity in terms of working conditions, particularly when workers' skills are optimized. This would enhance employee health by alleviating some of the pressure associated with errors[788].

Generally, mobile banking and its applications have had the greatest disruptive impact on financial markets in recent years[789], marked by the increased use of mobile phones and, correspondingly, users. Banking transactions are therefore increasingly completed through mobile applications. Mobile banking, as part of an automated process, appears to have had a generally positive impact, providing users with opportunities to access various financial documents directly via their mobile phones without the need for an intermediary or financial advisor[790]. This also facilitates greater transparency and competition on the financial market, and this is ethically positive, particularly when the benefits of Fintech are taken into consideration as a supplement to traditional banking services[791].

In terms of productivity, mobile applications and automation facilitate service reliability and optimize processes, leading to time savings[792]. Automation also promotes the elimination of service variations, which also has an impact on productivity, as fewer resources are lost in providing individualized services. In this regard, banking services appear to have undergone a degree of democratization, representing an ethically positive development. In addition, the standardization of applications generally reduces the error rate of financial services, an aspect that favors individuals who lack the financial capability and the time to understand the processes behind the financial industry. This is also ethically positive in granting increased access to financial education, similar to the deployment of robo advisors.

This standardization has also led to bots becoming predominant in customer service and support lines. Human financial advisors in the future

787 Gao 2021
788 Roll et al. 2019
789 Lee/Shin 2018
790 Shaikh/Karjaluoto 2015
791 Feyen et al. 2021
792 Hananu et al. 2015

will be increasingly used only to target high-value assets[793] and will therefore be regarded as a luxury service. This will affect thousands of frontline workers in the industry, and it is estimated that at least 100,000 jobs could vanish in the United States within the coming five years[794], potentially amounting to the largest reduction in the US bank headcount in history. Consequently, there will also be fewer bank branches and fewer opportunities for interaction with human financial advisors.

In various banks, changes to jobs, automation, and replacement appear to create a constant sense of fear, making training or retraining for new positions even more crucial[795]. The COVID-19 crisis has accelerated this development, shifting away from using physical branches toward more application-based banking[796] and initiated a development of job reduction in the industry. Generally, across countries, the use of digital payment tools and platform leads to higher digital literacy, at all levels of financial literacy[797]. In addition, the connected possibilities to make informed personal finance choices are associated with higher financial literacy, also when labor could become scarce. This shows that digital and financial literacy is required to leverage the advantages that digital finance offers, which should be considered in accessing digital financial products and financial markets while laboring under a lack of financial literacy. Ethical risk arises when people have digital literacy but lack the requisite financial literacy to make the right choice. Both skill types are key in supporting the ability to live a dignified life and the mindful management of finances required to secure income or savings[798] that may in turn be used for the development of all capabilities.

4.4.4 Blockchain

Blockchain technology, as the best-known form of DLTs, is increasingly applied in the financial industry to automate processes and replace human labor, particularly through the deployment of smart contracts[799]. Smart

793 Gomes 2021
794 Brooks 2021
795 Hu et al. 2021
796 Gallaroti 2020
797 Lo Prete 2022
798 Demarco 2021
799 Li/Kassem 2021

contracts may be understood as computer or transaction protocols intended to automatically execute, control, or document legally relevant events and actions according to the terms of a contract or agreement[800]. As the financial industry largely employs individuals working on compliance processes, the further incorporation of DLTs can have a significant impact on the number of paid jobs available.

Contract delivery, paired with risk management, plays an important role in many administrative units of larger financial corporations. The introduction of smart contracts allows for the reduction of human error[801] as it assumes control contract governance and leads to the automation of numerous manual processes[802]. Furthermore, smart contract technology can have a strong impact on credit payment systems when aiming for distributed business workflow automation[803]. As traditional trade processes typically involve numerous intermediary institutions with large workforces, DLTs can also affect traditional work in financial intermediaries, such as credit card companies or banks more generally.

Although the potential appears to be considerable in terms of human labor automation caused by DLTs in the financial industry, there is still a lack of standardization, irrespective of the technology. The implementation of automated processes in a multi-party, globalized network environment requires that market participants define and agree on the meaning and content of shared data, business processes, roles, and responsibilities[804]. The automation effort appears to be still in its early stages; however, several studies have highlighted the potential of DLTs[805]. The complexity of the financial markets also requires purpose-specific DLT implementations, meaning that several solutions are required to pursue the automation efforts further. This will require interaction and coexistence among different DLT initiatives in alignment with other automation efforts. Nonetheless, a considerable legacy of different networks is operating that interfere with DLTs, similar to the diverse nature of telephone networks worldwide[806].

Nevertheless, deeper automation appears to be inevitable as machines and the operability of DLTs continue to grow smarter, cheaper, and more

800 Barth et al. 1998; Fries/Paal 2019
801 Ye et al. 2018
802 Shojaei 2019
803 Chang et al. 2018
804 Ehrenfeld 2017: 248
805 Elghaish et al. 2020; Egelund-Mueller et al. 2017
806 Ehrenfeld 2017: 248-249

efficient. This means that a new "breed" of human capital will be required, with open-ended efforts that generate effectiveness rather than efficiency, organic value rather than speed, and firms will require more skills to oversee technologies and manage machines rather than people. In essence, the DLT will affect other industries further, exerting an impact throughout the entire supply chain, also with regard to human labor automation. An example of this would be the automation of legal work, further outlined below, which could have a strong impact on global governance, requiring global approaches and multidisciplinary analysis[807]. Blockchain offers a wide range of ethical opportunities in this regard; however, it is too early to assume it will have a direct impact on life with human dignity. For example, increased access to capital through cryptocurrencies based on blockchain[808] may enhance the availability of jobs owing to the effects that loans and capital exert on the labor market[809].

To conclude, digital finance offers access to financial services for more individuals, which is beneficial from an ethical perspective, because it also gives people greater incentive to become financially literate, and such education becomes more accessible through digital transformation[810]. In that regard, it enhances financial inclusion, with increased opportunities in developing and emerging economies when jobs become scarce. In addition, as the application of digital technologies provides individuals with more extensive and efficient financial support, the geographical limitations on traditional financial inclusion are lifted and financing costs for small firms are reduced while they are empowered through technology. Digital financial inclusion thus drives sustainable employment—at least, in upper-middle and high-income economies[811]. In that context, digital skills and financial literacy may also drive entrepreneurial spirit[812] and increase individuals' control over their environment.

The tendency whereby automation efforts and standardization lead to fewer job opportunities is difficult to evaluate owing to the variability of trickle-down economic effects, which have been largely cited as a positive effect of the high salaries paid to individuals working in the financial industries. Overall, automation in the financial sector leads to more positive out-

807 Hooper/Holtbruegge 2020
808 Black et al. 2019
809 Feldman 2013
810 Ozili 2018
811 Geng/He 2021
812 Oggero et al. 2020

comes in terms of democratization, fewer obstacles to receiving information and services, and improved financial control for more people. This directly affects the specific capability for control over one's environment, since the ability to hold property and control is enhanced, and transparency (e.g., through blockchain technology) is improved.

4.5 Machines in medicine

Automation will lead to job replacement and altered demands for medical education and competencies, and digital education will become more important for humans working in the sector[813]. However, there are significant differences between the various professions within the medical field. Whereas medical practitioners and physiotherapists run only an approximate 2% automation risk[814], nurses, care workers, nursing assistants, and home caregivers have a significantly greater probability (up to 60%) of replacement. In that sense, the higher the automation risk, the more skill requirements mark employment patterns[815], and job transformation is a rather more realistic prospect than complete replacements, shaped by new constellations of human–machine interaction systems. In addition, medical decisions and work are increasingly influenced by automation technologies, with data serving as the basis for decision-making. In addition, the vast application of medicine will require a reevaluation of the importance of modeling human reasoning and cognitive science to ensure that the impact on individuals is beneficial[816]. In that sense, modern medicine is becoming digital medicine, changing the profession and how the various actors relate to one another in the medical environment, in which the patient is increasingly centered[817]. Ethics is playing a fundamental role at each level of the application of automation technologies in medicine—for example, when it comes to the optimization opportunities of reduced labor costs in terms of drug distribution and the provision of medical services, which may affect the capability to health.

813 Carretero et al. 2017
814 Frey/Osborne 2017
815 Sætra/Fosch-Villaronga 2021
816 Patel et al. 2009: 16
817 Heinemann 2019

4.5.1 Medical decisions

Automated diagnosis is just one of the examples in which automation technologies influence medical decision-making[818], and the traditional care model is currently in a transformative process[819]. Diagnosis is considered one of the key tasks in medicine. Formerly, electronic medical records were the most technological tool of medical practitioners, representing a simple data repository designed to support appointment organization and billing. This has changed with the introduction of AI in medicine (AIM), which has the capacity to improve its performance by means of "autolearning" in real-world applications[820]. On the one hand, this affects the number of medical consulting hours worked; on the other hand, it affects how doctors make decisions. In this respect, those who are still working in medicine face increasing influence by automation technologies. This illustrates the two effects of automation on labor: first, the automation of human labor reduces the need for human involvement, and second, those who remain in their jobs will be affected by ADM based on the deployment of automation technologies.

AIM may be physical, like robotic surgery, or virtual, as in digital image manipulation, neural networks, and machine learning[821]. Practical examples of an AIM implantation might include the assessment of disease risk, estimates of treatment success, management or alleviation of treatment complications, assistance in patient care or clinical research, and drug development[822]. All these activities, nevertheless, are regarded as a decision support system, with the need for a final action executed by a human actor[823], or as a means of accelerating human investigative efforts[824]. Human inputs into, and control over, decision support systems are essential in managing the ethical consequences of degrees of augmentation of human agency in patient interactions[825]. Nonetheless, the amount of human labor currently invested may be reduced.

818 Bond et al. 2018
819 Arnold 2021
820 Reddy et al. 2020
821 Hamet/Tremblay 2017
822 Becker 2019
823 Mintz/Brodie 2019: 79
824 Ching et al. 2018: 3
825 Braun et al. 2020

Healthcare represents the largest area of AI investment in recent years[826], and medical technology increasingly influences how doctors encounter and treat patients and how patients understand their own ailments[827]. AIM may alter the role of humans working in the medical disciplines where pattern recognition skills have traditionally been important, as they might be rendered obsolete[828]. For example, robotic surgery may replace human surgery, and machine learning could outperform psychiatrists in suicide prediction[829], which could lead to an ethically positive effect, were increased remote electronic surveillance of digitally connected e-patients at risk to be supported[830]. This may place greater weight on medical practitioners' need to differentiate "between what a machine says and what we must do"[831].

In all these developments, human agency with respect to autonomous machine function remains clear to ensure that human capacities and skills are not denigrated[832], and challenges for medical students may arise when those skills are required to sustain human agency in the workplace. Web-based information, including unverified opinions and advice, are easily accessible through individuals' information-seeking efforts[833]. They can be easily weighted against medical expert information and may lead to trust or mistrust in medical opinion and advice. Trust, therefore, has emerged as a growing challenge for medical practitioners, as online resources appear to be provided by non-biased search engines; however, personalized "misinformation" may be harmful[834].

This also relates to the crucial "explainability"[835] when AI is deployed. In relation to AI usage, the concern arises that intelligible outputs are not provided to users, when computer applications influence the processing of medical decisions. The more intense the medical intervention is, the more relevant this becomes, particularly in biomedical contexts where patient safety is of the utmost importance. To counter this issue, greater interaction

826 Buch et al. 2018
827 Hoffmann et al. 2018: 246
828 Fogel/Kvedar 2018; Coiera 2018; 2019
829 Passos et al. 2016; Walsh et al. 2017
830 Fonseka et al. 2019
831 Coiera 2019: 166
832 Karches 2018
833 Gray et al. 2005
834 Arnold 2021
835 Combi et al. 2022

is needed with those who work on developing AI systems to ensure that explainability is built into the algorithms, where still remains considerable potential to bridge the gap and move away from the existing "black box" situation, which lacks transparency. In this regard, it will likely be important to build in control mechanisms to ensure that these algorithms are not subject to biases[836] and that they respect certain principles in terms of not violating human dignity. In that sense, humans will always need to be able to correctly interpret results based on data that are sorted or managed by AI. Moreover, the need for "causability" may arise, which describes the measurements for the quality of explanations[837] where not only the properties of the system and its decision must be intelligible but also the properties of the individual who is affected by these systems, especially given that tools such as deep learning systems increasingly gather personal medical data. Transparency in this regard may also promote the use of these systems and support opportunities related to AI solutions. In that sense, it would help to understand the human behavior behind medical decisions and actions, where we should consider not only who statistically recovered faster but also why.

The ethical issues in healthcare are broader, with automated resource allocation, prioritization, benefit/loss dilemmas, and consequent existential threats, than they are in other areas of services that use risk assessment algorithms in decision-making[838]. Human input is crucial as an active veto to avoid automated decisions resulting in unfair outcomes[839]. The potential arising from big data to personalize preferences and direct consumers' attention permits the option of "big nudging"[840] by employing personalized strategies to operationalize health and other governmental policies that affect individuals' autonomy through coercion, particularly when data from health devices connected to the "internet of things" secretly report to, for example, health insurance decision algorithms[841].

Moreover, in terms of medical decision-making based on algorithms and big data, data inputs are crucial for machine learning outcomes, and the quality of data sources, such as the traditional electronic medical record,

836 Panch et al. 2019
837 Holzinger et al. 2019
838 Kose/Pavloiu 2017; Rasmussen 2012, Nagler et al. 2018
839 Verghese et al. 2018; Broome 1990
840 Souto-Oter/Beneito-Montagut 2016
841 Bronsema et al. 2015; Helbing et al. 2019

are likely to be insufficient[842]. They require augmentation—for example, with social media data—to assist in medical decision-making, including treatment recommendation. However, these approaches underestimate the discontinuity between human objectives relating to the definition of the good, as other decision algorithms and benefit/loss analyses have been engineered to the software used at the expense of human objectives[843]. Moreover, if a human substitute decision-maker is present, it is questionable whether the decisions of the substitute decision-makers may be outdone by what are arguably more broadly informed AIM-derived decisions, ascribing to AI hegemony over the decision-making reality through an automation bias[844]. Social media data may also be inappropriately influenced by non-expert opinions[845]. The same concerns apply to further issues, such as the potential for patient discrimination, marginalization, and stigmatization[846].

AIM and related automations appear to simultaneously offer "utopian freedom" and "existential dystopia"[847]. Past and present promises regarding the future of medicine lead to fear, skepticism, disappointment, and ambivalence toward qualified and unqualified enthusiasm or optimism[848]. AIM innovations are expected to represent the greatest evolutionary progress in human history, bound to affect how humans live and act[849]. However, these new algorithmic decision-making tools offer no guarantees of fairness, equitability, or even truthfulness[850]. Human medical advice, moreover, may be overruled by personally controlled record tools that incorporate data from primary care, hospital interactions, consultative doctor–patient interactions, or network-based genetic and genomic knowledge[851] for the sake of person-centric care. In terms of competences, the increasing invasiveness of robotic surgery requires that both patient and doctor understand the role of AI, especially given that all parties are exposed to liabilities from the perspective of corporeal and legal adversity[852].

842 Arnold 2021: 126-127
843 Kose/Pavloiu 2017
844 Arnold 2021: 127-128
845 Cohen/Smetzer 2017
846 Arnold 2021: 128
847 Salla et al. 2018
848 Arnold 2021: 132
849 Salla et al. 2018: 1
850 Beam/Kohan 2018: 1318
851 Herr et al. 2018: 143
852 Mueller/Bostrom 2016; Swinglehurst et al. 2014

Robot-assisted surgery (RAS) is a recent innovation that promises less damage to the patient's body, less pain and discomfort, short hospital stays, and quicker recovery periods[853]. Since the mid-1980s, with the advent of the first RAS procedures, surgical robotics has become a highly dynamic and growing field for business and research, attracting clinical attention worldwide[854]. Robots offer the advantage of being devoid of shortcomings, such as fatigue or lapses in attention, and are able to perform repetitive and tedious surgical procedures. Deployment of RAS may also optimize the production and distribution of healthcare resources and improved use of the healthcare workforce, which also could support the medical situation and supply chains in low- and middle-income countries[855], which would be beneficial from an ethical perspective.

Despite these positive possibilities, the deployment of RAS is still subject to risks, particularly in the context of human–robot interaction[856], in which trust plays an essential role[857]. This relates to the fact that certain actions undertaken by bots cannot be supervised or corrected by humans and therefore may harm patients. Safety issues, in terms of the robot's functioning in addition other security concerns, such as vulnerabilities in the area of cybersecurity or privacy, also arise in relation to automated surgery. Questions of liability arise in this regard, as surgical practice has traditionally been characterized by tasks that were fully executed by humans. This recalls challenges similar to those encountered in automated driving, whereby the human remains in the "driving seat" just as a doctor remains "in-the-loop", safeguarding patients during operations that are supported by surgical machines with autonomous competences in which issues of accountability and culpability remain unclear[858].

As robot autonomy progresses, human surgeons' activity declines, while their supervisory role increases[859]. Sensory data is important for the use of RAS, where the medical support staff are integral to the procedures' success, including patient positioning or port placement. Humans will thus not be eliminated in highly automated surgical procedures, though they will be required to take on more roles in performance, oversight, or support.

853 Fosch-Villaronga et al. 2022: 1
854 Faust 2007
855 Reddy et al. 2016
856 Fosch-Villaronga et al. 2022
857 Sullins 2014
858 O'Sullivan 2019
859 Fosch-Villaronga et al. 2021: 368-369

These developments will also lead to an increase in personalized medicine, since the overload of available information means that knowledge-based work will inevitably be driven by the use of big data and AI[860]. As noted above, however, this requires a continuous influx of additional data to be an effective decision-maker. The storage of personal health data undoubtedly represents a major new profit opportunity for tech companies[861]. From an ethical perspective, greater precision, standardization, and personalized medicine represent huge opportunities, as more individuals would have access to reasonable healthcare, and lower costs could make diagnosis more affordable. The increased personalization could further support individual dignity by reducing the negative side effects of medications, which are generally developed based on a northern European or American target patient based on trials with "white" gens[862], may be reduced for large parts of global population[863]. From an ethical perspective, several opportunities may when medical decisions and actions are increasingly based on automation technologies. First, medical costs may be reduced and access to healthcare may be increased, since human medical advice tends to be expensive[864]. This could lead to a "democratization of high medical care"[865], whereby the specialties and capacities of medicine, such as radiology or pathology, may be disseminated worldwide, with increased capabilities for those who were so far left out from highly technologized patient care. In that regard, the work of medical professionals will likely shift toward more consultative and exclusively higher-level diagnostic tasks, such as integrating information to make accurate diagnoses, leading to improved personal care. Nonetheless, medical professionals' understanding of and acclimatization to the new circumstances will ensure better healthcare delivery to the masses[866].

Second, this could also strengthen the capability to life, since an individual's life largely depends on having access to health facilities when needed. Moreover, AI can better predict mental or emotional health as data can be used in more precisely and accurately manner[867] by including information

860 Naik/Bhide 2014
861 Felder 2015
862 Whyte 2022
863 Mathur/Sutton 2017; Goetz/Schork 2018
864 Vuong 2016
865 Ahmad et al. 2021
866 Amisha et al. 2019
867 Graham et al. 2019

from electronic health records, social media platforms, or brain-imaging data in an effort to ensure personalized medicine. Diagnosis through AI can reduce costs and enhance access to health and healthcare[868]. Furthermore, automated mental health smartphone apps can support psychological health[869], improving our understanding of humans who are suffering from mental health issues.

Third, automation and increased productivity may reduce employees' overtime and facilitate better rest between shifts, with reduced pressure and less stress[870], for example, by requiring fewer repetitive tasks. So-called cognitive automation technologies or automation of hyperspecialized workflows, which recognize and transcribe speech in medical encounters, increasingly allow for more patient-centered treatments and reduce the administrative tasks required of medical employees[871]. Furthermore, more precise diagnoses can support the efficient deployment of supportive surgery robotics[872], reducing the risk of failure on the one hand and alleviating mental stress for medical professionals on the other. Both effects support the capability to health, and the same applies to nursing operation automation, wherein the quality of patient care and staff satisfaction increase as a result of the opportunities that automation technology offers[873].

The opportunities must be guided so that the responsibilities of individual patients and society at large are appropriately balanced when fewer humans work in the medical sector[874]. Otherwise, several risks from an ethical perspective may ensue: first, enhanced data collection poses risks when not handled appropriately, and when data are sold to other providers, humans may be transformed into products as private data are traded, and if unpaid, will amount to data slavery (see Automation of communication section above) which is a violation of human rights. Second, errors made by machines lead to uncertainty, if responsibility and accountabilities are not regulated. Third, bodily health and integrity may be at stake if the exact uses of robots in medicine are not made transparent, giving rise to fears that robots might violently assault humans and threaten their health if not

868 Kent 2021
869 Tong et al. 2022
870 O'Connor 2020
871 Desai/Bowman 2021; Ratia et al. 2018
872 Nadimpalli 2017: 2
873 Suby 2013
874 Geiger/Hirschl 2015

appropriately supervised, which could even be life-threatening in the worst case.

4.5.2 Pharmaceutical industry, pharmacies, and drug distribution automation

The deployment of automation technologies is expected to have an impact on the pharmaceutical industry in terms of fewer available jobs on the one hand and with respect to how employees work in the pharmaceutical industry on the other[875], with further impacts on drug development and distribution. These developments are important in terms of the ability to access health, whereby the automation of work in the pharmaceutical and pharmacy industry might improve access owing to the lower costs for individuals while also exerting a substantial impact on those who work in the sector. Nonetheless, a substantial number of individuals worldwide depend on the pharmaceutical industry for health support, including pharmacies. The application of AI in this specific field has the potential to "create miracles in healthcare"[876], provided the utilization is "limited to human hands and strict adherence to human ethics", which includes the strengthening of available affordable therapies for the "betterment of human health". To ensure that automation in this sector is as beneficial as possible, methodology must be standardized[877], further guided by ethical inputs to ensure that automation technologies are applied in the right manner to clarify when, why, and how AI is used. It is also important that society understands the process so that there are grounded expectations characterized by transparency[878]. This is also affected by the increasing involvement of third-party software companies, which are proliferating in response to the growing demand for AI solutions[879].

Pharmacy workers, particularly those in low-skilled jobs, are likely to be affected by automation, and automation anxiety has been observed in the sector[880]. Automation technologies are increasingly used in hospitals and retail pharmacies to enhance processes' efficiency, with reduced inci-

875 Bremme et al. 2020
876 Sandeep Ganesh 2022: 11
877 Boehm 2022
878 Owens 2003
879 Kulkov 2021: 9
880 Piercy/Gist-Mackey 2021

dence of human error and faster fill times[881]. Human error may lead to unnecessary illness or, in the worst case, even loss of life. One example would be prescription filling[882]. As ADM focuses on operations, pharmacy workers' hands-on work will be reduced, particularly that of lower-skilled workers, such as technicians[883]. In that context, the reduction of human error represents an ethical opportunity in terms of facilitating good health and preventing premature death.

The pharmacist's role is typically characterized by judgment, decision-making, consultation, or supervising[884] and ensure that pharmacotherapy matches patients' needs while the patients understand the treatment[885]. Pharmacists thus require a relatively higher skill set than pharmacy technicians. As such, pharmacists are more likely to see automation as beneficial to work[886]. Automation can have a positive impact on staff by reducing stress and improving working conditions, work–life balance, and management of workload[887]. Pharmacy technicians working after automation reported feeling like workers on a "production line" rather than skilled dispensers; however, the negative effects of automation on job control could be mitigated by the provision of new opportunities for pharmacy staff to expand and develop their role on the wards.

Automation has also introduced new sources of stress, such as increased pressure as a result of the availability of fewer staff in dispensary or frustration caused by robot malfunction. These factors must be identified when automated systems are incorporated. Automation projects should be implemented alongside new, complementary jobs that are patient-facing, require upskilling, and offer task variety in addition to interdisciplinary learning[888]. This would also provide increased access to adequate education and allow workers to focus more on the human aspects of the job. Nonetheless, some groups contribute to so-called "polarized experiences of automation", particularly employees who have fewer opportunities for rotation across roles

881 Repko 2022
882 Fanning et al. 2016
883 Wheeler et al. 2019
884 Piercy/Gist-Mackey 2021
885 Albanese et al. 2010
886 Piercy/Gist-Mackey 2021
887 James et al. 2013: 115
888 Findlay 2017: 132

and more limited career paths[889], when standardization and intensification are paired with lean staffing and unwanted flexibilization.

Reduction in dispensing errors constitutes an important perceived benefit of automation in pharmacy settings[890], aside from the "rationalization of the dispensing process, leading to efficiencies in dispensary and throughput and turnaround times and re-engineering of pharmacy services, which might include the development of award-based medicines management service, and decentralization of the clinical pharmacy service". Nonetheless, issues of liability must be addressed when implementing these technologies, particularly given that errors may affect people's health. Manual compounding in the past has revealed that humans are the primary source of error[891]. In this regard, the majority of medications today no longer require manual compounding, and in such instances, automation systems can take over and significantly reduce errors.

Pharmacy faces more financial pressures in terms of conducting rapid cycle evaluation and implementation to maintain the quality of patient care while reducing costs[892]. Pharmacists often do not have the opportunity to critically evaluate the automation prior to evaluation and are often persuaded by unrealistic marketing promises or anecdotal information from colleagues. This may jeopardize the drug approval process, as errors and lack of understanding about how drug assignment works can lead to medical or health issues of patients. In that sense, standardization of relevant outcomes could benefit pharmacists internationally if they have the appropriate knowledge to make more informed decisions about capital investment in automation, which will require collaboration between professional organizations, pharmacists, and manufacturers of these systems. This highlights the importance of providing adequate education to pharmacists.

New developments in technologies, however, could make both professions increasingly obsolete. For example, so-called "pharmaco-electronic" technology[893] implants tools that can increasingly control and monitor bodily functions and communicate directly with providers of specific drugs or even replacing these drugs with various electronic features. In addition to sensors designed to detect anatomical infections with viruses or bacteria and or DNA bio-engineered sequences designed to fix genomic defects, AI

889 Kalleberg 2012
890 Goundrey-Smith 2013: 102
891 Hansen 2014
892 Boyd/Chaffee 2019: 9-10
893 Carvalko 2022

processors may improve resilience when the technical and biological worlds merge, and analytical or diagnostic tools may work seamlessly in concert with big data, in real time and offline. Moreover, predictors of health deterioration may, in that context, be supported by AI-based risk scoring, which is becoming increasingly common, as more individual health centers are integrating AI-based risk prediction into their operations. These technological advancements are likely to alter not only the nature of pharmacy work and related employment but the entire pharmaceutical value chain. However, these technologies are still in the early stages of development.

Regarding pharmaceutical companies, the efficiency gains of automation for larger corporations are significant, even if it just by a few percent[894]. Errors in predicting the success of clinical trials may be improved, which can enhance planning activities. This positive effect is evident not only in large companies, which also benefit considerably from automation of administrative or planning tasks, but also in mid-sized or smaller firms, which are more focused on R&D activities. In that sense, AI may be regarded as a paradigm shift in drug discovery and development. Nonetheless, decision-making should be assisted by these automation technologies rather than wholly delegated to them.

AI in the pharmaceutical industry also plays an important role in the personalization of medicine—namely, personalized medications with the desired dose, release parameters, and other relevant individual aspects can be manufactured in response to patient needs[895]. In addition, automation will accelerate products' market availability while simultaneously enhancing product quality and facilitating optimal use of available resources[896]—for example, when proper positioning and costing in the market is made increasingly possible by comprehensive market analysis and prediction[897], positive developments ensue from an ethical perspective, in safeguarding individuals' bodily health. The use of AI for diagnostic assistance with a more data-driven approach to patient categorization has also been acknowledged by the FDA, which has approved dozens of AI platforms for personalized patient care[898]. Many are used for remote patient monitoring, while others have identified brain bleeding via scans. AI can help to op-

894 Kulkov 2021: 8-9
895 Rantanen/Khinast 2015
896 Jaemsae-Jounela 2007
897 Paul et al 2021: 90
898 McGrail 2021

timize medical treatment by determining which drug should be administered.

Automation in the pharmaceutical sector may indeed cause job losses. At this stage, however, the systems are intended to ease work rather than completely replace humans[899]—for example, when AI contributes suggestions and predictions. The understanding of human needs paired with understanding of how the technologies work is set to become increasingly important, which may be summarized as "increasing data-driven demands combined with scientific decision-making that govern modern pharma"[900].

AI can thus reduce the complexities of cost in drug discovery, particularly in the cases of drugs for which there are already-existing therapies, thus enhancing further evolution of the specific treatment[901]. AI is especially helpful as a key component of innovation capacity when employees have a combination of AI skills and domain expertise as opposed to having AI skills only. Both skill sets are key, because developing and improving AI tools is an "iterative process requiring synthesizing inputs from bot AI and domain experts during both the development and the operational stages of the tool"[902].

AI may generally be regarded as a useful approach to drug discovery when the impact mechanisms are already known already or in discovering novel drugs[903]. Its limitations emerge in relation to incremental drugs, for which AI remains too expensive. AI also has no use in exploring radically novel drugs. As such, for AI to prosper as a drug discovery tool, it is crucial that data sets on which AI may be trained are developed[904].

It is anticipated that AI capacities will be increasingly deployed in the pharmaceutical industry, particularly in the discovery new drugs to treat chronic and oncological diseases[905]. Chronic illnesses are among the leading causes of death in certain Western countries, particularly the United States. AI is increasingly used for chronic disease management and enhancing patient health. AI also has potential for use in candidate selection processes for clinical trials, whereby the selection could be enhanced to provide trial opportunities to more suitable candidates. Drug discovery and

899 Davenport/Ronanki 2018
900 Henstock 2019: 545
901 Lou/Wu 2021
902 Lou/Wu 2021: 1451
903 Lou/Wu 2021: 1467
904 Smalley 2017
905 McGrail 2021

manufacturing will also be supported by AI, which will become the norm in pharmaceutical manufacturing. The COVID-19 pandemic has accelerated the use of AI in clinical trials, as reliance on digital technology in clinical trials has increased[906]. Rare diseases may also be more easily detected as an aspect of personalized medicine, as body scans, patient biology, and analytics are improving to support disease detection[907]. The prediction of treatment results also benefits the matching of drug interventions with individual patients, reducing work that formerly involved trial and error. In that regard, patients' potential responses to drugs might be more easily predicted by inferring potential relationships among various factors. An example hereby would be the body's ability to absorb compounds and the distribution of those compounds around the body as well as the person's metabolism.

In addition, predictive biomarkers[908] may help to identify potential responders to molecular targeted therapy before the drug is tested in humans, thus reducing the likelihood that individuals participating in trials will experience side effects, leading to drug repurposing, where particularly budget-pressed pharma companies may benefit from reduced R&D expenditure. The same advantage applies to drug adherence and dosage, as AI and simulation technologies may help to prevent the occurrence of side effects[909]. Monitoring and algorithms for evaluating test results can ensure timely drug adherence, facilitating swift decision-making and optimizing patient treatment[910].

To conclude, access to healthcare may be ethically improved by means of automation, particularly if personalization is increasingly possible and medical product costs are reduced. However, these tools must be carefully evaluated to ensure that they do not violate privacy or jeopardize human dignity. The risk of complete automation of these jobs is currently low which would reduce the opportunity of humans in the field to earn a living.

906 Kolluri et al. 2022
907 Sartorius 2020
908 Sartorius 2020
909 Blasiak et al. 2020
910 Paul et al. 2021: 90

4.6 Care and sex robots

Care technology has expanded in recent years, giving rise to the question of how robots commonly used in aged care might contribute ethically[911]. The aging populations in Western societies are predominantly paired with shortages of direct care workers, causing the care of elderly persons to have become a growing societal issue[912]. In this context, it is anticipated that the nature of care work will be driven by the forces of automation in response to these aging populations[913]. The deployment of sex robots shall also be explored from an ethical perspective below.

There are demographic reasons for the decline in caregiver numbers[914]. As such, care robots are regarded by many as a promising development that might mitigate the growing recipient–caregiver disparity and may be considered embodied forms of semi-independent or independent technologies that support caregivers and older adults in physically assistive tasks[915]. The applicability of these robots can include assistance with eating problems, provision of hygienic care, or social support. They may also fulfill combinations of several functions.

It seems likely that personal or professional service robots will be found at the homes of elderly and disabled patients in the near future[916]. This will lead to a shift in how human labor in care is perceived, particularly in the service sector. Service or care robots can have different capacities (e.g., infrared sensing or locomotion), degrees of autonomy (e.g., the amount of input required from a human operator), and appearances (e.g., robot-like, machine-like, or humanoid)[917]. They should further be distinguished from purely industrial robots used in, for example, factory automation[918]. The use of AI in elderly care promises to enable so-called "4p-medicine", encompassing predicate, personalized, preventive, and participatory healthcare[919]. In addition, these care robots may alleviate the burden on unpaid

911 Vandemeulebroucke et al. 2018
912 Ho 2020
913 Phiromswad et al. 2022
914 WHO 2015
915 Vandemeulebroucke et al. 2018: 15
916 Wynsberghe 2016: 311-312
917 Engelberger 1989
918 Engelberger 1989; Lin et al. 2012; Veruggio/Operto 2006
919 Rubeis 2020

caregivers, such as family members[920]. From an ethical perspective, however, this may also lead to reduced opportunities for affiliation and social interaction for elderly people.

Care robots are used in private and human environments, such as people's homes, fulfilling functions that include health and safety monitoring and the provision of companionship[921]. However, this will likely also lead to more significant harvesting of private data on the part of the robots. Several ethical concerns emerge as important in relation to ethical care. First, healthcare robots can reduce the potential amount of human contact. Second, there is a risk that elderly people may become increasingly objectified and experience the associated sense of a loss of control. Third, privacy concerns arise when robots are present in private and personal environments. Fourth, dependency and loss of personal liberty may ensue. Social isolation is a common threat that may lead to a loss of dignity[922] when human interactions are significantly reduced.

Nonetheless, there are several ways in which robots may be employed in elderly care and positively affect human labor: first, they can assist elderly individuals and their carers in performing daily task; second, they can help monitor behavior and health; and third, they can provide companionship. In all of these areas, the introduction of bots may enhance elderly individuals' quality of life, provided that they do not lead to total social isolation and leave room for affiliation. In this respect, the complete replacement of humans in elderly care[923] seems an unrealistic prospect, largely owing to the "human touch"[924] that is traditionally required in these services and facilities, and a complete substitution (e.g., a retirement home staffed by robots) would provoke political or societal conflict. Even more, the application of technology to support elderly care may strengthen or enhance human interactions, particularly with close family members. A good example of this is the Kinoo App[925], which encourages grandparents and their grandchildren to play games and interact with one another through the app. In addition to automatically reminding individuals to keep in touch, the app also includes a feature that encourages conversations about relevant topics, such as values or global issues, thereby aiming to keep families

920 Ienca et al. 2018
921 Sharkey/Sharkey 2012a: 27
922 Laitinen et al. 2012; Sharkey 2014
923 Sharkey/Sharkey 2012b; Sparrow 2016
924 Sætra/Fosch-Villaronga 2021; Fosch-Villaronga 2019
925 Berthelson 2022

affiliated during periods of isolation, such as those caused by the COVID-19 pandemic.

Increasingly, support platforms may also help when this meaningful whole is under threat, and suicide prevention and crisis intervention can also be enhanced through AI and automated services, such as "The Trevor project" shows, which support wider availability of digital mental health services to LGBTQ youth[926]. Chatbots may help facilitate initial consultation when life-threatening events occur, which is both ethically beneficial and supportive of elderly people. Furthermore, reduced human labor costs and automation improves mobility, allowing elderly individuals to become more autonomous and expand their social horizons[927]. In addition, from a material perspective, awareness about the essentiality of human work could improve the treatment of humans by humans, provided care robots are appropriately regulated, while manual or heavy physical work is increasingly performed by machines, allowing humans to focus exclusively on the "human work", such as conversation or care targeting emotional and mental well-being, while reducing the need to perform physical tasks. In that respect, it is important that robots remain identifiable as robots for their environment, human care workers and elderly people alike, and treat humans with the appropriate level of dignity when they operate.

Accordingly, working conditions must be regulated to ensure that humans do not become objectified with increasing automation and are placed front and center in decisions to automate human labor. This also requires the option to exercise the right to work at a higher age and contribute to society, which may be supported by increased opportunities to work in cognitively demanding environments. Care robots may thus be instrumental in enabling humans to remain part of the workforce. In that sense, paid labor may still be accessed, if necessary, and provide for other capabilities—for example, having sufficient financial resources for recreational activities and education in concert with adequate working conditions. Nonetheless, care robots must be carefully controlled in this regard. This could be encouraged either by technological governance[928] or suitable skills training for workers, grounded in high-level or digital skills[929] that provide an understanding of how robots work. Another important feature of using care

926 Kent 2021
927 Nadimpalli 2017: 2
928 Zardiashvili/Fosch-Villaronga 2020: 13
929 Sætra/Fosch-Villaronga 2021: 10-11

robots ethically is the use of "democratic spaces"[930] in which all stakeholders in aged care, with a focus on those who receive care, are included in the ethical debate. This would certainly also help to structure demands toward the providers of these technologies.

Various specific threats may arise as a result of automation, such as depersonalization of care through algorithm-based standardization, discrimination against minorities with the subsequent generalization that arises with standardization, dehumanization of the care relationship, and increased "disciplination" of users through monitoring and surveillance[931]. To counteract this, a joint effort is required on the part of users, caregivers, providers, and policy makers.

In essence, to build suitable care robots, the understanding of care is crucial[932]—specifically, how relationships between robots and users can be mediated to ensure that authentic care is delivered, built on certain capacities that are reciprocal and responsive. From that perspective, robots' lack of humanity places a significant restriction on their ability to properly care for humans. Moreover, robots cannot genuinely stimulate meaningful conversations that include humor and compliments. This would prevent them from truly caring about care recipients' deeper needs in long-term care relationship contexts. The treatment of humans as an end, when social isolation is causing psychosocial distress[933], is an existing risk facing society for demographic reasons owing to population decline, and the further removal of human care may exacerbate these issues when care robots are used. Furthermore, caring must fluctuate and transform within social structures, and so health needs would likely not be met by robots in the long term, despite the manufacturers' promises.

However, care robots can provide assistance when "natural care" is distinguished from "ethical care", which includes the notion that the focus is placed on the perceptions of the care recipient rather than the giver[934]. In that regard, the caregiver, who is responsible for "natural care", such as bringing up children or caring for elders, alongside demographic or economic reasons would not be the primary basis for decision-making, but rather the needs and feelings of care receivers would be prioritized. From that perspective, if the receiver feels cared for, this would be a legitimization

930 Vandemeulebroucke et al. 2018: 15
931 Rubeis 2020
932 Hewitt 2021
933 Fierloos et al. 2021
934 Johansson 2013: 75-77

to avail of robot-provided assistance services. This again shows the importance of strengthening the ability for affiliation, which allows robots to remain up to date with the needs of those receiving their care.

As indicated above, AI health monitoring technologies may play a significant role in addressing the aging health workforce and filling human resource gaps[935] while simultaneously reducing the burden on family caregivers. In this regard, however, privacy concerns apply, and potential algorithmic biases could be a threat. Nonetheless, with care patients, the direct application of medical care must be considered as an additional dimension. Monitoring systems can provide a comprehensive picture of elderly individuals' overall activity patterns and the influence of the environmental context to better cover symptoms. Furthermore, technology can support the detection of symptoms, such as in the case of COVID, and secure social quarantine when required, supervising the physical and mental health of elderly patients, paired with a remote health center feedback analyzed by means of AI to sustain elderly people's confidence during difficult periods[936].

These tools may therefore be valuable supports for healthy aging. In that context, as elderly patients' health and care costs rise, care robots may not only promote autonomy for elderly people but also reduce the burden on public finances[937]. Nonetheless, certain aspects of relational care, safety, and privacy must be balanced, particularly regarding the design of these technologies, and clinical and ethical factors emerge as highly relevant as humans are increasingly monitored in their day-to-day activities. This is key in ensuring that systems enhance relational care, facilitate independent living, and promote health outcomes. All these developments are positive from an ethical perspective and reinforce the dignity of elderly individuals.

Similar in this vein is "value-sensitive design"[938], which aims to embed normative considerations in the design of care robots at an early stage in the design process, to proactively indicate the evolution of the technology. This would incorporate specific care values that would ensure that patients' dignity is respected prospectively, rather than retrospectively. This approach also centers the question of what care society ultimately requires.

935 Ho 2020
936 Qian et al. 2021: 87
937 Ho 2020: 5
938 Wynsberghe 2013

A subsequent idea, the "nature-of-activities approach"[939], aims to consider different value practices in accordance with different healthcare practices to distinguish the nature of a given healthcare activity. This should help to draw a line between those tasks that should be left to humans—practice-oriented activities that require human skills—and goal-oriented activities in which care robots may assist in a way that is ethically sound for all concerned. This should help provide a clear definition of the robot's role, depending on the specific nature of the activity that is targeted from an automation perspective.

Since the publication of *Love and Sex with Robots*[940], the discussion as to whether sex robots may be a suitable alternative from an ethical perspective, whether as a replacement for sex workers or as supplement, has expanded. They represent a specific kind of care robot, which can be also used for elderly or disabled individuals[941]. Advancements since the publication of Levy's book have ensured that the "development of highly humanoid sex robots is on the technological horizon"[942]. Phone sex workers must now increasingly compete with sophisticated digital technologies that would perform their jobs at a far lower cost[943]. Erotic depictions date back to Paleolithic and Mesolithic ages, and so the existence of artifacts that offer sexually relevant functionality is not new to human civilization[944].

Specific applications to support a dignified life are evident in the deployment of sex robots for older adults with disabilities[945], which arguably reinforces several of the ten central human capabilities. First, as human life may be understood as an unfolding story, sexuality plays an integral role in the narratives of our lives and who we perceive ourselves to be. Given the stigmatization of sexuality among older individuals, sex robots could help to generate a counternarrative and integrate this into older disabled people's lives. Second, sexuality may be regarded as an integral component of health that includes physical and psychological dimensions. In that context, sex robots may serve as a tool that allows individuals to maintain their sexual health. Third, the expression of sexual feelings and engagement in sexual behavior may be regarded as a form of self-determination and therefore,

939 Santoni de Sio/Wynsberghe 2016
940 Levy 2008
941 Fosch-Villaronga/Poulsen 2020
942 Frank/Nyolm 2017: 305
943 Carlone 2008
944 Koumpis/Gees 2020: 228
945 Jecker 2021a

an aspect of bodily integrity. As cognitive impairments may interfere with sexual agency, sex robots can be designed to assist with social functions, serving as a source of affiliation and sexual partnership. Fourth, sexuality is related to emotional intelligence, which enables people to be caring, kind, and compassionate. Working with sex robots could help overcome struggles caused by impairment and restore a sense of wholeness and meaning to life. Fifth, reflecting on and choosing a plan of life that expresses authentic values and ends relies on practical reason. Many people's life plans center sexual partnership, as these relationships facilitate happiness, intimacy, and self-fulfillment. Sex robots in that sense could support to incorporate sexual activity into the life plan. Sixth, the capability to affiliation is related to sexuality, whereby affiliation with others is the underlying goal of erotic desire. In that sense, people could bond with sex robots and feel intimately connected to them.

These examples illustrate how the deployment of automated sex robot can generally support a dignified life; however, we must investigate in what sense the robot would differ from a human sex worker and whether sexual relationship can be fulfilled by machines rather than humans[946]. In addition, a robot's manipulating of a human being on a sexual level prompts further discussions from a mental and psychological standpoint[947]. Nonetheless, many who regard prostitution as objectionable may consider robots to be an acceptable solution, and arguably, the deployment of sex robots allows individuals' sexual needs to be met without violating the rights of any other persons[948].

Other positions regard prostitution as morally problematic and apply the same reasoning to the deployment of sex robots[949]. The deployment of sex robots may additionally be framed as a distorted attitude toward human sexual partners given that consent is not an issue that arises with robots[950]. Bodily integrity is "a form of self-determination through the body"[951], and care and sex robots may increasingly support this capability, particularly for older and/or disabled individuals. In addition, sex robots may help preserve the dignity of sex workers who are targeted by sex trafficking and forced labor, as the business model may become automated through the increased

946 Boni-Saenz 2021
947 Sullins 2020
948 Jecker 2021b
949 Richardson 2015
950 Gutiu 2016
951 Jecker 2021a: 29

deployment of humanoid sex robots. What appears to be clear is that the use of sex robots may cause friction in societal perceptions of reproductive activities.

Another issue that may arise is objectification, where a sex bot's design is based on personification[952]. Human dignity may be violated as the personified individual is considered as merely a means and not an end. In this regard, consent may be required to counteract the objectivation. Other perspectives regard user autonomy and responsibility as crucial to ensuring that intimate relationships may develop healthily, for example, among adolescents[953]. Sex robots that look and behave realistically could also help train people to behave confidently and respectfully in intimate relationships. In therapeutic settings, they may support the development of empathy or enhanced self-esteem in individuals who exhibit narcissistic or dependent personality disorders.

What remains open is the question of how society might respond to and regard individuals who avail of sexual services or care from sex robots[954]. Societal conceptions of love and sex might change, with radical behaviors comparable to those associated with drugs and prostitution, practices that are considered taboo. A similar threat may arise in relation to stigmatization and illegalization, which already causes considerable problems, particularly with respect to prostitution when bans on legal sex work reinforce the poor conditions experienced by those affected by human trafficking[955]. Nevertheless, ethical guidance is required, as robots will surely alter societal perceptions of sex, as has been the case with robots used in healthcare or warfare[956].

Sex robots may support mental health in terms of reducing extreme solitude (e.g., feelings of inadequacy, physical or psychological problems) by providing a palliative solution or a companion to support satisfying experiences and emotional relief[957]. In that sense, the ability to attain sexual satisfaction using sex robots may even transcend the "humanly possible"—for example, by satisfying the desire for particular acts that might be unacceptable to potential human partners[958]. However, it can also be argued that

952 Lancaster 2021: 598
953 Peeters/Haselager 2021: 64
954 Peeters/Haselager 2021
955 Cho et al. 2012
956 Peeters/Haselager 2021: 64
957 Carvalho Nascimento et al. 2018: 238
958 Anderer 2022; Dubé 2017

the deployment of sex robots might in fact reinforce feelings of isolation and loneliness[959]. Users of companion robots may be reluctant to attend events that are conventionally attended as part of a couple, such as weddings.

The potential for coping with loneliness and isolation with the assistance of sex robots is of particular interest in the context of the aging and elderly population who require support for well-being and health[960]. From that perspective, the threat of using AI that could reposition value systems in terms of sex, however, appears to be an issue affecting the deployment of robots in general.

From an ethical perspective, as outlined above, sex robots do represent an opportunity. First, from an individualistic standpoint, sex robots can support capabilities relevant to sexuality in efforts undertaken in pursuit of a dignified life. Second, considering sex robots as substitutes for prostitution may prevent the horrendous violations of sex workers' dignity, which compromise such workers' bodily health and integrity[961] as a result of human trafficking or forced labor[962] and may even lead to a destruction of this ethically reprehensible "business model".

Conclusively, robots represent a range of opportunities in the area of care and sex from an ethical perspective. On the one hand, individuals can be supported to live an independent life, provided that the human interaction in their lives is not wholly reduced as a result of the deployment of robots. On the other hand, robots may enhance care workers' and other individuals' quality of life by improving their working conditions.

4.7 Weapons automatization

Automation is increasingly affecting the use of weapons. Conventional warfare is increasingly using autonomous weapons systems (AWS), which incorporate AI in different forms. Meanwhile, automation technologies are increasingly used for surveillance and espionage, even in domestic contexts. Both diminish human influence in decision-making and, in effect, human labor. Their use thus warrants an ethical evaluation.

959 Borenstein/Arkin 2019
960 Koumpis/Gees 2020
961 McTavish 2017
962 Hancock 2020

4.7.1 Conventional warfare and autonomous weapons systems (AWS)

AWS have been increasingly used to reduce human labor in the military or in war zones, in which work has traditionally been performed by humans. So-called "killer robots" are entering the warfare arena by reducing the influence that humans have in decisions as to whether a particular individual or group should be eliminated. In recent years, scholars have debated whether the use of AWS violates human dignity or whether such an argument is even applicable in discussions surrounding automation of this nature[963]. Most states generally agree that a certain degree of meaningful human control is necessary at all times when deploying autonomous weapons and that new regulations may be necessary[964] to ensure that the arms race between nations developing these advanced weapons is not posing any risk to international stability and security. In addition, the development of these weapons is becoming cheaper as the costs associated with data processing decline.

AWS are arguably the most extreme example of automation in terms of the technology's use in making life and death decisions. In extreme cases, these weapons select and engage with targets without any human intervention. While the current stage of development varies across contexts, fully autonomous weapons are likely to already be a reality. In that sense, there is a new case of "death by algorithm"[965]. Their use has been subject to multiple discussions at the United Nations as to whether autonomous weapons raise "unique ethical questions" for warfare[966].

Automated robotic weapons are already available to evaluate and engage with targets[967], and the extent of human control requires definition, where different aspects exist, as to whether it is direct or indirect control—also called "control-by-design". Direct control constitutes "human-in-the-loop" control, whereby constant and uninterrupted physical control is given and a human is constantly engaged to influence the outcome. Another form of direct control would be "human-on-the-loop", whereby the human has the ability to intervene and override the system's actions as part of a last-resort measure—keeping one's "hands on the wheel", so to speak. Indirect control consists of an appropriate level of capacity on the part of human operators

963 Saxton 2016
964 Righetti et al. 2018
965 Heyns 2017: 48
966 Horowitz 2016
967 Firlej/Taeihagh 2021

to work with a predictable and reliable system, and the autonomous system would have the necessary ethical guidance incorporated in the event of inevitable accidents or events.

In international humanitarian law, the principle of distinction has played a major role in the stigmatization and norm-setting processes of weapons[968], leading to the ostracism of anti-personnel landmines and cluster munitions. The same reasoning has been used in the past by proponents of the ban on AWS, who state that the automated weapons cannot differentiate between civilians and combatants, making them inherently unlawful. Technological advancement has made this argument redundant and shifted the discussion toward new argumentation regarding how the ban on AWS may be justified. AWS not only affect warfare between countries, but are also increasingly available in domestic law enforcement, where their application could be even more concerning (Heyns 2016). For example, police officers, unlike individuals in the military, have a duty to protect the public, and their judgment demands more personal involvement than those who perpetrate hostilities. This requires meaningful human control and higher standards of responsibility on the part of the force. Nevertheless, fully autonomous weapons would not be subject to human control and therefore should not be instrumental in law enforcement. The same argument may be applied to military "meaningful control", whereby the rights to live and dignity embodied in human rights support the conclusion that fully autonomous weapons should be banned[969].

Calls for complete bans are also emerging from the healthcare community, citing the radical violation of health professionals' moral code and ethical principles[970]. The argumentation is based on absence of human supervision, "exacerbating the encoded human biases while excluding human morality. Targets would be chosen based on their perceived age, sex, ethnicity, facial features, dress code, gait pattern, social media use, or even their home address or place of worship". Owing to its digital nature, the use of these weapons would be vulnerable to malfunction and cyber hacking, with nebulous legal accountability. Another threat may be found in the self-improving algorithm, which increasingly requires more data and thereby becomes increasing lethal.

968 Rosert/Sauer 2019
969 Heyns 2017
970 Armitage 2019

On a global level, AWS are not subject to any specific regulation[971], which would call for a differentiation of the specific applications of autonomous weapons. Mines are an example of weapons already beyond human control, illustrating how the automation of weapons can harm innocent or random victims with an absence of human intervention. This also shows that there is some sort of autonomy or autonomous weapons in the past, which could give guidance on how to use them today and in the future. Again, the distinction rule, as exemplified by the mine, is recognized as a first characteristic indicating the at least partial use of autonomous weapons. Generally, a minimum level of human control should be implemented for AWS, which would oppose the development of fully automated weapons.

Ethical concerns around the usage of AWS are evident in the fear that the cruelty of warfare delegated to machines could further exacerbate dehumanization or make war more abstract[972]. Moreover, their deployment could show a lack of respect toward combatants targeted, who may be subjected to "undignified deaths"[973]. From a deontological standpoint, the need for human control and judgment may be based on the principle of dignity, whereas consequentialist accounts highlight global stability and the likelihood of warfare to object to AWS[974]. Exploration of the human control argument reveals that the main reason usually cited in the interest of prohibition is the lack of accountability; AWS cannot currently be regarded as moral or legal agents[975], whereby human rights and humanitarian principles are jeopardized by the mere fact of these weapons' deployment[976].

The healthcare community has typically been influential in establishing bans on chemical, biological, or other conventional weapons, such as landmines[977], and the medical professionals claim a certain moral authority and professional credibility in terms of the devastating humanitarian consequences wrought by warfare and inhumane weapons. Furthermore, at this stage, the deployment of weapons that seek to replace human judgment in the decision to inflict harm should be banned, according to health professionals' representatives, who advocate for banning these weapons while "understanding the risks of automation in decision making".

971 Hughes 2022
972 Armitage 2019
973 Leveringhaus 2018
974 Sharkey 2019: 75
975 Asaro 2020: 212
976 Asoro 2012: 689-688
977 Armitage 2019

Meanwhile, some arguments advocate that AWS may be aligned with conceptions of human dignity. The use of "right-making features" could rebut the argument that the use of AWS would be an affront to combatants' dignity; however, this argument is vulnerable to the charge that a killer robot could cause unnecessary suffering[978]. In addition, it may be argued that just because a killer robot disrespects combatants' dignity, it would not necessarily bring about undignified deaths, and may help maintain dignity "in the face of indignity". Moreover, humans may be regarded as unlikely to relinquish the level of control over war in the coming years[979], where moral agency would still be ensured provided these weapons are not "fully" automated. This also raises the question as to what can actually be considered a fully automated AWS, since algorithms invariably underpin the operation of these systems, which are built by humans and can thus never be regarded as neutral[980]. In addition, it may be argued that human decisions, as part of the rule of law, for example, are also subject to bias, or that a bot is not substantially different from a morally discerning solider deployed in battle or a police officer on patrol, which generally supports the further automation of weapons[981].

Furthermore, new conceptions of "standards of basic respect for human dignity"[982] have arisen in dealing with the question of the terms on which AWS could be employed while still meeting certain ethical concerns. This approach considers actions in light of basic standards if, first, the action is militarily necessary; second, it involves a distinction between combatants and non-combatants; third, non-combatants are not targeted for harm; and fourth, any and all incidental harm to non-combatants is minimized. The specific issue with this approach emerges in terms of the fourth perspective and the calculation of damage to non-combatants, albeit in a minimized manner. Aligned with the above approach[983], it is questionable whether this would be compatible with the right to bodily integrity under the human rights framework.

The discussion regarding how AWS should be guided by the principle of human dignity highlights the specification challenges associated with

978 Young 2021: 473
979 Horowitz 2016: 34
980 Stinson 2022
981 MacIntosh 2016
982 Kahn 2022
983 Heyns 2017

the concept and confusion as to how the principle should be stringently applied. Accounts differ, therefore, depending on the perspective and perception of dignity. For that reason, autonomous weapons may be evaluated using the framework of the ten central human capabilities to complement the research field in which "its relevance to military action and to AWS, where it does not yet seem to have been explicitly discussed"[984].

Freedom from unwarranted search and seizure increasingly relies on machines rather than human beings, which poses a greater ethical risk when weapons become "fully automated", acting purely on algorithmic guidance. In addition, control over these weapons may shift increasingly further away from democratic choices and influences, as fewer individuals know how and when these weapons are deployed, an aspect that has already been criticized—for example, regarding the US drone war[985]. In addition, the capability to grieve over losses is impeded by a lack of accountability when the perpetrators of an attack remain unclear. Drone attacks on funerals have been reported in the past, with innocent casualties resulting from such attacks[986], constituting a violation of bodily integrity.

The same applies to the use of autonomous weapons in domestic circumstances when collateral damage is done[987]. For example, protecting individual bodily dignity by the state (i.e., policy) may be at stake—for example, at events requiring individual judgment, such as demonstrations where children or bystanders risk being trampled upon by protestors. The lack of accountability in the public sphere by autonomous weapons in domestic use presents another threat to bodily integrity, particularly since moving freely from place to place, at least in Western democracy, is considered a right in most legal systems and forms part of article 13 of the Universal Declaration of Human Rights. In that respect an individual may be hit based on a specific location while exercising this right.

In general, the capability to life may be jeopardized when autonomous weapons conduct strikes that are not justifiable and terminate life prematurely. From the perspective of the capabilities approach, the deployment of AWS represents a violation of human dignity, critically affecting the capabilities to life, bodily integrity, emotions, and control over one's environment. There are few grounds to justify their usage, such as the argument

984 Sharkey 2019: 82
985 Boyle 2015
986 Friedersdorf 2013
987 Heyns 2016: 365-366

that they could be used where search and seizure is warranted; however, the "death penalty"-like impact of these strikes[988] would not be justifiable under the ten central human capabilities. As such, AWS are a clear violation of human dignity.

4.7.2 Espionage and surveillance automation

Automated technologies are increasingly used to spy and surveille not only other countries, but also in domestic contexts, and intelligence capabilities are unprecedented in terms of their reach and efficiency. This development poses a threat not only to democratic individual rights but also to privacy, with massive collection and analysis of data, including predicting and influencing behaviors[989]. Paired with access to social media and other global communications platforms (for an extended discussion, see the above chapter on communication), individuals are increasingly losing the ability to protect their rights when connected through those platforms where privacy is relinquished for the sake of "control" and "security". These developments are relevant to ethical discussions.

While hundreds of thousands of spies were necessary to sustain totalitarian systems in the past, as in the case of East Germany and the Stasi[990], the dimensions and possibilities in terms of gathering data for surveillance and espionage have increased to unprecedented levels, with a reduction in the need to employ humans. Prior to the digital age, surveillance was linked to private investigators or government agents in stakeouts, which involved physical work, expense, and time[991]. Technology has now fundamentally altered the "second oldest profession"[992].

The increasingly algorithmic and automated surveillance that evaluates and spies on human beings can reinforce structural inequalities[993]—for example, in policing[994]. Certain communities or groups may be attacked or spied on, posing a direct threat to equity within a state and challenging individual rights. Outdated legal rules are insufficient to protect the

988 Friedersdorf 2021
989 Avila Pinto 2018
990 Hall 2006
991 Friedland 2015
992 Cunliffe 2021
993 Kelly 2022
994 *The Economist* 2020

individual from the state (Friedman 2015), as governments increasingly enlist private companies to conduct surveillance and spying operations, with warrants no longer necessary and law enforcement increasingly using the gathered data for operations, thereby violating fundamental human rights. Specifically, technologies that support home activities, such as the "Internet of Things", assist law enforcement in surveilling citizens. Among the practical applications witnessed hitherto was the "Amazon Rekognition" platform used by the US police, which identified lookalike individuals as potential subjects[995]. The software was also prone to more frequent errors with dark-skinned individuals[996].

Despite their global operation, these tech companies are largely concentrated in California, where global espionage and surveillance in other jurisdictions is becoming increasingly normal, without accountability to the law in the jurisdictions of individual victims[997]. This may pose an increasing ethical challenge, as individuals are often unaware that they are being spied on and lack the opportunity to fight back. The weakness of consumer defenses and its expensive enforcement, particularly for corporates headquartered in the United States, reveals how spying and surveillance may be conducted in an automated manner with minimal human labor, which also strips individuals of their rights in countries outside the United States.

Certainly, mass surveillance and spying on citizens may enhance safety and reduce crime, specifically through cameras and data analytics that support the pursuit of suspects[998]. Furthermore, the government efficiency facilitated by automation technology can enhance service quality for citizens and reducing labor costs on the government side, which may then lower the need for government tax collection. Moreover, fewer police personnel might be required, and, if implemented correctly and without bias, automated security measures may provide an ethical opportunity, considering the hate crimes often perpetrated by police officers[999].

In China, the low espionage and surveillance costs thanks to automation technology have led to an "automated tyranny"[1000] in which an authoritarian regime tramples on individuals' rights to privacy as well as their civil

995 Hao 2020
996 Wiggers 2019
997 Avila Pinto 2018
998 Priks 2015
999 Bunn 2022
1000 Wang 2020

and human rights, a development that was enforced during the COVID-19 pandemic[1001]. In that sense, the stripping of privacy through automated surveillance has been widely accepted by citizens, including the collection of citizens' biometric data without consent. These data are increasingly used to marginalize and harass minorities, as the case of the Uyghurs demonstrates[1002].

As Chinese surveillance technology is increasingly sold to Western governments, these dynamics also affect individuals in liberal democracies[1003], where legal bases are also not granted. This promotes the growth of technology-powered authoritarianism worldwide, owing to the lack of global governance on the circulation of these technologies. Nevertheless, the EU has begun developing a more human rights-centered approach to governing the export of cyber surveillance technology received by the US and Chinese governments. However, it remains unclear how this will interact with competing geopolitical, commercial, and security agendas[1004]. At this stage, external backlash from liberal democratic countries against the authoritarian capitalist dynamic producing surveillance technology has been observed[1005].

From an ethical perspective, the use of these technologies must be carefully supervised, as they can easily be abused by political interests, which would violate political rights and freedom from unwarranted search and seizures, if the usage is not transparent. Spy software has reportedly been used to manipulate democratic processes[1006] and suppress freedom of speech. Moreover, the categorization and ADM that is subsequently based on this information may be discriminatory.

To conclude, the automation of weapons presents several challenges from an ethical perspective, since such weapons violate individual rights when deployed. Careful supervision is required going forward to ensure that they are not used to undermine basic capabilities to live a dignified life.

1001 Liu/Zhao 2021
1002 Baptista 2022
1003 Bernot 2022
1004 Kim 2021
1005 Huang/Tsai 2022
1006 Priest et al. 2021

4.8 Automation of the rule of law

Advancing automation increasingly affects the rule of law, whereby enforcing and protecting individual rights has major implications for living with human dignity. For example, legal work is increasingly influenced by AI-driven "law", and humans in government jobs may become increasingly replaced or assisted by robots that make decisions that have wide-reaching influences on civilians. Although legal work will likely not entail the complete replacement of human labor, as jobs require skills that technology still lacks—human capacities, such as social intelligence, creativity, and general intelligence[1007]—the reduced involvement of humans will nonetheless have an impact, including the growing use of so-called e-government solutions to automate the public services value chain[1008]. For example, in light of the dependence on an ever-smaller group of technicians who control the deployment of automation technologies such as AI[1009], the rule of law must ensure a "rule of persons, not machines"[1010]. Moreover, the rule of law is a mechanism designed to curtail the abuse of power and to ensure that society upholds certain values, including human rights[1011]. Commonly, the rule of law is viewed as a notion that is worth protecting despite its exposure to political abuse. Modern technologies, including AI and machine learning, have improved so that they can assist human decision-makers across almost all fields, and their decision-making abilities will also be enhanced, allowing more control and responsibility to be transferred to them. These technologies challenge the ideals associated with the rule of law as a concept of traditional law—for example, treating everyone equally before the law. The ethical evaluation of these developments is highly relevant.

4.8.1 Legal services

In legal services, automation tendencies have meant that law is increasingly considered to be algorithmic, at least from a business and efficiency-driven perspective. This involves efforts to transform objectivized "facts" into outputs (agreements or litigation stances) via the application of a set of rules

1007 Furman 2018: 320
1008 Bwalya 2020
1009 Coeckelbergh 2013
1010 Pasquale 2019: 1
1011 Greenstein 2021: 28

(law), and technology increasingly automates these processes[1012]. The consequence is that many tasks typically performed by lawyers and attorneys, traditionally white-collar workers, can now be performed by technology. Automation of labor in the legal area is often advertised as improving access to justice, reducing legal costs while enhancing performance[1013], and promoting the rule of law, compared with the democratization of law and consequent empowerment of ordinary citizens. It is promoted as a new form of law that will emerge to provide the benefit of rules and standards without the costs of traditional legal services[1014]. One example of increased algorithm usage is the use of automated document view[1015] or tax statues that are no longer prepared by lawyers or accountants but rather in the form of computer code, eliminating the interpretive process, which has become standardized[1016]. As technology is already assisting civil lawyers in their traditional roles as advocates and advisors, it will continue to do so in the future, particularly given that the digital world will continue to yield more information and data. Software could thereby offer considerably more support, rather than writing documents by itself. This would lead to a "legal singularity", whereby the accumulation of data and improved methods of inference would render legal uncertainty obsolete[1017], albeit at a great cost to the individual consideration of cases. In addition, automation technology is automating other activities, such as litigation review, generating expertise, legal research, or contract analysis[1018].

It is commonly assumed that technology has the potential to reduce the errors made by human attorneys or limit their biases, particularly given that human judges can likewise be influenced by such factors. Therefore, automation can elevate the legal system above the fallibility of any particular person[1019]. Promising developments in legal automation target people who need and deserve but cannot afford to enlist the services of an attorney. This is the case in many low-income households: in the United States, for example, thousands of children have juvenile records for crimes such as

1012 Pasquale 2019
1013 Remmers 2018
1014 Susskind/Susskind 2015; Katz 2013: 939-941; Casey/Niblett 2015
1015 Thomson Reuters n.d.
1016 Lawsky 2017
1017 McGinnis/Pearce 2019; Susskind/Susskind 2015
1018 Davis 2020
1019 Eren/Mocan 2018; Smith 1998; Radin 2005

marijuana possession or vandalism[1020]. In such cases, attorneys can usually quickly arrange an expungement, but not everyone has access to a lawyer. Another example of how software automation can help is the use of tax software that offer ordinary citizens considerable time savings by relieving them of the need to provide tax documentation in paper form. In that sense, the greatest potentials in the automation of legal work are those that encompass a wider consumer sphere, as represented by fields such as tax, will preparation, or everyday disputes, such as traffic or parking fines. Several start-ups and legal technology innovations are working on improving access to justice for more citizens[1021]. Accordingly, substitutive legal automation may also be a fortunate phenomenon from an ethical perspective, as more individuals are empowered to claim and enforcing their rights. In this sense, low- to middle-income socioeconomic households may have their legal needs met more as software would be the only form of advice available to them. The same would apply, for example, to small business[1022]. In that regard, certain ethical opportunities arise from the use of automated legal services, whereby political rights may be easier to assert owing to lower costs and consequent better access to these services while improving the ability to be treated as a dignified being whose worth is regarded as equal to that of others.

Legal questions, however, quickly become more complex, making it more difficult to use computer code to translate legal code in a way that is intelligible to the layman[1023]. In this regard, the role that lawyers and attorneys play as the main crafters and maintainers of social order[1024] by representing the rights and interests of individuals in the rule of law is changing, as equal treatment may become difficult when the intention of the deployed technology remains opaque[1025], posing an ethical risk. In addition, without ethical guidance, law firms and third parties from the technology sector risk deploying "AI-driven tools that fail to provide effective client-centered services, inhibit wide-spread access to justice, and undermine lawyers' ethical obligations to current and former clients, including the obligations to practice competently, maintain confidentiality, effectively supervise third

1020 Pinard 2013: 967-968
1021 Sonday 2020
1022 Chu et al. 2013: 965-966; Pasquale 2019: 17
1023 Pasquale 2019: 7-8
1024 Abbott 1988; Pasquale/Cashwell 2018
1025 Greenstein 2021

parties, communicate with clients, and exercise independent judgment and render candid advice"[1026].

Legal processes typically deal with explanation and judgment—a different set of activities to the predictive modeling and pattern recognition common to most legal automation technologies. A decision-maker aims to ensure that a certain result (guilty or innocent, etc.) not only follows a certain pattern of past documents and words contained therein[1027], but also considers the situational context. For example, tax administrations may violate privacy when profiling individuals for tax non-compliance based on certain keywords[1028], which could be an issue from an ethical perspective if these profiling mechanisms discriminate against certain groups.

Regarding DLTs (see impact on financial industry above) or blockchain, smart contracts are expected to expand the automation of legal services without the need for intermediaries. Nonetheless, debate surrounds the question as to whether this kind of automation renders contract law obsolete or whether smart contracts are simply another iteration of traditional contracts[1029]. One key issue relates to the question of how to align the powers of government with blockchain contract automation in the absence of a central authority to settle disputes[1030], where one option would be to provide the state authorities the status of a superuser and another would be to rely on traditional remedies in "offline mode". In any case, blockchain technology appears to provide certain opportunities if a legal system is unable to serve its citizens—for example, in developing countries. However, the absence of authority to rule in the case of dispute represents a risk from an ethical perspective, when certain services and functions can no longer be supervised. In general, the automation of the legal sector must be carefully observed, as, on the one hand, access to services can be enhanced owing to lower costs; on the other hand, however, ethical guidance is specifically required in terms of controlling and supervising the design and deployment of the specific automation technology.

1026 Simshaw 2018: 173
1027 Brennan-Marquez 2017; Pasquale/Cashwell 2018
1028 Scarella 2019
1029 Ruehl 2021; Raskin 2016
1030 Savlyev 2017

4.8.2 Public services

Governments are increasingly pressured to deploy automation technologies in a bid to become more efficient in the operation and provision of public services. This inevitably also affects how the rule of law works. The aim of reducing government spending worldwide is growing, and decision-making is increasingly influenced by automated processes. This operative set-up reduces employment, as governments are major employers in most global economies. In addition, those remaining in government jobs will be obliged to make decisions that are influenced to a greater extent by preceding decisions made by automation technologies, such as sorting or categorizing relevant information.

Ultimately, labor accounts for 20–25% of government expenditure[1031]. Austerity and debt have forced governments to cut costs in recent years, and automation has considerable potential—for example, for low-level clerical and data entry positions and other repetitive tasks, such as general maintenance and operations positions[1032]. Some positions may be partially automated, while others can relieve human workers of the need to perform mundane tasks, splitting jobs into smaller tasks or augmenting and complementing the skills of workers[1033]. As an example of automated public services, we may cite algorithms in social work[1034]. These determine which family receives what kind of social assistance[1035] or policing as part of the legal system[1036]. It is anticipated that automation in the UK public sector workforce may reduce the workforce by up to 25%, based on study estimates[1037]. Automation in public services promises financial resource savings in the form of taxpayer money, better service quality, and lower transaction costs[1038] a more equal treatment of citizens through standardization[1039] and decisions that are less prone to error than human decisions[1040]. Ethical

1031 Cribb et al. 2014; IMF 2016
1032 Viechnicki/Eggers 2017
1033 Eggers et al. 2017
1034 Ranerup/Svensson 2022
1035 Gilingham 2021
1036 Adensamer/Klausner 2021
1037 Deloitte 2016
1038 Dickinson/Yates 2021: 7-8; Petersen et al. 2018; Eggers et al. 2017; Borry/Getha-Taylor 2019
1039 Steelcase 2010
1040 Weitzenboeck 2021

opportunities and risks thus arise whenever fewer humans work in governmental services.

4.8.2.1 Access to services

Access to public services is not a given in large parts of the world[1041], and digital transformation can enhance access for individuals when standardizing services are increasingly provided, despite the fact that personal costs are saved in times of declining state revenues in line with a narrative centered on reducing legal spending[1042]. In this regard, procedural fairness may be enhanced through an automated system, depending on the decision-makers' circumstances and based on the assumption that the decision is supported but not supplanted[1043]. Furthermore, the specific process does not involve complex issues, such as family-related circumstances that would require individual attention. An applicable example would be chatbots and intelligent assistants for public engagement, providing information about ongoing cases or responding to citizens' questions[1044]. Robot advisors could also support civil servants, thereby improving service or response time.

Liability is an issue when the provision of public services is not fair or transparent, particularly when the automation process has been outsourced. In that sense, lawyers could challenge government decisions based on algorithms but may face claims that they are proprietary[1045]. This issue also applies in terms of traceability, as the growing complexity of AI systems involving machine learning and neural network has diminished human operators' ability to keep track of outputs and inputs of public services. Potential approaches to resolving this issue might include clearly assigning accountability in terms of externalized services to the government[1046] or extending responsibility to vendors to close the "AI accountability gap"[1047]. Nevertheless, from an ethical perspective, automation represents an opportunity when standardization is implemented under the guidance of certain ethical requirements, involving services that do not require further indi-

1041 Hewett/Montgomery 2001; Batley et al. 2012
1042 Pasquale 2019: 17-18; Synergist 2018
1043 Nagtegaal 2021
1044 Engin/Treleaven 2019
1045 Roberts/Wernstedt 2019; Gilman 2020; Crawford/Schultz 2020
1046 Alford/O'Flynn 2012
1047 Crawford/Schultz 2020

vidual consideration of a particular case. In addition, in many countries, access to public services can be achieved only by means of bribes, owing to widespread corruption among the government employees providing or making decisions regarding these services[1048]. In this regard, automation of public services could support a dignified life, based on the assumption that accountability—in that regard, "public accountability"[1049]—and other ethical standards as discussed below, such as equity as part of a functioning rule of law, are enforced. This would bolster the right to political participation.

4.8.2.2 Equity

Equity is an important legal ideal that may be regarded as consistent with the ideal of the rule based on an Aristotelian view and is defined as "doing justice in particular cases under appropriate circumstances"[1050]. The public sector workforce enshrines four prominent values: economy, efficiency, effectiveness, and equity. The equity value derives from the expectation that a good administration is equally good for everyone, rooted largely in a democratic viewpoint[1051]. It forms part of the aim to social equity as part of fairness and justice with a direct public policy implication to reduce the influence of social characteristics, such as economic circumstances, for access to public services[1052]. This is also essential in the provision of public goods and resource allocation with the aim of furnishing the conditions necessary to support a dignified life[1053], representing the ability to be treated as a dignified being whose worth is recognized as equal to that of others.

As mentioned, standardization provides certain potential for equity treatment from an ethical perspective when rules and appropriate supervision with transparency as to how the automated decision tools are used are applied in the provision of public services. This is even more essential since the interest in automation technologies is broad from a governmental perspective, where organizing social security more efficiently is just another example in addition to the more efficient prioritization of legal cases. In

1048 Robinson 2012
1049 Busuioc 2021
1050 Solum 1994
1051 Frederickson 2005: 31; Norman-Major 2011
1052 Johnson/Svara 2015: 282
1053 Perin/Panfilis 2021

any form, the aim would be to reduce human involvement, and human decision-making in government is increasingly replaced, which substantially affects the rule of law itself and its operation[1054]. The promise to make governments and whole democratic systems more accurate, efficient, and fair has accompanied the use of automation technology in recent years. Several nations have become enthusiastic adopters—for example, in areas such as welfare allocation and the criminal justice system, where social equity must be even more carefully reviewed when automation technologies are applied, particularly for law-related public services that require individual case attention.

The use of automation technology paired with increased standardization has the potential to have a critical impact on the ideal of equity in two key ways: first, considering the workforce in public services, automation could reduce diversity, as certain groups could be more affected by automation than others. This has the potential to affect workforce equity[1055], as female and non-white employees appear to be the most affected by automation in the public sector when administrative jobs are replaced by robots, at least in the United States[1056]. This may raise equity concerns, and if automation targets positions that are heavily populated by these groups, it is also important to consider how automation efforts may impact the public sector's commitment to a diverse workforce and ensuring equal employment opportunities. If workforce diversity no longer represents the general population, citizens using government services may be less likely to encounter any staff members with whom they can identify[1057], particularly when fewer humans are employed to provide government services. This could result in higher social inequities and injustices[1058], on the one hand, owing to a lack of common understanding in tandem with the decline in representative bureaucracy, as fewer citizens will be able to identify with government agents. On the other hand, deciding algorithms may follow predefined patterns that impose disadvantages on certain groups, for example, in the context of policing[1059]. In that respect, as biases in policing may occur, and algorithms are used in decisions regarding proceedings of the rule of law,

1054 Zalnieriute et al. 2019
1055 Borry/Getha-Taylor 2019; Clifton et al. 2020
1056 McClure 2018
1057 Borry/Getha-Taylor 2019
1058 Butcher/Beridze 2019; Dwivedi et al. 2019; Carney 2019
1059 Eubanks 2018

the threat of unwarranted search and seizure may increase, particularly if the underlying rationale is to a greater extent based on ethnicity or other discriminatory characteristics. Surveillance techniques used in China exemplify how automation technology increasingly determines whether or not a certain individual should be regarded as a criminal[1060].

Second, equity may be threatened if the bots entrusted with programming decisions, which are supposed to be minimized in terms of bias, turn out to be less neutral than initially believed because they also have been programmed by humans[1061], which would mitigate the "standardization" advantages. In addition, the removal of "street-level bureaucrats" expertise[1062], for example in social services, gives rise to questions as to how IT professionals shape public service encounters when there are fewer human case workers[1063], particularly given that automation technologies will sort gathered information based on a predefined algorithm that will subsequently be used for decision-making by those government workers that remain.

A risk in this context would be that IT professionals may begin to dictate how government agencies organize their processes and interactions with citizens—in most cases, without understanding the nature of public service provision and, often, without ethical awareness. This may cause mistakes as programmers may incorrectly translate regulatory requirement into source code[1064], including biases. Exposure to other services also generates risk when complex services, such as welfare programs, engage in "cream-skimming", whereby the easiest tasks or clients are selected while the least profitable clients are put on hold[1065]. This again would be an example of a bias in an algorithm that threatens equal treatment. Regarding AI decision-making, the algorithm may miss essential policy questions that should be considered in specific cases—for example, in terms of administrability, efficiency, or fairness, a rigid rule cannot be applied to a set of facts[1066], which is also relevant when hiring public servants[1067] in a diversified manner. Furthermore, AI automation may not be appropriate where caseworker

1060 Mozur/Krolik 2019
1061 Feldman et al. 2015: 259-268
1062 Zouridis et al. 2020
1063 Lindgren et al. 2019: 434
1064 Gilman 2020
1065 Bovaird 2016; Considine 2011
1066 Pasquale/Cashwell 2015
1067 Borry/Getha-Taylor 2019: 8

discretion is required to prepare a case and make decisions. In this regard, AI should only be used to undertake a pre-handling of the case before passing it to a human for a final decision[1068]. One example, the Robodebt case, illustrates how an algorithm incorrectly calculated welfare recipients' incomes and automatically issued thousands of debt notices to clients, causing considerable stress, anxiety, and even depression for Australia's most vulnerable individuals[1069]. This illustrates that an implementation of automated systems in public services without attention to procedural fairness and human intervention causes significant issues from an ethical perspective. The involvement of algorithms may assist perceptions of justice if it supports human managers' decision-making of human managers, but not the other way round. In this sense, it would not be ethically viable to automate entire processes, and humans will need to be involved in at least all decision-making elements[1070].

The COVID-19 pandemic supported the advanced use of automation technologies in the public sector, as remote access to tools became particularly relevant[1071]. Nevertheless, the high development costs and limited availability of costly expertise must be considered[1072] when implementing automation technologies in the government, particularly when enforcing compliance with data protection and privacy law[1073], where high-pressure situations, such as a pandemic, suddenly increase the demand for automation. This typically comes at a higher price, including "shadowing costs", when human contact is reduced on labor that is reduced[1074], such as in the typical case of public services, in which clients should be treated with empathy and perceived fairness[1075]. In this sense, if the implementation of these tools is not carefully evaluated, both equity and privacy may be easily violated[1076], specifically when these technologies are used in governmental legal activities and might displace the traditional understanding of law with technology-driven prediction[1077]. For example, data concerning minority

1068 Lindgren et al. 2019; Nagtegaal 2021
1069 Huggins 2019
1070 Dickinson/Yates 2021: 10
1071 Dickinson et al. 2021
1072 Wirtz et al. 2019
1073 Pencheva et al. 2020: 34
1074 Korinek/Stiglitz 2021
1075 Alford/O'Flynn 2012
1076 Pujol/Machanavajjhala 2021
1077 Pascuale/Cashwell 2018; Hildebrandt 2018

groups may be used to discriminate based on private data, which, on the one hand, is a violation of privacy, and on the other hand, violates equity. Therefore, any technology deployed must be controlled by humans who evaluate and decide what government processes regarding the rule of law are sufficiently useful, appropriate, and consistent to be automated[1078].

The same applies when outsourcing to third parties or AI providers, as the government needs to maintain the capacity to effectively manage these providers[1079]. The issue of algorithms' opacity may create systems that target some populations or disproportionally exclude certain non-typical citizens, particularly if designed in ways that reinforce the norms of certain specific social or political actors while excluding those of others by using historical datasets that include biases and inequalities to inform automation technology[1080], which is an issue from an ethical perspective. At this point, human programmers may input their own judgments and biases into algorithmic processes[1081], which may be traced back to the lack of diversity in the workforce that designs, codes, and programs AI technologies[1082], a dimension that may become more salient because private companies tend to be more market-oriented, using biases for client targeting, than programmers in the public sector, owing to the equity principles in the government.

Similarly, when AI assists judges in making judicial decisions[1083], these decision-making systems may further be considered a "black box", as they are complex in their set-up and lack transparency. In addition, decisions are becoming difficult to explain if based on inputs given by a machine. In that regard, fully automated decisions may logically be based on two premises[1084]. First, the data representing every relevant fact of the case must exist in machine-readable form and be digitally available in the appropriate format. Second, it must be possible to process all case data using computer programs containing correct and complete representation of all applicable legal rules. However, these premises would require transparency regarding the usage of the algorithm.

1078 Zalnieriute et al. 2019: 455
1079 Desouza et al. 2020
1080 Eubanks 2019; Asaro 2019
1081 Gilman 2020: 5
1082 Clifton et al. 2020
1083 Greenstein 2021: 1
1084 Schartum 2020

The rule of law is essential for dignified life in terms of political rights but also wealth distribution[1085]. Therefore, the incorporation of unfamiliar tools without transparency into governance structures raises ethical issues with respect to the legal labor conducted (i.e., partially or wholly automated). This may also affect the legitimacy of the rule of law when legal labor is automated and deny the idea that the rule of law is "good for everyone"[1086]. This is especially relevant since automation may cause a reduction in humans working in government positions while those remaining are heavily influenced by ADM.

4.8.2.3 Market pressure and efficiency

The disruption caused by AI is currently approached primarily from an economic perspective, as calls for efficiency and market pressure have been the main drivers, while "law" on the public side is regarded as equivalent to the work conducted as "legal services" in the market[1087]. This leads to a similar pressure in the service market but also in the rule of law relating to the public sector[1088], as they heavily influence one another. In general, the increasing pressure influences the social aspects of the work performed by legal service firms, challenging norms, traditions, and culture, which in turn affects the rule of law. In tracing the impact, we may distinguish between the deployment of technologies in the "business of professional services", which are associated with business process management and increased workflow efficiency, while automation in the public sector largely leads to a loss of human shaping in legal decision-making. The interdependence between humans and machines must always be considered to meet the goals of ethical integration, particularly the requirement that the human be kept in the "loop"[1089] at a minimum when taking decisions.

An example of this ethical gap may be found in the collaboration between lawyers and computer scientists who engineer and design the technologies[1090]. This may be crucial in sustaining democratic participation in

1085 Sunde 2017
1086 Tamanaha 2012
1087 Hildebrandt 2017
1088 Brooks et al. 2020
1089 Jones 2015
1090 Hildebrandt 2016: 1-2

law-making, contestability of legal effect, and transparency around how citizens may be manipulated by the invisible computational backbone, which is also relevant from an ethical perspective. This could help to safeguard human autonomy and human conditions, where "at the last stage of the laboring society, the society of jobholding, demands of its members a sheer automatic functioning, as though individual life had actually been submerged in the over-all life process of the species and the only active still require of the individual were to let go, so to speak, to abandon individuality"[1091].

Market and efficiency pressure also leads to outsourcing efforts in services that are socially complex and highly reliant on description, such as child protection services. Several voices have raised concerns about the outsourcing of public services, claiming that the evidence suggests that it does not consistently lead to improvements but largely causes challenges and problems from an ethical and legal perspective[1092]. Outsourcing and AI-supported automation may be conceptually compared, as both processes involve the transfer of work from public sector employees to another agent, either through a non-government organization or an automated system, which is typically externally provided[1093]. The related problems and informational asymmetry occur in both processes, as work is undertaken by people external to the government organizations. The same occurs with automation powered by AI, as the purchasers may lack the requisite knowledge or insights into the algorithms used, which is also, in many cases, justified by their proprietary nature. Machine learning can further exacerbate this issue, as the system learns from data and is not simply an algorithm that follows a series of pre-programmed rules but rather adapts itself to the circumstances, exemplifying the issues surrounding the supervision of governments' outsourcing of services to third-party providers. In these circumstances, systems operate in processes that have not been designed as such by the purchasing governmental organizations and may represent a significant informational asymmetry with respect to public work. Nonetheless, the growing importance of ethics AI can positively contribute to governance with respect to outsourcing arrangements[1094].

1091 Arendt et al. 2018: 322
1092 Sasse et al. 2019; Petersen et al. 2018; Reichard 2016
1093 Dickinson/Yates 2021: 3-4
1094 Beulen et al. 2022: 23

Monitoring and supervising legal administrative processes may thus become a major task to be fulfilled by legal workers, as assistive tools, such as document review bots, and even interpretation of the law looks set to become increasingly automated. This includes ensuring that the final decision is invariably made and justified by a human, though automated tools may support the decision-making process. This is essential in terms of political and social inclusion, as human[1095] agency is arguably a cornerstone of society that has becomes threatened by machines. Among the major upcoming challenges will be the use of these technologies' benefits while simultaneously protecting society from their harms. This includes, for example, promoting innovation while simultaneously balancing it against the interests of society. One key challenge would be to determine which values to balance technology against, whereby a functioning rule of law and its values of equality or protecting human rights would be a starting point.

To conclude, the automation of the rule of law offers certain opportunities from an ethical perspective—namely the provision of enhanced access to services for "standard" cases requiring only minimal human interpretation. Nevertheless, threats occur specifically with the reduction of human involvement, where automation technologies subject to biases threaten to be substantially influential in the decision-making process and legal work conducted.

4.9 Evaluation of policy instruments from an ethical perspective

The capabilities approach intends to critically evaluate and inform policy from an ethical perspective. To this end, the subsequent policy instruments, which are frequently discussed in terms of possible actions regarding digital transformation and human labor, are assessed under the ethical point of reference addressing the specific question of whether they might be beneficial in terms of the ethical opportunities and risks identified in previous sections. These instruments include labor market policies in addition to other regulatory measures, such as technology restrictions or taxation. Furthermore, companies can act self-responsibly as part of corporate social responsibility (CSR) in self-regulatory efforts. The list of tools mentioned and outlined is not exhaustive. Nonetheless, the wealth of material for discussion and available literature reveals that the instruments outlined

1095 Greenstein 2021

below are improved options for dealing with the direct outcomes and consequences of automation from an ethical perspective. In that sense, they will be evaluated from the perspective of the ethical point of reference.

4.9.1 Minimum wage

Minimum wage is a classical labor market policy instrument designed to regulate the lowest remuneration that employers can legally pay their employees and may be defined as "the minimum sum payable to a worker for work performed or services rendered, within a given period, whether calculated on the basis of time or output, which may not be reduced either by individual or collective agreement, which is guaranteed by law and which may be fixed in such a way as to cover the minimum needs of the worker and his or her family, in the light of national economic and social conditions"[1096].

The application of a minimum wage is regarded as a mechanism designed to reduce inequality[1097], as it ensures earnings for those at the bottom of the pay scale. It is considered an effective tool for compressing wage distribution while serving to lessen the incidence of low pay in both developed and developing countries. Nowadays, more than 90 per cent of the ILO member states have a minimum wage system in place, and even in developing countries, where enforcement mechanisms tend to be weak, minimum wages appear to be effective in reducing inequality.

In terms of the impact on unemployment, controversy surrounds the question of whether minimum wage directly influences the rise of unemployment, as employers may cease hiring more people[1098]. Minimum wage advocates emphasize its positive impacts, such as the increased standard of living, reduced poverty and inequality, and the boost in morale it provides[1099].

Views differ regarding how minimum wages might affect manual labor that is under the threat of being wholly automated. Concerns have recently been voiced that firms would engage in labor-displacement capital investment that could harm workers[1100], explained by the fact that the higher

1096 ILO 2014: 19
1097 Berg 2015
1098 Black 2003: 300; Card/Krueger 1995
1099 Bonte-Friedheim 2019
1100 Mourdoukoutas 2019

the labor cost, the greater the incentive for companies to invest in automation technologies. According to this capital–labor substitution hypothesis, a minimum wage would accelerate automation[1101]. Nevertheless, a minimum wage could, as stated, increase the salaries of the remaining workers. In that sense, the instrument appears to be beneficial for manual labor in the short term, as in the long term, automation appears to be an attractive means of reducing or even eliminating labor costs. In that regard, it would support individuals in accessing education, since they will need to transfer out of the job in the mid- or long term. This is particularly relevant given that skills and the ability to adapt to shifting skill requirements will be crucial in granting access to the future labor market, and a minimum wage would enhance the opportunities for these individuals to have a functioning income that is sufficient for the time being.

Where the risk of wholesale automation as a result of the need for a "human touch" tends to be low, such as in elderly care, a minimum wage could also be helpful in the long term as a means of raising income[1102] and helping individuals in these sectors to support all capabilities, which would be beneficial from an ethical perspective. This effect may also play out in the public sector; in most cases, however, government servants' salaries are regulated based on predefined criteria such as certificates, years of experience, position, and so on.

4.9.2 Universal basic income (UBI) as a social assistance scheme

The provision of a universal basic income (UBI) may be a useful measure for ensuring the necessary conditions for a dignified life if paid work becomes obsolete, and has been cited frequently as a potential response to advancing automation[1103]. UBI may be regarded as a necessary element in the social contract afforded to the new workforce, as the social safety net must to be adjusted to consider a workforce that is increasingly independent or without work[1104]. The concept of UBI is not new but was favored by activist Martin Luther King Jr and libertarian Milton Friedman alike[1105]. It is a source of fascination for many because it is an idea rather merely a

1101 Geng et al. 2022
1102 Vadean/Allan 2021
1103 Dermont/Weisstanner 2020; Cabrales et al. 2020
1104 Sundararajan 2017: 10-11
1105 Gentilini et al. 2019: 17-18

program, a lesson, or an economic policy[1106]. Discussions surrounding UBI are often a proxy for debates concerning the role of the state and markets and revolves around the distribution of power within societies. Therefore, it is not merely a form of redistribution of wealth but rather represents a moral statement[1107].

Social assistance schemes may generally be codified according to three features or dimensions[1108]. These encompass what modalities they provide, whether and how they are conditional, and whether and how they are targeted. A UBI would represent a combination of three choices—a transfer that is provided universally, unconditionally, and in cash. Within this framework, however, proposals vary across a range of key parameters, such as transfer level and frequency, citizens or residents, or age of eligibility. The modality and coverage of such a universality are thus already controversial. A further point of criticism concerns the issue whereby universality must be progressive and ensure that those who are most in need receive adequate support to address their greater vulnerabilities and demands, which would go beyond the basic income targeted. In that regard, debate surrounds the question of whether universality should be interpreted[1109] in terms of outcomes (i.e., all people should be guaranteed a minimum level of welfare) or receipt (i.e., everyone needs to be covered). Therefore, the understanding of universality (i.e., what and who a UBI should cover) varies.

Frequently raised criticisms warn that an unearned income would lead to people working less; however, the existing literature indicates that UBI-type schemes have little to no impact on participation in paid work[1110]. Furthermore, conditions of paid work may even improve because guaranteeing everyone access to an unconditional income would enable workers to turn down insecure, low-paid, or exploitative work while simultaneously enjoying greater empowerment to demand improved work conditions[1111]. However, a contrary effect might also ensue, whereby the UBI might serve as a subsidy to low wages and make low pay increasingly acceptable—for example, by promoting casual work and job insecurity by increasing the supply of labor for insecure jobs. In this context, the literature indicates that additional cash through basic income-type or transfer can initiate a

1106 Lowrey 2018: 191
1107 Atkinson 2011: 4
1108 Gentilini et al. 2019a: 20-25
1109 Gentilini et al. 2019b; Rutkowski 2019; Packard et al. 2019; Parjis 2004
1110 Bastagli 2019: 114-116; 100
1111 Bastagli 2019: 100; 115

process of emancipation by addressing the constraints to improved working conditions and providing workers with an exit strategy by strengthening their position in the bargaining process.

Another important topic is the valuation and distribution of unpaid work[1112]. Many of the discussions surrounding cash transfers and work incentives focus on paid work, and concerns have evolved that the UBI might reduce incentives to spend more time in paid employment. Nonetheless, UBI could also free up time for engagement in voluntary work that is valuable to society or the individual. In that case, when it comes to domestic and care work, this could lead to a redistribution between the genders, as such work is overwhelmingly performed by women. On the other hand, a UBI might actually reinforce the gendered division of work, increasing the incentives for women to reduce their participation in paid work when their position in the labor market is weaker. This might occur when women are secondary earners; however, women's participation in paid work may actually increase if they are empowered to overcome the barriers to employment participation, such as meeting childcare costs. A solution approach would be to pay everyone individually, avoiding targeting the main breadwinner, a feature that would be enabled by universality. Together with the unconditional nature of an UBI, this could help prevent the risk that women will be relegated to care-provider roles, which may occur when conditionalities target women. Nonetheless, these impacts vary according to the specific circumstances and are not elaborated sufficiently at present.

From an ethical perspective, as the implementation of a UBI would have different effects on different industries based on its nature, no evidence exists to suggest that it would be an overall instrument under the ethical point of reference. For example, manual laborers have coexisted with the ever-growing threat of the machine since the industrial revolution[1113], and in this area a UBI might be useful in countering the well-grounded fears and anxieties associated with technology. Owing to the heavy competition with machines, one advantage for workers would be that a UBI would cover their basic needs, affording them a stronger position for negotiation with their employer, while providing them with a minimal income that could help to support them while transitioning from one job to the next when leaving one of these manual industries. The same applies in the

1112 Bastagli 2019: 100-101; 115-116
1113 Gentilini et al. 2019a: 50

context of existing social assistance schemes, for example in Europe, which would allow individuals whose jobs were automated to access healthcare or education. Depending on the characteristics of the UBI scheme, it might be sufficient to support other family members, particularly relevant for women in working-class communities, and strengthen their individual capabilities to receive a sufficient income independently from that of the breadwinner. In any case, social assistance schemes are crucial for enabling capabilities with advancing automation. A UBI, however, might place the cohesion of a society and the social contract at stake, as work, in accordance with the ethical point of reference, plays a key role in capabilities such as identity and receipt of co-mutual recognition. In that sense, the unconditionality must be acknowledged as critical, as, although an income would be provided, other capabilities facilitated through work would not be taken into account. Furthermore, the needs of ill or disabled people would still require additional measures as part of the social safety net. Conclusively, the implementation of a specific social assistance scheme or safety net is necessary for optimizing the opportunities of automation from an ethical perspective; however, a UBI, if provided unconditionally, would neglect the importance of work for a dignified life.

4.9.3 Educational programs and awareness campaigns

Education is a key feature in the capabilities approach to a dignified life, not only as its own capability but also in terms of accessing the labor market. To date, education has been one of the main drivers of wage inequality owing to the wage gap between those who have high school education and those with college graduation, which has doubled since 1980[1114]. In terms of automation, if a human worker's job is replaced by a robot, the human worker can return to school to retrain. Or, in the best-case scenario, the worker may anticipate their job loss and commence education prior to losing the job. This could be supported by government policy to benefit a dignified life.

For example, higher education institutes could start offering specific technology programs, such as AI programs[1115], that provide students with the skills necessary for current and future digital transformation. This would include training in human–computer communication and interac-

1114 Mann 2019; Moretti 2012: 107
1115 Cantú-Ortiz et al. 2020

tive design manufacturing. In addition, the interaction between organizations and academic institutions requires further attention, particularly in the context of such programs, as the dimensions affected are interdisciplinary, as correspondingly outlined above in the section on skill sets in today's labor market. These involve disciplines such as natural science, social sciences, arts and humanities, and health sciences.

Educational programs could provide policy with a tool and become increasingly important, as automation increases the skill premium, resulting in a greater share of people obtaining higher education[1116]. The increased use of robots has increased the competitiveness of the unskilled sector and will help to narrow the technology gap; meanwhile, however, it has exacerbated wage inequality, as unskilled workers are replaced or substituted by robots[1117].

The increased importance of digital skills has been recognized in the OECD's[1118] learning framework 2030, which regards digital literacy as a core fundamental competency for future education. Until recently, however, coordination between programs has been weak, with no globally accepted definitions of key concepts, such as digital literacy[1119]. Moreover, the impact of digital skill education programs has remained limited even as digitalization has accelerated. To address this issue, a coalition for digital intelligence, comprising the OECD, the IEEE Standards association, and the DQ institute in association with WEF, published a recently approved IEEE Standard for Digital Intelligence (DQ) framework for digital literacy, skills, and readiness[1120]. This standard established a common framework to coordinate global skilling efforts, which may be beneficial in enabling a dignified life for an increasing number of individuals.

The digital skills education focuses on eight competencies: identity, use, safety, security, emotional intelligence, literacy, communication, and rights. The competencies are elaborated across the three levels of citizenship, creativity, and competitiveness[1121]. The DQ framework has now been adopted by numerous government agencies, non-profit organizations, and schools[1122]. The program also has a strong awareness-building aspect as it

1116 Afonso/Forte 2021: 4; Prettner/Strulik 2020: 26
1117 Afonso/Forte 2021
1118 OECD 2022
1119 Jackman et al. 2021: 543-544
1120 IEEE SA 2022
1121 Singh Chawla 2018
1122 Jackman et al. 2021: 543-544

aims to empower one billion people and ensure that they receive adequate information and education on universal human rights and enable sustainable development of nations with more inclusive growth, well-being, and prosperity. The project seeks to work with stakeholders such as developers, initiative leaders, academic researchers, and educators. In this regard, this project's aims also enshrine an ethical agenda in addition to empowerment and upskilling by advancing an inclusive agenda. The mentioned skills may be beneficial from an ethical perspective, particularly given that they reinforce political rights, thus benefiting the capability to political control over own environment and affiliation.

In addition, civil society may be instrumental in educating and raising awareness in terms of the potentials and challenges that occur with digital transformation and automation, particularly with respect to rights. Civil society may be defined as social institutions that lie beyond the borders of households, the market, and the state[1123]. Traditional examples include not-for-profit organizations or charities, which are formed on a voluntary basis to address issues that have not yet been covered by state or market. Civil society plays a significant role in communities in terms of addressing unmet public needs—for example, by raising awareness of ethical issues in terms of technological advancement. In that sense, it also warrants the provision of policy guidance that specifically weighs the ethical advantages of machines automating "dull, dirty, and dangerous" work against large-scale job losses and unemployment[1124].

Regarding social contribution, it is also important to reduce the competitive factor in terms of automation so that workers still have the sentiment of contributing to the company's efforts, which is aligned with awareness and is further relevant to ensuring that the worker's voice continues to be heard in terms of political activities. The recent Amazon[1125] case offers a relevant example of how strikes can still help to exert pressure on corporate bodies to ensure that decent working conditions are maintained. In this regard, awareness with respect to political activity appears to be key, paired with educational programs that will allow workers to transition between jobs. In that respect, the manual labor industry has always been vocal in advocating for workers' rights, supporting the conditions beyond manufacturing itself (e.g., working hours, family time, and so on). In this regard, the political

1123 Lynn et al. 2022: 91-101
1124 Byard 2017
1125 Gurley 2022

voice is becoming increasingly silenced by advancing automation, which may affect working conditions in other sectors in the long term.

Furthermore, strengthened educational policy is important given that workers who find themselves threatened by automation are consistently less likely to participate in job-related education, independent of the specific welfare regime[1126]. In this regard, social assistance schemes would require the inclusion of educational programs, whereby chances of reintegration into the labor market could be improved, reinforcing the right to work and a sufficient income.

From the perspective of machines' increased decision-making capacity, AI literacy and awareness must be distributed so that workers can maintain their political influence and voice, not only with respect to working conditions but also in terms of the receipt of public services. Daily interaction with machines and robots, such as care robots, is also increasingly to be expected, requiring awareness and education. Furthermore, financial literacy is increasingly important given that additional income may be generated by suitable householding of finances[1127].

From an ethical perspective, awareness and education are also relevant in medical services, since health information is increasingly available and ADM regarding diagnoses will be available. The automation and transformation there will shift further toward interacting with telemedicine, which was enforced by the COVID-19 pandemic[1128], and machines to find solutions to health problems. Knowledge is thus required to strengthen the capability to bodily health.

In terms of communication automation, robots are increasingly responsible for distributing and creating content, which requires additional awareness and knowledge for the sake of political and social inclusion and the stability of a democratic system. In this regard, awareness campaigns and educational programs may affect our ability to maintain our "biopolitical potential of human communication", as the political discourse is threatened by the control of an ever-smaller group of people who understand how the algorithms work. In addition, mental health issues are on the rise owing to social media, another field in which civic society and educational institutions must increase their activity, particularly regarding the process by which the youth are socialized.

1126 Ioannidou/Parma 2022
1127 Demarco 2021
1128 Koonin et al. 2020

Adolescents should be made aware of health issues that may arise as a result of social media use, although these may also affect adults. Work on selfhood in the real world through real social interactions must also be incentivized for pedagogically valuable purposes as opposed to mere commercial values in addition to bolstering mental and cognitive health. All these efforts should be represented in educational policy, where digital skills affect everyday lives across all the specific contexts and capabilities mentioned.

4.9.4 Self-regulation

Self-regulation would delegate the responsibility to the private sector. In that respect, CSR, which may be understood as self-imposed standards set by companies seeking to implement fairness in their economic behavior, such as their working conditions or social aspects[1129]. The focus lies on the institutional responsibility of the private sector and the dimensions it affects—for example, the fulfillment of human rights is frequently demanded from companies on account of their power and influence in a globalized economic order[1130], and the right to work is enshrined in the Universal Declaration of Human Rights[1131]. In the context of potential lack of paid labor associated with digital transformation and automation, the private sector must face social responsibility in an environment in which fewer individuals can find suitable work[1132]. In this context, companies' calls to upskill employees become redundant when there are no jobs at all. Furthermore, transparency with respect to how automation technology is used is becoming increasingly important.

There is substantial debate over whether CSR is part of marketing and how it actually affects society or whether it is merely self-serving for corporates as an aspect of prestige, with the advantage of lower costs than traditional marketing activities[1133]. For example, CSR managers in the past have had a rather utilitarian perspective on job losses as a result to advancing automation[1134], with a relatively meager sense societal responsibility.

1129 Hilty/Henning-Bodewig 2014: 4
1130 Pogge 1998; Raith 2013; Kaufmann et al. 2014
1131 UN 1948
1132 Frey/Osborne 2017; Sachs 2019
1133 Michael 2003; Coelho et al. 2003; Donaldson/Fafaliou 2003
1134 Bhattacharyya 2021

Local-level firms providing education to individuals with respect to social dimensions and vocational training may be regarded as a manifestation of CSR[1135]. In that sense, automation, employment, staff training, and profitability may be regarded as interconnected when firms move toward the age of automation. In this regard, for example, companies may set up technical training on robotics and AI not only to train and upskill their employees but also to support local communities and schools with the necessary knowledge.

The corresponding term "corporate digital responsibility" (CDR) has emerged in recent years, highlighting the emerging responsibilities of companies regarding digitalization-related impacts, risks, challenges, and opportunities[1136]. Whether CDR should be considered part of CSR or regarded as its own topic, distinct from the traditional stakeholder approach, continues to be debated, as artificial/technological actors linked to digital technology and data would require different conceptualizations[1137]. To ensure a holistic approach to policy guidance in this research, however, CDR will be considered a part of CSR, comprising all levels of corporate responsibility[1138] and all domains of the Environmental, Social, Governance (ESG) framework.

CDR contains various topics that relate to education and automation. On the one hand, corporates are required to engage in digital empowerment, which includes the ever-evolving skill of digital literacy[1139], while on the other hand, they must engage in awareness-building. This involves more democratic corporate processes on the part of employees using digital tools[1140] and the nurturing of awareness and education by creating well-educated digital citizens who are empowered to contribute to a more ethical, safe, and responsible digital environment[1141].

Specifically, with the rise of automated systems, students and workers must be prepared by modernized education systems that encourage them to obtain sought-after skills and competencies rather than specific academic degrees[1142]. Company policies on retraining and redeploying employees

1135 Ure/Skauge 2019
1136 Herden et al. 2021: 14
1137 Lobschat et al. 2021
1138 Caroll 1991
1139 Hill et al. 2015: 415
1140 Burnett/Lisk 2019
1141 Heick 2018
1142 Chamorro-Premuzic/Frankiewicz 2019

that are subject to automation systems could ensure productivity, economic growth, and the creation of new jobs in this regard. This "socially compatible automation" is further represented by organizations' responsibility to ensure that new roles are created with new emerging technologies and that humans retain their value in the future. In that sense, they must also be prepared in advance for such business shifts and technological changes[1143].

In addition, corporates may have a responsibility for fostering trust with society, and societal fears surrounding AI automation and job losses may be alleviated by "fairer access for all", showing more transparency when using these technologies[1144]. In that regard, increased productivity through AI and economic growth arising from innovative endeavors can benefit society. Another term to have recently emerged is "technological social responsibility" (TSR), which considers the importance of social stability, prosperity, and cohesion[1145].

In terms of manual labor industries, corporates are frequently called on to take responsibility and an active role in furnishing employees with transferable skills that equip them for a working life after their jobs have been automated, allowing them long-term access to the labor market. This would also prepare them for transitioning between jobs. Selecting suppliers based on maintaining labor standards that include access to further education is thus crucial with respect to CSR area in the manual industry[1146], which also requires awareness on the part of the consumer, including the consumer's attitude when purchasing goods[1147].

One important aspect with respect to the mentioned standardization and connected "democratization" of financial services, as discussed above, is financial literacy (i.e., education regarding how to manage one's finances). As the educational system in most parts of the world is hesitant to prepare individuals and citizens for managing their finances properly, this skillset will become increasingly important, and provide opportunities owing to the lower maintenance costs of financial products as a result of advancing automation. An increased educational standard for ordinary citizens will also enhance the financial system's political control owing to the influence of votes, as more people will understand and observe the background of

1143 Bean 2017
1144 Elliot et al. 2021: 185; Pasquale 2020
1145 Polak 2021
1146 Xu et al. 2013
1147 Goyal/Kumar 2017

the machinations in the industry. Moreover, it would support citizens in managing their economic risks more appropriately[1148]. This would also lead to greater pressure to provide the necessary conditions that humans require to live with dignity. In that sense, the first step in such a development and "democratization" would be improved wealth distribution. As the financial sector has a rather indirect influence on the state of the economy by financing other services sectors, CSR constitutes an important tool for assessing whether certain technology projects should be financed. Historically, the financial sector has performed poorly in terms of sensitivity toward labor issues[1149], and thus the situation has improved in this regard.

Media corporates and social media corporates must assume responsibility, particularly for the sake of democratic stability from an ethical perspective. Moreover, they must be transparent with respect to how they use AI and machine learning technologies and how the algorithms work. For example, companies providing metaverse services and environments must be addressed by CSR demands and regulated, as they can represent human, social, and consumer elements[1150]. This applies to codes of ethics in the virtual world, tax questions, land ownership, and how the particular currency used in a given virtual environment should be handled. In the medical field, corporates are responsible for ensuring transparency around how they use robots and automation technology, not least for patients' relatives. This is within the remit of meeting the patients' needs paired with the call for accountability for actions taken by a medical provider[1151]. In terms of CSR, legal companies must be transparent regarding how they use technology, particularly if they have an influence on government legal decision-making. Correspondingly, assessments must be conducted as to how the deployment of a specific automation technology might affect how the government is influenced, specifically with respect to biases toward certain groups of people. This is particularly important in preventing discrimination.

In terms of CSR, for example, the mining industry has projected an overwhelmingly positive narrative around automation technologies and their economic benefits, having invested heavily in them[1152]. Nevertheless,

1148 Arthur 2012: xi
1149 Weber et al. 2014
1150 Papagiannidis et al. 2008: 618
1151 Russo 2016: 332
1152 Keenan et al. 2018

how these technologies are experienced by the local communities most immediately affected requires further attention, and companies must understand the social impacts that the deployment of their technologies have and provide assurance that their use will not risk host communities. The employment of new technologies is generally sold as overwhelmingly positive by mini executives positioning the industry as progressive, primarily through the adoption of accelerating innovation that can make mining safer and more energy efficient[1153]. In addition, the narrative frames these technologies as enhancing these companies' sustainability credentials by supporting environmentally friendly operations[1154]. Nevertheless, this would require due diligence[1155] whereby companies should, at a minimum, self-responsibly check their efforts in tandem with using international CSR instruments to evaluate the resulting social impact, including environmental standards[1156] and working standards[1157].

Self-regulation appears to be an insecure policy instrument from an ethical standpoint, since it leaves all freedom to the market and the companies themselves. Companies may start educating their employees as part of CSR, but it is largely undertaken out of self-interest—that is, for profit[1158]. In this regard, it remains unclear whether the education provided will help workers on the labor market once the job has been automated. In addition, corporates have not been transparent in the past when it comes to revealing how algorithms are deployed[1159]. Consequently, CSR does not appear to be suitable as such for the support of capabilities when human labor is increasingly automated and work is increasingly fulfilled by automation technologies (i.e., ADM).

4.9.5 Technology restrictions

One approach would be to ban the use of automation technologies, either partially or completely[1160]. Moreover, the employment of technologies could be restricted so that their use only contains algorithms that have been

1153 Jurgens 2017
1154 O'Neill 2015; Resolution 2022
1155 Keenan et al. 2018: 753-759
1156 IAIA 2015; IFC 2012; UN 2011
1157 ILO 1993
1158 Jarvis 2019
1159 Collins 2021
1160 Meier 2022

proven from an ethical perspective to serve the benefits of humanity and respect human rights (i.e., the dignity of every human being) rather than being purely efficiency-driven and serving the interest of a few technology corporations.

From a legal standpoint, much discussion has surrounded the question of whether the use of automation technologies should be regulated to ensure that transnational corporations respect human rights[1161]. One of the demands may be that global institutions, such as the World Bank, adopt policies that limit loans for development projects that use products that could negatively affect human rights through the application of AI.

In that sense, legal action may also be taken to impose asset freezes or travel bans for transnational corporations that cause or perpetrate human rights abuses through AI, and laws may be used as a deterrent and an instrument for accountability. In that context, increasing regulation, particularly incorporating the human element, appears to be increasingly essential as the legal profession and legal field itself moves ever further toward the use of automation technologies, bringing underlying risks connected to the technology itself[1162]. Consequently, in the legal field, attention should be directed toward the application of these technologies, as this would have a broader impact on their use in other sectors as well. From an ethical perspective, capabilities affecting political rights may benefit from such restrictions.

Total bans on technologies (i.e., prohibiting their employment in specific sectors or applications) can be found in other areas, such as environmental protection. For example, the aim of reducing greenhouse gas emissions led to discussions on banning internal combustion engine vehicles[1163] in favor of electric energy technology. Regarding automation technology, bans are frequently discussed in the context of weapons, and recently the discussion has intensified around the question of whether AI should be banned when using lethal autonomous weapons systems (LAWS), which may increasingly take decisions on hurting or even killing suspects[1164].

Another means of confronting this challenge would be an "ethics of care"[1165] that focuses on the critical understanding of the relevant datasets.

1161 Schwarz 2019
1162 Soukupova 2021
1163 Meckling/Nahm 2019
1164 Lauwaert 2021
1165 Asaro 2019

This might include how data are collected, biases and social structures that might be embedded within these data, and potential consequences of prejudging people according to statistical patterns and categories. This would support the restraining of automation, which would aim to control, stigmatize and cheat innocent people. There remains greater potential for public discussion regarding the role of machines and software in ordering human affairs[1166]. Nevertheless, the efficacy of restriction seems to depend based on the specific task at hand. For example, in manual labor, inventions benefit workers by making work safer and they may also benefit the environment. In that regard, a regulatory restriction would only make sense if corporates begin to use technology to abuse workers or do not use technology to improve working conditions. In the financial industry, the implication of restrictions currently seems unclear. Some approaches for example, aim to build human-level AI that will provide a clear structure to automation technologies as to how to serve humankind[1167], which may be relevant owing to the influence of the financial sector on wealth distribution.

In terms of communicative labor, restrictions are helpful as private information may be used to manipulate human relationships through bots, while technology corporations make vast profits by transforming individuals into unpaid products[1168]. In that sense, a ban on the employment of automation technologies in social media and communication may be necessary, as individuals are performing unpaid labor by providing time, creativity, and content in the form of data, which is problematic from an ethical perspective. In general, privacy rules and regulations are an important aspect of restricting technology use to ensure human agency. Respectively, the legal and public sectors may be charged with regulating and controlling the usage of automation technologies, while themselves being affected by automation and fewer government employees. In the spirit of equity, technology restrictions should specifically counter discriminatory biases, which, for example, could affect the capability to enjoy freedom from unwarranted search and seizure.

1166 Pasquale/Cashwell 2015
1167 Lab42 2022
1168 Meier 2022

One step might be to rely on "open source" software, whereby all actors would be able to observe how bots work[1169]. Moreover, technology restrictions could prevent robot vulnerability to hacking and cyber-attacks[1170].

Conclusively, more technological governance and restriction is required, particularly to prevent biases when providing services, such as in health and social media areas, but also in the context of the automation of rule of law. In this regard, restrictions may help to enforce a more humane treatment by robots, secure political rights, and save lives, for example, regarding autonomous weapons. In social media, technology restrictions must ensure that technologies do not foster consumer addiction or maximized screentime[1171] by keeping users hooked, which would negatively affect their mental health.

4.9.6 Taxation

The question of whether taxation might help as a policy instrument in terms of steering the effects of advancing automation has been the subject of considerable discussion. On the one hand, ideas have been proposed with respect to tax automation technologies like robots (i.e., their usage in production processes), and on the other hand, through a progressive wage tax that would mainly affect those who are still employed in an increasingly automated labor market[1172]. Likewise, a capital tax is discussed below. In addition, the decreasing costs of automation technologies have generated interest among policy makers in changing the tax system, particularly as an alternative, to complete investments in education and training, or to enhance social benefits[1173], which may be beneficial from an ethical perspective. Furthermore, under the current tax system, a drop in automation costs could generate a large rise in income inequality and a decline in welfare for those working in routine occupations[1174]. Taxes are considered a key element in the achievement of global justice[1175]. Specifically, tax dodging leads to severe inequality on a local, national, and supranational level.

1169 Keogh/Henry 2016; Jakku et. al 2019
1170 Sparrow/Howard 2021: 828-829
1171 Lewis 2018
1172 Prettner/Strulik 2020
1173 Abbott/Bogenschneider 2017
1174 Guerreiro et al. 2022
1175 Pogge/Mehta 2016; Murphy/Nagel 2005

Outflows may be reduced through structural reforms and improved policies at the national level, and in addition, through modifications of existing supernational fiscal and financial arrangements[1176], in particular, multinational use differences in local tax systems to avoid taxation on their services in developing countries[1177]. This may be an issue in terms of funding the additional social assistance required to support a dignified life.

Generally, automation has the potential to significantly reduce government tax revenue, since most comes from labor-related taxes and therefore, when firms replace employees with machines, the government will lose out on taxation[1178]. This is enforced by higher productivity—i.e., capital for corporates—while fewer people are employed at the same time. This may be illustrated by the differences that emerge retrospectively from recent decades. In 1990, the three largest corporations in Detroit had a combined market capitalization of 36 billion USD, while employing 1.2 million workers. A mere 24 years later, in 2014, the three largest companies in Silicon Valley combined a market capital of 1.09 trillion USD and employed only 137,000 workers[1179].

In that sense, considerable portions of fiscal solvency may decrease owing to reduced tax revenue[1180]. The current tax system is formulated to charge labor and not capital, so tax schemes may lead to situations wherein companies opt for human workers. In this sense, with robots there is considerably less tax per amount produced compared to an automated worker, which encourages automation by providing employers with preferential tax treatment for robot workers. Consequently, automation allows firms to avoid employee and employer wage taxes on the federal, state, or local levels. In addition, firms are permitted to claim accelerated tax depreciation on capital costs for automated workers and creates various indirect incentives for machine workers. Tax policies may thus generate situations wherein firms may favor automation over human workers. This would be one reasoning behind robot taxation, as companies could bypass the employee and employer wage taxes demanded by authorities[1181]. Since technology corporations are increasingly accumulating capital[1182], taxation

1176 Pogge/Mehta 2016: 1-2
1177 Corrick 2016: 173-174
1178 Abbott/Bogenschneider 2017
1179 Manyika/Chui 2014
1180 Abbot/Bogenschneider 2017
1181 Ionescu 2019
1182 Manyika/Chui 2014

on capital is becoming more important as a means of providing for larger portions of the population, including when it comes to framing a suitable educational policy. This would also support the use of the capitalization effect of automation[1183] (automation leads to new services and goods demanded from a market perspective and therefore creates new jobs), and so capital accumulation may be reduced while investments are held back.

4.9.6.1 Robot and digital taxation

Robot and digital taxation may thus be beneficial in supporting a dignified life, to compensate for government revenue to support education and social assistance schemes but also to supervise processes and ADM, for example, in the provision of health services. Furthermore, taxation of robots would facilitate societal benefit from enhanced productivity as opposed to simply benefiting private corporations when work processes are automated.

In certain sectors, such as the manual labor industry, robots can have a positive impact on workers' health. In that sense, it is necessary to adopt a balanced view as to whether taxation would harm positive innovation from an ethical perspective. Nonetheless, in a completely automated value chain, robot taxation may be a suitable measure since revenues can be generated without the need to pay wages. Thus, the tax system, which still focuses on taxing wages, should also shift its focus so that although human work would generate lower wages, access to a sufficient income could be improved through tax exemption.

In the financial industry, taxation of bots may be beneficial in supporting additional funding of social assistance, etc., as trade activities will also significantly involve lesser human workers[1184]. In that respect, value chains that can autonomously gain profit on the capital markets through investments, without any taxation on these tools, should be prevented, as this would even further promote social inequality.

Robot tax is of critical importance to the automation debate, as tax policies should not encourage automation unless there is a deliberate strategy based on sound public policy[1185], which is the case in the current system, which taxes labor. In that context, another solution would be to adjust the

1183 Schwab 2016: 37-43
1184 Hsu 2012
1185 Abbott/Bogenschneider 2017

system so that it would be "neutral" between robot and human workers[1186]. This would be connected to a change in tax policies to compensate the loss in government tax revenue attributable to automation, which would help to finance education and social benefit programs[1187] relevant to ensuring a dignified life.

A different approach that may help make up for losses in governmental revenue as a result of labor taxation would be to implement digital taxes that mainly target technology companies and differentiate them from traditional businesses[1188]. Digital taxation could apply a framework in which neutrality is aimed at different types of business. Digital businesses have benefited largely from preferential tax regimes in recent decades owing to missing regulatory requirements in the age of digital transformation. They include, for example, tax advantages for income earned from intellectual property, shorter amortization for intangibles, or R&D tax reliefs. Another advantage that digital business enjoy is the possibility to operate without maintaining a physical presence in countries by serving customers through remote sales and service facilities. This allows profits through cross-border sales without a physical presence that challenges the traditional corporate income tax rule. Hitherto, corporate taxes have only been paid by digital businesses in those countries in which they had a permanent establishment—for example, a headquarters, factory, or storefront. In that sense, when online users are located in other countries, there are no taxing rights over the firm's income.

The current lines of the OECD-Inclusive Framework (IF)[1189] aim to change the distribution of tax revenues paid by digital enterprises, whereby countries imposing low corporate tax and with investment hubs are likely to lose revenues as fewer profits will be directed toward them[1190]. Thus, countries in which multinational enterprises are not headquartered but which serve customers would likely receive revenues from the reallocation.

1186 Meisel 2013; Ford 2009
1187 Abbott/Bogenschneider 2017: 151-152
1188 Merola 2022
1189 OECD 2021
1190 Merola 2022: 6-7

4.9.6.2 Progressive and capital taxation

Another alternative to robot taxation would be progressive wage taxation, leading to reductions in higher education and growth through reduced supply of high-skilled labor, as opposed to a robot tax that would reduce demand for machines and growth through diminished R&D[1191]. This approach, which may be regarded as a wage subsidy for low-income workers, could be combined with a cut to payroll taxes, which overly burden low-paid workers, while increasing taxes on the richest (i.e., high-skilled) labor remaining in the market[1192]. This shortcut to making human labor cheaper could reduce inequality in the short term but would likely slow down productivity in the long term, as it preserves unskilled labor employment, which is less productive than robot labor. Thus, a balancing of trade-off effects in the long and short terms is required from a policy perspective[1193].

A different approach would be to tax capital rather than wages[1194]—namely, to tax return on financial investment. Classic economic literature rejects the notion of taxing capital income as inefficient with few benefits, mainly owing to the fact that capital is "mobile" and offers abundant offshore moving opportunities[1195]. Tax authorities have a restricted influence over capital, and taxing capital would discourage savings[1196].

In general, capital tax rates are typically lower than the rate on labor income, which may become increasingly relevant when fewer individuals are able to convert labor income into capital income[1197]. In that sense, those taxpayers who receive income from capital benefits based on the current tax system, including those who receive business profits[1198], would be targeted by an increasing capital tax rate.

Conclusively, robots and automation technologies may be treated as capital or labor. If they are replacing labor and classified as such, they should be classified correspondingly. Nevertheless, the taxation of capital may offer a viable approach to robot taxation, as high labor taxes have generally

1191 Prettner/Strulik 2020: 264
1192 Merola 2022: 7
1193 Berg et al. 2021
1194 Mann 2019
1195 Zodrow 2010
1196 Block/McBride 2012
1197 Banks/Diamond 2008: 3, 27
1198 Mann 2019

been blamed for unemployment, particularly in developed countries[1199]. In this regard, changing the taxation of capital toward the approach of taxing labor may resolve the robot tax issue in two respects[1200]: first, taxing capital at higher rates confronted by labor would raise revenue; and second, taxing capital at the same rate as labor would eliminate the tax-induced preference for capital investments, which involves investment in automation technologies, such as robots. In that regard, taxation may emerge as a useful instrument in the future in terms of facilitating a dignified life for an increasing number of individuals when governmental activities in terms of social assistance and educational policies require additional funding.

1199 Radu et al. 2018: 687-689
1200 Mann 2007