AI and Digitalisation's Impact on EU's Future Labour Market: Scenarios and Implications

CHAPTER 10

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Robin Teigland and Mikael Wiberg

We are living in a time of wicked problems and turmoil. Global climate change, hunger, poverty, and ongoing wars are affecting the entire world's population, economy, and human living conditions. In times of such global unrest, international exchanges, multicultural encounters, and trade are on the decline. However, our research and that of others also point to the transformative nature of modern information technology (Teigland et al., forthcoming; Wiberg, 2004). Digital technology applications, such as virtual worlds and industrial metaverses, can open entirely new ways of communicating and connecting, while other digital technologies, such as the Internet of Things (IoT), additive manufacturing, and

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more recently generative AI, are expected to have a significant impact on the EU's workforce in the future.

The implementation of AI and digital technologies has implications for productivity and job relocation and creation, which has consequences for this book's theme—the European Union's depth and breadth. While many would like to paint a positive picture of a productive EU with a human-centred workforce and new industries creating a prosperous and sustainable future in the wake of AI, a more challenging and less rosy future EU is also emerging. This future is marked by increasing geopolitical instability, social polarisation, and a global climate emergency. Thus, we have decided to address the following overarching question in this chapter: *What impact will AI and digitalisation have on the EU labour market, and what might the consequences be for EU depth and breadth?*

During the past twenty or so years, considerable research has been conducted on the development, implementation, and use of digital systems. Numerous scholars have investigated the relationship between the use of digital technology and its effects on the labour market (e.g., Arntz et al., 2019; Bührer & Hagist, 2017; Vasilescu et al., 2020). However, there is still great uncertainty about where this development will ultimately lead. What will the EU look like a decade from now? What role will digital technology and AI play? And what alternative paths forward can we foresee? In this chapter, we aim to offer a glimpse into the future through a method known as "disciplined imagination" (Weick, 1989) where we first construct theories about the future and then present four possible alternative future scenarios.

This chapter is structured as follows. We begin with a background exploring the effects of digital technology on the EU labour market and industries. Next we present a scenario matrix with four alternative but equally plausible future scenarios for the year 2035. We conclude with some policy recommendations that we believe can lead the EU towards a more positive future.

AI, Digital Technology, and the EU Labour Market

Over the past few decades, digital technologies have driven a profound transformation across industries. In particular, the manufacturing sector has increasingly replaced human labour with robots. However, the overall impact of automation on the labour market has varied across countries. For instance, research in the U.S. has shown that each industrial robot

led to the loss of approximately six jobs and widened income inequality (Acemoglu & Restrepo, 2018, 2020). In contrast, a similar study in Germany found that only two jobs were lost per robot, with new positions—particularly in business-related services—compensating for these losses (Dauth et al., 2021). Germany's relatively neutral effect is thought to result from robust in-company retraining programmes and the nation's strong global market position, which allowed productivity gains to translate into increased world market shares (BMWK, 2022).These findings align with the broader view that, so far, technological advancements have adhered to Schumpeter's concept of creative destruction, wherein more jobs have been created than eliminated due to technological progress (Balsmeier & Woerter, 2019).

It is crucial to note the recent shift in the type of labour being augmented. During the industrial revolution, machines enhanced human physical labour, mechanising skills far beyond human physical limits. In the mid-2020s, however, we are amplifying cognitive, knowledge-based work through digital technologies, expanding the human mind's capacity far beyond its natural limits (Ramirez, 2023). Indeed, Professor Douglas Engelbart was an early visionary in this field. In the 1960s, he presented the scientific article "Augmenting the Human Intellect," in which he highlighted what could be achieved with computers (Engelbart, 2023). Fifty years later, a landmark study by Frey and Osborne (2017) analysed 702 US occupations and estimated that 47% of total employment was at high risk of automation within the next one to two decades.This study categorised jobs into four types: routine manual (e.g., welding machine operator), routine cognitive (e.g., bookkeeper), non-routine manual (e.g., personal care assistant), and non-routine cognitive (e.g., engineer). The key insight was that the implementation of digital technologies tends to lead to "routine-biased technological change," where routine tasks—both cognitive and manual—are more likely to be automated than non-routine tasks (Acemoglu & Autor, 2011; Spitz-Oener, 2006). Recent research, however, found a net positive employment effect from digital technology adoption in Switzerland as the increased demand for high-skilled workers more than offset the employment decline for low-skilled workers (Balsmeier & Woerter, 2019).This was primarily attributed to firms that implemented machine-based digital technologies, such as robots, 3D printing, and IoT, rather than those adopting non-machine-based technologies, e.g., ERP, e-commerce systems.

But what about AI and in particular generative AI? A study investigating customer service agents in the workplace found a 14% productivity increase due to the introduction of a generative AI-based conversation assistant, while an experiment-based study of management consultants found a 17–43% increase (Dell'Acqua et al., 2023). In addition to increasing productivity, AI may also create new jobs (Ernst et al., 2019; Petropoulos, 2018) and may even impact labour unions (Nissim & Simon, 2021). Further on, The World Economic Forum estimated that even though AI may replace 85 million jobs worldwide by 2025, it may also create 97 million new ones (World Economic Forum, 2020). A study of online vacancies in the US from 2010 to 2018 did find that AI is substituting humans in a subset of tasks; however, the study did not detect any aggregate labour market consequence. Still, it is too early for conclusive findings (Acemoglu et al., 2022), especially since generative AI has taken the stage with researchers suggesting that not only are highly educated, highly paid, white-collar occupations the ones most exposed (Felten et al., 2023) but that AI job and skillset replacement may already be occurring (e.g., Berger & Frey, 2016; Cazzaniga et al., 2024; Damioli et al., 2021; Gallego & Kurer, 2022).

Thus, the assumption that tasks of a more creative/more complex nature are in the low-risk category seems to no longer hold. Indeed, the jobs under discussion tend to involve tasks that non-machine-based digital technologies could substitute as jobs such as software engineers, media content creators, paralegals, market analysts, teachers, financial advisors, and customer service agents are all being transformed (Zinkula & Mok, 2024). Further, generative AI models and agentic workflows are being developed for advanced cognitive tasks within particular content domains, such as drug discovery, and in the future multi-agent systems may be able to prompt each other iteratively and autonomously. As of the mid-2020s, these jobs still require the human at the start to create and enter the correct prompt into generative AI models and at the end to evaluate and edit the AI-generated content. Thus, many are concluding that the need for humans will remain for some time as the focus moves from task automation to task augmentation. "AI is not going to replace humans, but humans with AI will replace humans without AI" and that perhaps creative generalists and those skilled at integrative sensemaking will be more embraced than specialists in one field (Lakhani & Ignatius, 2023).

The challenge is that this technologically induced change may lead to an increasing polarisation or "hollowing out" of the labour market,

as documented in the United States and Europe (Autor et al., 2008; Goos & Manning, 2007; Goos et al., 2009). Job polarisation is argued to have already started in the 1950s in the United States due to the decline in manufacturing with middle-wage workers losing both in employment and average wage growth compared to low- and high-wage workers (Bárány & Siegel, 2018). The primary argument today, however, is routinisation, i.e., that jobs that are of a more routine nature are more likely to be automated, and these jobs tend to be in the middle of the qualification and wage spectrum. More highly qualified people conduct more non-routine tasks, while those at the other end of the spectrum tend to be without any formal training and perform non-routine manual tasks that are either difficult to automate or routine ones that are too expensive to automate. As those who hold middle-wage jobs reallocate to low-wage sectors, there may be increasing pressure to keep wage levels low, leading to little economic incentive to automate tasks with existing technology or to innovate new technology.

Increasingly relevant to the situation of the 2020s is the argument that job polarisation is also due to structural transformation in which jobs shift from one sector to another—from agriculture to manufacturing to services, due to unbalanced technological progress across sectors (Bárány & Siegel, 2018). For example, between 1975 and 2010 in Germany with its heavy manufacturing focus, the percentage of the work force in the middle-wage category of production, operation, and crafts fell from around 55 per cent to 35–40 per cent with many jobs shifting to the service care sector (OpenMind, n.d.). As automation continues and increasingly replaces low-skilled service jobs, e.g., self-checkout kiosks, warehouse logistics, and customer service, the question is also to what degree this labour shift will influence income inequality due to lost wages. For example, over the last four decades in the United States, automation has accounted for more than half of the income gap increase between more- and less-educated workers (Acemoglu & Restrepo, 2022).

While AI and machine learning receive the most attention, other digital technologies are also influencing jobs and the labour market. In fact, we are moving away from an understanding of computing as a general-purpose technology (Balsmeier & Woerter, 2019; Brynjolfsson & McAfee, 2014) towards "particular-purpose technologies" where it matters how the technology is actually used in practice. In the mid-2020s, digital technologies are for instance used in various contexts for (1) connectivity and computational power through cloud technology,

internet-of-things, and quantum computing; (2) human–machine interaction through virtual and augmented reality, robotics and automation, and autonomous vehicles; and (3) advanced engineering in manufacturing and healthcare through additive and subtractive manufacturing (e.g., 3D printing), renewable energy, computational biology, and smart materials. Together these technologies may lead to entire professions disappearing over time while machines and AI will replace tasks formerly performed by humans. However, new professions and job tasks will emerge and may even lead to an enormous shortage of skilled workers, i.e., precisely the opposite of mass technological unemployment (Varian, 2020). For example, new jobs such as robot personality designer, cloud security guard, and DNA coach have been suggested. The hope is that similar to all previous technological shifts, aggregate labour demand will not show any technologically induced downward trend while a rise in labour productivity will translate into long-term increases in real wages and living standards. However, the challenge is how to avoid a mismatch in skills on offer and those in demand as well as to avoid continued rising wage and income inequality (BMWK, 2022). Questions abound such as which tasks will be replaced by digital technologies that were until the 2020s shielded, how can we ensure that the skills offered match those demanded, and finally how do we hinder job polarisation and income inequality?

All these questions are of relevance to the future of the EU's labour market. However, it seems that either the time horizon on most politicians' minds and that of others is a shorter one of two to three years that looks only at digitalisation's direct effects and not within a greater, longer-term context or they are discussing the "end of the world" due to AI. To better understand the indirect effects of the influence of digitalisation on EU's depth and breadth, it is thus important to enable a critical discussion at a collective level. One such means is through scenario thinking presented in the next section.

Year 2035—Four Scenarios and Implications of AI and Digitalisation for EU's Labour Market

One means for organisations and individuals to prepare for the future is through a critical collective discussion of future scenarios. Scenarios enable envisioning a range of future potential alternative futures, and scenarios are particularly relevant in periods of significant uncertainty and change. One tool for developing scenarios is the scenario matrix—a 2 ×

2 matrix wherein each axis represents a critical uncertainty, i.e., a pivotal driving force of high uncertainty related to which direction the force will go while wielding the greatest influence over the unfolding of the future. A scenario matrix facilitates the development of four distinct yet equally plausible visions of how the world might evolve, prompting consideration of the opportunities and challenges inherent in each scenario. It is essential to recognise that there is no single "correct" scenario, as the actual future often incorporates elements from multiple scenarios. However, it is intriguing to apply this approach within this chapter to gain deeper insights into how various future scenarios could shape EU's trajectory in terms of its breadth and depth and its labour market.

To create our scenario matrix, we project ourselves to the year 2035. Looking ten years ahead enables us to break free from the situation in late 2024, yet it is not so far into the future that it is difficult to predict. For the two critical uncertainties, we chose (1) the purpose of digital technologies with the axis ends as "technology for exploration" vs "technology for efficiency" and (2) the geopolitical will to integrate with the axis ends as "no will to integrate" vs "full will to integrate." Together these axes create four distinct future scenarios that lead to significantly different EUs and thus four distinct labour markets.

As for the first axis of the purpose of digital technologies, we base this on the well-known concept of exploration-exploitation (March, 1991). The exploration-exploitation concept embodies a paradox as it entails a delicate balance between 1) exploration, i.e., embracing uncertainty and discovering innovative solutions by seeking new opportunities and experimenting with new ideas, and 2) exploitation, i.e., maximising efficiency through refining and optimising existing processes, products, and strategies by leveraging established knowledge and practises. This paradox highlights the challenge of simultaneously fostering innovation and efficiency as organisations must navigate between embracing uncertainty and leveraging established practices to survive in the evolving landscape. In our context, we suggest that organisations can choose to use digital technologies primarily for exploration or for exploitation, and these choices would greatly influence the future of work and the labour market. Further, digital technologies, such as AI, can enable trade in new products and industries, which are largely beyond the control of politicians (Sjöholm, 2023).

For our second axis, while there are many forces influencing the EU and the labour market, one of the most significant is the geopolitical

will across countries to integrate as this force influences the mobility of goods and services, capital, and labour as well as the emergence of cross-border industries and standards (Sjöholm, 2023). For example, due to international trade policy such as China joining the WTO, world trade increased exponentially during the past two to three decades. However, this increasing integration also led to a significant number of manufacturing jobs moving to low-income countries. For example, in the United States, import competition accounted for around 25 per cent of manufacturing job decline during 1990–2007 and falling wages (Autor et al., 2013). Since the financial recession of 2007, we have seen the geopolitical integration pendulum start to swing the other way as the world has experienced a decline of global trade from 60 per cent of world income since its peak in 2007 while foreign direct investment as a share of gross domestic product has fallen to below pre-1970 levels of around 0.5 per cent (Sjöholm, 2023; World Bank Group, n.d.). Contributing factors include the pandemic's aftereffects on supply chains, populist-driven manufacturing and trade policies, and war. Looking into the future, however, one could imagine that the climate crisis and the desire to create a sustainable future encourage the pendulum to swing back. As such, it is highly uncertain as to which way this force will go.

Combining the axes leads to four distinct scenarios (Fig. 10.1): (1) Race to the Bottom: China in EU Driver's Seat, (2) The Wild West: EU in Total Disarray, (3) Circularity: EU as a Sustainable and Resilient Island, and (4) A Transformed World: The Sky is the Limit. Below we present our scenarios grounded in current events that signal a possible trajectory towards a respective future.

Scenario 1: Race to the Bottom: China in EU's Driver's Seat

In this scenario, all great and small world powers have realised that the only means to tackle global challenges is to align their efforts and ensure a focus on efficiency and economies of scale. China fulfilled its 2017 plan to become the world leader in AI by 2030, and it was able to influence the geopolitical scene and global ethics to move AI's development towards efficiency and surveillance. The EU with China and USA managed to encourage Russia to cease the Ukraine war and to agree to avoid conflict in the South China Sea. Further, China took the lead in tackling the threat of a global recession in order to avoid the growing civil unrest in

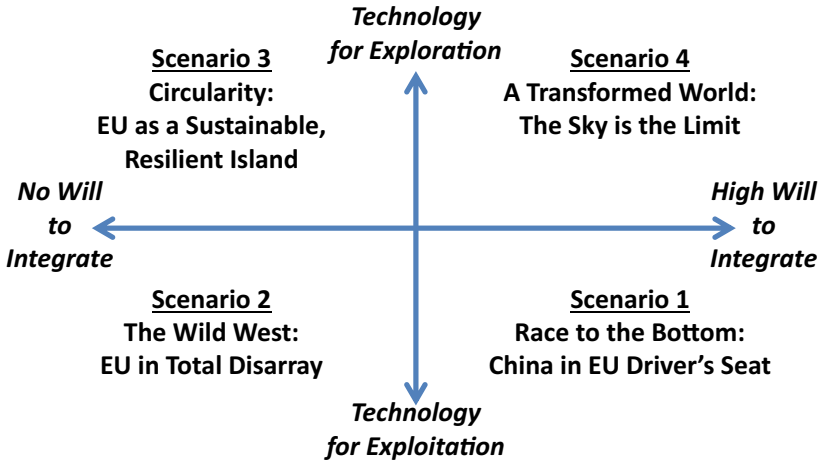

Fig. 10.1 The year 2035: Four alternative futures for the EU

the urban population that had increasingly taken root, as in 2025, 21 per cent of individuals from 16 to 24 were unemployed.

As to climate change, countries began removing all waste throughout global linear supply chains. In 2025, huge resource inefficiencies existed, and 70 to 80 per cent of all resources extracted for the manufacture of goods, services, and food was wasted. To avoid depleting Earth's resources, the great AI superpowers of USA and China decided to "divide" the world and leverage AI to create extremely controlled and efficient centralised manufacturing systems to reduce waste in extraction, manufacturing, transportation, and mechanical recycling. USA focused on the Americas while China took control of Asia, Africa, and Europe.

One reason for this East–West division was that during the 2020s, USA and China outcompeted all other countries in the quantum computing race and developed significant computer processing power with real-time prediction. These two countries were the only ones able to access the necessary competence, data, and natural and financial resources to deploy quantum computing. Thus, China's long-term geopolitical influence in Africa paid off as it provided the country with control over natural resources, such as helium in Algeria that was used for cooling in quantum

computing, as well as with data due to China's extensive telecommunication and remote sensing satellite systems built up through international cooperation guided by the China Academy of Space Technology.

In Europe, Chinese companies grew exponentially due to the Chinese state's computing power and data and their ability to leverage AI to monitor, predict, and influence consumer behaviours. As a result, barriers to entry for new more innovative and productive companies continued to rise, and entrepreneurship became a thing of the past. Further, smaller European companies were outcompeted, forcing them to reduce headcount as they did not have sufficient financial resources to either build their own quantum computer systems or buy/rent from others nor did the EU manage to create a significant counterpart. Additionally, the larger B2B and B2C multinationals of the 2020s were squashed by Amazon and Alibaba that controlled a new era of semi-global production chains comprising extremely highly specialised independent manufacturers. China's extensive investment in autonomous, electric vehicles, e.g., trucks, warehouse forklifts, self-driving cars for the last mile, along with vehicle-to-vehicle communication and the required infrastructure and logistics services paid off in Europe. China and USA together also developed autonomous container traffic enabling sustainable transportation across global production chains, leading to increased global trade with countries trading more in inputs than in finished products.

Due to this focus on routine-biased change and AI-driven global efficiency, individual job losses resulted in the middle of the skill and wage scale without any new or complementary jobs being created in the middle. This led to long-term unemployment and an involuntary exit of many from the labour force. This hollowing out led to all new jobs being created in the high tech/AI content jobs or in low-skill jobs. As a result, job polarisation greatly accelerated across the EU with countries developing vastly different profiles due to the inability to mitigate a mismatch of labour within the EU. While many people in 2025 had predicted a labour shortage of competent tech skills, advances in generative AI had significantly improved the productivity of high tech/AI skill workers. Together this resulted in increased income inequality despite real wages falling across the EU. Thus, as predicted in the 2010s, the workforce was divided into two categories: those who command the robots and those who the robots command.

High-skill tech/AI jobs in the Nordics and Germany revolved primarily around mining and manufacturing and included tasks related to industry

6.0 for specialised manufacturing by medium-sized firms, autonomous vehicles for warehousing and logistics/transport, and data infrastructure for monitoring and predicting consumer behaviours. In Central and Southern Europe, high-skill tech/AI jobs revolved around using IoT, remote sensing, and advanced analytics for precision agriculture to reduce crop losses and disease. Due to rising temperatures, droughts, and the risk of fires, a considerable amount of agriculture had moved indoors to vertical greenhouses using autonomous farming and agricultural robot systems.

Those individuals not able to reeducate themselves or obtain jobs in the high-skill tech sector were forced to take low-skill service jobs in the healthcare and wellness sector caring for the EU's growing population over 65. For example, the demand for exoskeletons rose dramatically, and the elderly required help in assembling and putting these on their bodies. In addition, due to the sustainability focus, numerous people worked as field technicians in repair shops on wheels to extend the life cycle of just about every product. These individuals relied on AI and augmented reality steered by the mother companies in China to facilitate their tasks. While many tasks could be automated, the cost was relatively high compared to the sector's low wages. Governments also wanted to provide employment for this skill group to instil a sense of purpose for these individuals. The challenge was that to promote efficiency, there was a high degree of surveillance and workers were required to wear devices tracking their movements and that vibrated if they did not perform efficiently. Control was further exerted as certain aspects of China's social credit system were adopted in the low-skill sector that rewarded people who followed the rules and punished those who stepped out of line. As most of these jobs were of a physical nature, many individuals were forced to migrate across the EU to find a job.

Unfortunately, despite these efficiency efforts, the world did not manage to beat climate change. However, China and its insurance companies did develop the ability to monitor and accurately predict climate emergencies in real-time due to its extensive satellite and telecommunications network. These companies also implemented policies and collected extensive data to monitor and control people's behaviour to "encourage" them to act more sustainably.

Scenario 2: The Wild West: EU in Total Disarray

In the Wild West scenario, the world has fallen into total disarray due to a perfect storm of factors, and borders are more or less closed for all people, goods, and services. As a result, the world is quickly becoming poorer due to depressed GDP growth, severe inflation, and many countries defaulting on their debt. Individuals could not consume as much as before as real wages and welfare declined, leading to extreme poverty.

Since 2024, organisations across the globe vying to win the AI race launched one inexpensive generative AI tool after the other, which led to the rise of the disinformation industry and a tsunami of "spear phishing," i.e., non-consensual image sharing, voice and video cloning. Digital falsehoods were created and spread on every social media platform imaginable, and individuals could no longer tell true AI-generated videos and audio clips from false ones. By the time a deepfake or cheapfake was potentially flagged, it had already been made viral by bots, cyborgs, trolls, and sock puppets out to spread conspiracy theories—many with the pure intention to create chaos and undermine democracy. As a result, elections across Africa, Europe, Mexico, India, and the US were all substantially influenced, leading to the end of democracy as the world knew it. Several countries became authoritarian states, led by the US. Further, US political polarisation, in which the democrats became more left-leaning and the republicans more right, spread to the EU and led to severe populism and political polarisation and the near dissolution of the EU.

Globalisation continued to decline after the WTO's collapse due to highly protectionist economic policies implemented by most countries in complete disregard of any rule-based global trade. While world trade had peaked around 60 per cent of world income in 2007, it was now at pre-1970 levels. This decline was initiated by the US that placed high tariffs on all China and EU imports, which then countered and raised tariffs on US imported goods. Further, all countries increased government subsidies. For example, the USA Investment Reduction Act subsidised the development and purchase of electric vehicles, clean-tech production, and production of carbon–neutral fuels, exclusively for US producers, which severely damaged EU's green sectors as several EU companies moved their production to USA.

The climate crisis and extreme weather events continued, and the prediction that "the world at + 4 degrees is uninsurable" was coming true. During the 2020s, most Global Fortune 500 multinationals had

continued to greenwash and completely disregard sustainability. The polarised political situation led to countries being unable to agree on how to tackle climate change through regulation while climate-denier social media campaigns led by multinationals out to increase shareholder value led to continued natural resource exploitation without any interest in sustainability efforts. Rising global and ocean temperatures, droughts and water shortages across Africa and the Middle East, fires across Europe and the Americas, and flooding and land rise across Asia made agriculture next to impossible. A severe energy crisis was occurring across the globe as not even developed countries could manage to finance large renewable energy projects while oil-rich countries hoarded their reserves for themselves or their closest allies.

As a result, global peacefulness rapidly declined, and the Global Peace Index fell each year since 2023 as the number of countries deteriorating rapidly outnumbered those improving in peacefulness. In early 2025, the USA diverted resources towards the increasing conflict with China in the South China Sea. Africa had entered a dark time as political instability and political terror led to many countries experiencing coup after coup. Under ex-Wagner rebels, many African nations violently took possession of numerous Chinese and Russian operations and their assets, such as telecommunications and energy infrastructures, oil and gas reserves, and cobalt, iron, uranium, and copper mines. Due to limited food and natural resources, Russia increased its expansionist activities across Eastern Europe after winning the Ukraine war. Due to increasingly diverse economic and political systems, the BRICS countries were completely disbanded. Meanwhile, other nations in Latin America, such as Mexico, had become mafia states due to systemic corruption and extensive organised crime. Transportation of goods was highly risky due to an increasing level of organised "pirate" activities.

The only thing keeping the EU together was national security due to increasing threats from outside as well as within, but this was increasingly challenging. Increasing numbers of refugees and migrants from Africa and the Middle East due to their dire state created considerable violence along Europe's borders, leading to heavy militarisation by the EU. From within, polarised political factions waged war with each other on social media while political and climate activists and gangs instigated violent riots and property damage throughout Europe. To pave the way for mining natural resources such as lithium and high-grade iron ore, numerous cases of arson of agricultural and other arable land led to continuous

forest fires. No one and nothing escaped poverty, and most people turned to petty crime for income. Telecommunications, public transportation, and electricity companies were all under attack due to theft of copper cables as copper prices had risen astronomically, leading to considerable infrastructure damage and unreliable service. Likewise, the few people who still had cars spent considerable resources protecting them from thieves searching for lithium batteries and platinum in catalytic converters. Indeed, the organised theft of lithium batteries in electric vehicles, e.g., bikes, scooters, had led to the downfall of what once was an emerging industry—shared urban mobility. Meanwhile the online space had become one of continuous chaos due to the exponential rise of aggressive and confrontational cybercrime in areas such as online fraud, money and data theft, sexual extortion, and social engineering. While cybercrime initially started to grow during the Covid pandemic, it became increasingly organised as criminal gangs moved online and used generative AI to create ransomware, scareware, spyware, and phishing schemes and traded expertise in online communities. Further, China, Russia, Iran, and Brazil had stepped up their hacking efforts to steal technology and data from EU companies.

As a result, the digital transformation of society had waned, and private individuals and companies did a complete reverse on electrification and IoT as they began to understand how the "digitalisation of everything" increased their vulnerability to crime and disturbances in addition to being costly and difficult to service. The only industries in the EU that were growing were commercial security services and defence along with hardware and software suppliers to these industries. In security services, digital technologies combined with physical security systems enabled sophisticated security systems to deter threats in real-time, e.g., surveillance cameras with advanced image and facial recognition, access control systems with biometric identification, and drones and autonomous vehicles for monitoring large areas. AI was used for cybersecurity such as network vulnerability scanning and penetration testing to try to stay ahead of hackers trying to access private and organisational IT networks. Due to high equipment and electricity costs and the need for security, computer processing power and data, the EU experienced the consolidation of the security services industry as well as several cross-industry collaborations, e.g., ASSA Abloy, IKEA, and Deutsche Telekom.

However, hardware and software developers for commercial security services were primarily specialised SMEs operating within complex

defence supply chains across the EU that were governed by a handful of large system defence integrators. Realising the need to raise collaboration between the private and public sectors, the EU's defence industry increased support for these SMEs through financial investments and infrastructure to promote innovation. Further, the legal and compliance industries continued to develop and enforce regulation to promote efficient resource use and cross-border cooperation and to ensure that the defence and security industries did not overstep privacy boundaries too far. As a result, member states no longer invested in or bought only from their own national companies, enabling SMEs to scale across the EU.

While a very small percentage of people worked in high-skill jobs, job inequality was now at an extreme. Many jobs across all sectors had disappeared—however, not due to AI implementation or other digital technologies but rather due to the world falling into a deep recession characterised by political chaos and organised crime. Most people worked in low-skill, low-tech jobs—either in "mom-and-pop" establishments, e.g., food production, repair, or as waste pickers and day workers performing short-term gigs in the shadow economy within transportation and construction. As international trade had more or less ceased, the biggest industry within the low-skill, low-tech sector was the waste management industry, which naturally the mafia ran due to their decades-long global stronghold of this industry. However, instead of trafficking waste out of the EU, the mafia had now turned its attention to recycling within the EU due to high prices of and inability to access resources. Organised criminal gangs were now becoming material experts in order to efficiently clean, sort, and mechanically recycle. Due to the low cost of labour and high unemployment, the industry was defined by heavy manual labour. Trade was characterised by "cash is king" and barter leading to the official economy being squeezed out and the rapid erosion of the EU's tax base. Thus, the member states were having increasing difficulty financing their supporting infrastructure, especially as the defence industry demanded such high investments to maintain security on an EU level.

Scenario 3. Circularity: The EU as a Sustainable, Resilient Island

Contrary to scenarios 1 and 2, while there was relatively little interest in global trade, in this scenario larger governments and their private sectors realised that to tackle global challenges, it was necessary to pull back from

a world focused more on shareholder capitalism driven by profits achieved through efficiency and resource exploitation as well as political conflict and aggression to gain resource access. As such, countries were turning inwards and investing within their borders so that they could become more sustainable and resilient. For example, the "Made in China 2025" strategy and the "Dual Circulation" strategy served as building blocks for Xi Jinping to move the country away from a market economy to one of state control and governance with a focus on increasing self-sufficiency and reducing dependence on the outside world. This became a strategy of necessity that the government took to avoid another great depression like the one in the late 2020s.

As the EU had several of the world's most peaceful and innovative countries in the mid-2020s, the EU was able to channel its efforts towards resilience and self-sufficiency and to transform itself into a leading powerhouse of cutting-edge renewable technologies and sustainable practises. Inspired by China and USA's place-based policies, the EU developed its active industrial policy initiated in the early 2020s whereby certain industries and companies were selected for special support and protection from competition. The EU focused on industries such as ICT, energy, food, healthcare, mobility, waste management, and manufacturing, and selected a handful of companies within each sector to lead development. However, these companies were not tasked with innovation. Rather, the EU decided that the best way to promote more radical innovation towards self-sufficiency was to revamp public funding schemes. During the 2020s, extensive time-consuming applications and onerous project governance processes had hampered innovative thinking as large organisations with deep pockets could "play the funding game" through inhouse or hired consultants, thereby excluding innovative startups and small organisations from receiving vital public funding. Inspired by Stanford University's flash organisations, the EU developed an AI-enabled innovation tool that crowdsourced individuals from across the EU into relevant sustainability R&D projects, which then received a lump sum of start capital. Despite the innovation tasks being open-ended and complex and team members from different cultures and geographic areas, next generation genAI tools along with virtual worlds and augmented reality greatly facilitated digital collaboration. The Flash Innovation Tool enabled the flexible and continuous assembly and reassembly of project teams based on the required competences as the innovation project progressed, while smart contracts

ensured the automatic release of additional project funds and remunerated individuals for their completed tasks. The large organisations selected within each sector then took the innovations to market, and this process was greatly facilitated as their employees were generally selected by the Flash Innovation Tool to participate in various phases throughout development. These organisations oversaw integrated production chains with different components produced across different member states through specialised automated factories.

As a result, the EU was well on its way to becoming a self-sufficient region as member states increased their collaboration and regulations were harmonised, and other European countries joined. Great strides were made within ICT since hardware production had returned to the EU in the 2020s, and significant investment through acts such as the EU Chips Act had built up local semiconductor production capacities. The EU finally developed its own quantum computer; however, due to its high cost, applications were limited to chemistry and materials in order to develop improved batteries, fertilisers, and carbon capture. The energy sector witnessed transformative progress, with significant strides in areas such as ocean wind far out in the North Sea, bladeless wind turbines in urban areas, energy-harvesting trees, and 3D-printed solid-state batteries that were completely recyclable. In the food industry, as climate change had significantly reduced Europe's arable land, the EU decided to relax its regulations on gene-modified crops and lab-grown meats, leading to the development of high-yield, climate-resistant plants and more sustainable lab-grown protein grown in vertical greenhouses within closed systems. Related to healthcare, the EU worked diligently to encourage the development and implementation of personalised nutrition and predictive and personalised medicine. Waste management experienced significant leaps in material science and chemical recycling, while advances in generative design and additive manufacturing enabled the development of microfactories that transformed local waste streams into locally demanded products for the construction/building and consumer goods industries. Due to limited natural resources and high energy prices, privately owned cars were replaced with electric public transportation while goods were transported through a network of autonomous electric trucks. The entertainment industry developed reality-like virtual reality services that replaced leisure and business travel and enabled remote healthcare while augmented reality allowed anyone to be a technician.

As the innovation focus was exploration instead of exploitation, the implementation of digital technologies led to productivity increases across all sectors as opposed to job displacement. One driving force for this was the strikes within the creative industries that spread quickly to other professions. Thus, to meet changing labour demands, the EU leveraged generative AI and virtual worlds to continuously train and reskill individuals of all ages. These efforts served to avoid a labour mismatch and to reduce income inequality and the economic rural-urban divide.

Scenario 4. A Transformed World: The Sky Is the Limit

As the year 2035 unfolded, a world once plagued by divisions and protectionism had undergone a remarkable transformation towards a world of global equality and peace. In 2026, the seeds of change were sown as the most peaceful region of the world—the EU, leveraged its position to lead the World Trade Organisation's efforts to change its name to the Global Sustainability Collaboration, which then expanded to include almost all countries. Working groups across nations began to tackle climate change through pooling knowledge, resources, data and computing power.

The world entered an era of unprecedented innovation as knowledge, ideas, and capital flowed freely with individuals continuously upgrading their skills through interacting with generative AI-based learning tools embedded in every device. Quantum computing was at the core of most advances as China, USA, and the EU overcame their differences and even collaborated on researching ultracold atoms in space and solving the helium shortage. Together they built large-scale, stable quantum hardware while training quantum programmers to create efficient quantum algorithms, leading to the quantumisation of everything. These efforts paid off as geoengineering innovations began to cool the planet by reflecting sunlight back into space and numerous solutions removing carbon from the atmosphere and ocean were advancing quickly. Even the challenges of cloud seeding were overcome, leading to the ability to modify weather and avoid extreme events.

To prevent a return to the climate challenges of the early 2020s, sustainability was at the core of everything. Renewable energy sources, including fusion, hydrogen, and space-based solar, along with advanced battery recycling and innovative energy storage solutions without batteries reduced the 2020's heavy pressure on mining and all deep sea mining projects were halted. Manufacturing underwent a seismic shift towards

circularity and gone are the days of centralisation, economies of scale, and global supply chains. Due to advances in chemical recycling, nanomaterials, and additive manufacturing, most goods were now produced locally for local markets using 4D printing in which 3D printers produced objects of all sizes from intelligent recycled materials programmed to change shape, colour, and size on demand. Hunger was also eradicated due to innovative agritech solutions that decontaminated soil and created local food sources through the 3D printing of alternative proteins.

Healthcare transcended expectations due to the pooling of all medical data and quantum computing, which led to predictive medicine and designer drugs using nanoparticles for precision drug delivery. The few operations performed were done remotely by specialists around the world using body parts grown locally from stem-cells. Meanwhile, brain-computer interfaces were pushing the boundaries of human-computer interaction and even human-animal interaction, while robotics evolved beyond imagination, with general-purpose robots that could learn on the go and adapt to unforeseen scenarios, emulating human learning processes.

Collaboration, innovation, and sustainability were the driving forces behind this transformed world, and the once-feared job losses, polarisation, and income inequality along with humanity's destruction by AI were completely forgotten. Individuals lived in smaller self-sustaining communities, with all needs within a 15-minute walking distance, eradicating the private automobile industry while improving personal health. Networks of smaller autonomous vehicles provided transportation for local goods and mobile wellness, and the large warehouses from the 2020s were transformed into microfactories. The few goods that could not be produced locally were transported by autonomous hydrogen-fueled aircraft for longer distances and by autonomous electric drones for shorter distances.

Individuals enjoyed a three-day work week as AI and automation had enabled reskilling and greatly increased productivity while governments ensured equal wealth distribution through new business models. The leisure industry exploded with shopping malls turned into recreational and learning parks with their roofs serving as landing spaces for electric spaceplanes transporting individuals across the planet in a few hours. Even space exploration transcended frontiers, with ventures into mining and colonisation, clearly showing how humanity's collective endeavours have forged a path towards progress, unity, and a brighter future for all.

Which Future Europe Do We Want to Create?

We began this chapter with the following question: What impact will AI and digitalisation have on EU's labour market, and what could the consequences be for EU's depth and breadth? With our four widely divergent scenarios (summarised in Table 10.1), we have painted pictures of future worlds with labour market implications. We have tried to create extremes to help us see where today's various trends could take us in the long term. By starting from the current situation in 2024 and pushing the development lines to their extremes, we open up critical discussions about which future we would like to see. Given these different future scenarios, policy recommendations are also needed to steer the EU towards the desired future.

What Does This Mean for Policy Development?

Policy work aimed at correcting current problems can, at best, improve the present situation, but it provides very little guidance for the future. That is why we have chosen an alternative approach. These images of possible futures around 2035 allow for the analysis of what challenges, consequences, and obstacles each alternative future might entail. Further, this chapter shows how each scenario would require different types of recommendations as a future promoting international exchange and cooperation requires different guidelines than a future based on borders, barricades, and territories.

We suggest, therefore, that the EU's policy development must consider which future scenario, or parts of a scenario, are most desirable. This means going beyond the short-term to adopt a more forward-looking approach, where strategic visions shape policy. This approach can help the EU anticipate potential challenges, avoid undesirable outcomes, and prepare for opportunities that will lead to a sustainable, productive, and equitable future for its labour markets and societies.

Our recommendation is presented at a meta-analytical level, where the central question must be: what overarching policies and guidelines should the EU develop in order to choose and shape a future scenario, or parts of a possible scenario, that it aims to realise? Ultimately, this is almost an existential question about what kind of society within the EU we would like to live in the long term and how we perceive the use of, or deliberate distancing from, digital technologies to create new opportunities

Table 10.1 Four scenarios for EU's labour market in 2035

Race to the bottom: China in EU Driver's Seat	Digital technology and quantum computers for global efficiency Chinese and American tech companies in the driver's seat and coordinating the EU labour market High job polarisation and significantly different work profiles across EU: Highly skilled tech/AI jobs in mining, manufacturing, and autonomous vehicles in Northern Europe and precision agriculture in Central and Southern Europe, alongside low-skilled service jobs in local healthcare and care sectors
The Wild West: EU in Total Disarray	Digital technology for security, both physical and online, due to deep global disorder EU held together by national security concerns against organised crime and widespread global unrest Labour market in total chaos due to severe economic downturn and shadow economy Some high-tech jobs within national defence and security in small and medium-sized companies, with remaining in low-skilled, day jobs
Circularity: EU as a Sustainable, Resilient Island	Digital technology for self-sufficient EU Significantly strengthened EU with an industrial policy creating high-tech jobs across all sectors, Innovation driven by AI and a labour market where individuals continuously reskill with help of generative AI
A Transformed World: The Sky is the Limit	Digital technology and quantumization for an entirely new world EU at the forefront globally, focusing on sustainability both on Earth and in space Three-day workweek in high-tech jobs or in an extensive leisure industry

that would remove or replace existing practises. Moreover, it is a question of how the EU should evolve in relation to global trends, conflicts, and emerging living patterns. This becomes a matter of ethics, about how we relate to one another and to nature, a question of quality of life, and about how we can collectively work—on a global scale—towards a better

future. This is especially pertinent in a time when the future seems increasingly fragile and uncertain and the developments of the last decade may fundamentally redefine how we view global cooperation, nations, and the role digital technology can and should play in societal development.

Furthermore, since no scenario is more likely than another, "early warning signals" should be identified for each scenario, signalling which specific scenario may be emerging. The external environment should be continuously monitored for these signals to foster collective discussions about what these signals mean for future directions and the path towards a particular scenario.

Another recommendation we offer to policymakers and others is to collectively use "futuring tools," such as the scenario matrix presented here. This framework allows space for structured, informal, critical, and collective discussions—especially with others who view the world through different lenses—so that decisionmakers can better understand potential scenarios (both positive and negative) and their implications. By using these futuring tools, we shift the focus away from short-term crisis management to daring to think further ahead—to consider possible futures and the potential long-term effects of current decisions.

The Sky Is the Limit—Stimulating Diverse Thinking and Networks Based on Diversity

Europe and the world face many uncertainties, and how we will utilise digital technology in the future is also partly an unwritten story. However, this does not mean that the EU should shy away from this challenge. Instead, the challenge should be embraced, and a structured approach should be used to help the EU and its population, both individually and collectively, explore and discuss future scenarios and their consequences.

To facilitate this, we have taken a structured approach to look ahead and develop several potential future scenarios. We have questioned many of our assumptions about technology, the labour market, and even society itself, both within the EU and in relation to other countries around the world. Developing these scenarios has allowed us to engage in critical discussions about how the future may unfold—radically differently—depending on the trends and signals we observe going forward.

We believe that the best scenario for the world is Scenario 4: A transformed world: The sky is the limit. To achieve this, the EU needs to progress along both matrix axes—towards "technology for exploration"

and towards "strong willingness to integrate." However, AI presents several challenges in moving in these directions. On one hand, concerns have been raised about how over-reliance on AI can lead to a loss of independent thinking and idea diversity. If decisions across the globe are made based on the same data, models, and algorithms, the result could be uniformity and herd behaviour. Furthermore, since models are generally trained on historical data and patterns, fewer new radical ideas may emerge. This could potentially lead us towards "technology for exploitation" as thinking converges on incremental ideas, while many others may choose to opt out due to feelings of learned helplessness or their inability to influence outcomes in a society increasingly governed by embedded algorithms. To move towards "technology for exploration," we must avoid concentrating power in AI platforms and large tech companies, and consider regulations that not only prevent monopolies in AI model development and training data but also address the dangerous horizontal issue of companies in the same industry using the same base models for decision-making.

On the other hand, there are many signals suggesting that AI is leading us towards the "no willingness to integrate" end of the political axis. Social media algorithms encourage us to network with those who are similar to us, leading to polarisation, an inability to appreciate intercultural and other differences, and ultimately resulting in conflict and exclusion. As generative AI text, video, and audio tools become available and affordable to anyone with an internet connection, democracy and peace are also at risk. This is due to criminal activities, disinformation, and fake news facilitated by online bots and deepfakes, such as a person's digital likeness. To move along the "strong willingness to integrate" axis, regulation of social media and other networking platforms should thus be at a global level, promoting AI use to encourage people to build networks with those who are different from themselves, while also preventing AI use for misinformation, fake news, and criminal activities.

Although the above reasoning represents an ideal scenario, and the EU may not be able to implement such measures on a global level, member states should continuously work collectively to achieve the next best scenario—Scenario 3: EU as a Sustainable and Resilient Island—by making decisions that actively move the EU towards this outcome. Failure to do so could result in the EU, and potentially the world, ending up in Scenario 1: Race to the Bottom or, worse, in the catastrophic Scenario 2: the Wild West.

By asking critical questions and posing "what if?", we can improve our ability to identify opportunities and make better decisions. Hopefully, this is part of the initiatives required to set us on a course towards a more sustainable future.

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