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**The Future of Work in the Age of
Automation: Towards a World Without
Traditional Jobs?**

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Preamble

Writing about the future of work—particularly at a time of such rapid technological transformation—presents a unique methodological challenge. On one hand, the topic demands urgency: automation, artificial intelligence, and digital platforms are already reshaping the way people work, where they work, and whether they work at all. On the other hand, many of the deeper structural impacts of these changes remain difficult to quantify, and even harder to predict with any certainty. Choosing an appropriate methodological approach for this thesis meant confronting these tensions directly. Traditional empirical research tools—such as field interviews, surveys, or even econometric models—appeared unsuitable to capture a phenomenon that is, by its nature, still unfolding.

For this reason, the thesis does not rely on primary empirical investigation. It contains no interviews, no new survey data, and no original field observations. Instead, it follows a pathway better aligned with the fluid, anticipatory nature of the topic: a **comparative documentary analysis**. The research is built not upon direct observation, but on the critical interpretation, cross-referencing, and synthesis of existing literature as well as academic, institutional, and theoretical. In this sense, the work is an exercise in structured reflection, seeking to draw connections across diverse bodies of knowledge already produced by economists, policymakers, social theorists, and international organizations.

This choice responds first and foremost to the nature of the phenomenon under study. The future of work in the age of automation is not a static subject; it is a moving target. While visible trends—such as job polarization, platform labor, or the rise of cognitive automation—are already shaping labor markets, many fundamental transformations remain at an early stage. Key questions, such as the redefinition of full-time employment or the potential decline of wage labor as the dominant social norm, remain speculative. Attempting to measure these developments through traditional empirical means at this stage would likely generate speculative, fragmented, or even misleading results. As emphasized by Yin (2018) and Blaikie (2010), when the phenomenon itself is unstable or anticipatory, documentary analysis provides a way to ground reflection without prematurely fixing conclusions.

Second, the thesis takes advantage of the rich and growing body of secondary sources already available. Economists like Piketty (2014), Acemoglu and Restrepo (2020), Autor (2015), Frey and Osborne (2017), Brynjolfsson and McAfee (2014) have extensively explored the intersections between technological innovation, inequality, and labor market disruption. At the same time, leading international institutions—the Organisation for Economic Co-operation and Development [OECD] (2023), the International Labour Organization [ILO] (2021), the World Economic Forum [WEF] (2023, P .6-20), and the McKinsey Global Institute [MGI] (2020)—have produced large-scale, data-driven reports mapping present trends and offering projections for the future. Rather than replicating these efforts, the thesis seeks to place them in dialogue: comparing their assumptions, highlighting their tensions, and examining their often implicit political, economic, and social stakes.

The methodology chosen here is thus **both comparative and critical**. Comparative, in that it reads across multiple literatures—academic research, policy papers, historical analyses—to identify convergences and divergences in how the future of work is understood. Critical, in that it does not treat any prediction, model, or policy recommendation as final or self-evident. The aim is not to endorse a single narrative, but to clarify the range of positions, expose their underlying assumptions, and interrogate their implications. Some authors frame automation as an opportunity; others warn of structural unemployment and social destabilization. Some envision a future of post-work abundance; others anticipate new forms of labor precarity. Rather than resolving these debates, the thesis attempts to chart them carefully, helping to map the conceptual landscape in which future decisions will be made.

The choice of documentary analysis also enables **interdisciplinary exploration**. The sources mobilized include not only classical economic theory and labor economics but also sociology, political economy, future studies, and philosophy. This reflects the reality that automation is not merely a technological innovation; it is a social, institutional, and existential phenomenon. The thesis thus engages with both **quantitative projections** (e.g., WEF, 2023; OECD, 2023) and **conceptual frameworks** about capitalism, inequality, and the meaning of work in human life.

Of course, this approach has limits. Without fieldwork, the thesis cannot directly capture the lived experiences of workers undergoing automation-related transitions. It cannot measure subjective responses—fear, hope, adaptation—that are often central to how technological change is perceived. Yet, as Flyvbjerg (2001) and Bowen (2009) argue, when empirical data is fragmented or premature, documentary analysis provides a robust foundation for critical inquiry, helping to frame more targeted empirical investigations in the future.

In this spirit, the thesis remains **anchored to concrete realities** without claiming premature authority. It interprets projections not as deterministic forecasts, but as contingent signals—artifacts of the present’s attempt to anticipate its own future. It offers a conceptual and analytical groundwork that future researchers, once more stable patterns emerge, may build upon or contest.

In sum, this is a thesis that reads rather than surveys, that compares rather than tests, and that questions rather than quantifies. It engages critically with the available literature to shed light on one of the most important and uncertain transformations of our time: the redefinition of work itself. In a context where change is rapid and uncertainty is high, the most meaningful contribution may not be to predict, but to think carefully about the world we are building—and the futures we still have the power to shape.

"What we are confronted with is the prospect of a society of laborers without labor, that is, without the only activity left to them. Surely, nothing could be worse. To have freedom from labor without freedom from necessity, to be liberated from the burden of toil without being freed from the necessities of life, is a contradiction inherent in the very notion of a society that has abolished labor without abolishing labor's necessity."

— **Hannah Arendt, *The Human Condition***

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Introduction

What if the very idea of "work" — the fixed schedules, the stable salaries, the familiar career ladders and job titles — was quietly slipping away? Not through a slow, evolutionary drift, but abruptly, and perhaps irreversibly. Today, the foundations that have structured human labor for centuries is being pulled apart by technologies that do not only lift, push, or sort, but that can also read, write, listen, reason, and decide. Machines are no longer just extensions of physical strength; they are beginning to emulate cognitive processes that once was thought uniquely human. Artificial intelligence, robotic process automation, and autonomous systems are no longer future possibilities. They are here, embedded in the systems that fuel productivity and growth. And as they scale, they are not simply transforming factories or retail counters; they are questioning the very assumption that human intelligence may not be irreplaceable.

The real question, then, is no longer whether machines will take over jobs. That debate belongs to another era. The urgent questions now are: which jobs, how many, how fast — and crucially, what comes after? Work has never been only about survival. It has shaped identities, organized social hierarchies, and provided meaning. We are, in many ways, defined by what we do. But what happens when that scaffolding weakens — when work becomes a shrinking privilege rather than a universal expectation?

Recent projections suggest that the changes underway are neither marginal nor temporary. According to the World Economic Forum [WEF] (2023), automation and AI are expected to displace over 83 million jobs globally by 2027, even as they create around 69 million new roles — a net loss of 14 million positions can be noted (WEF, 2023, P.6-10). The McKinsey Global Institute [MGI] offers an even starker estimate: by 2030, up to 800 million workers, or about one-fifth of the global labor force, could be displaced (McKinsey Global Institute, 2017). These forecasts are not speculative warnings. They are grounded in current investment patterns, technological diffusion rates, and the observable integration of AI into business practices worldwide.

What makes this disruption distinct from previous industrial revolutions is the nature of the labor being automated. In the 19th and 20th centuries, it was physical labor — farmhands, machinists, factory workers — that technology displaced. Today, it is cognitive labor that is increasingly vulnerable. Studies by Frey and Osborne (2017) estimate that nearly 47% of U.S. jobs are at high risk of automation, and similar findings have been echoed by the Organisation for Economic Co-operation and Development [OECD] and the International Labour Organization [ILO] (OECD 2019, p.45 & ILO, 2019 P 19). Machines now perform tasks once thought insulated by intellect: drafting legal briefs, composing investment reports, assisting medical diagnoses, and even creating original content. The longstanding assumption that white-collar work would remain untouched by automation is being dismantled.

Meanwhile, the structure of labor markets is evolving toward polarization. High-skill, high-wage roles — in AI engineering, data science, and digital platform design — are expanding. At

the other end of the spectrum, low-skill, low-wage jobs — in care work, delivery, and maintenance — persist because they are difficult to automate, but they offer little security or progression. In between, the middle has hollowed out. Middle-skill jobs that once sustained broad sections of the population — accounting clerks, logistics managers, administrative assistants — are disappearing at alarming rates. OECD data (2021, p.212) shows a decline of nearly 9% in middle-skill occupations across member countries since 2000, a shift that has profound social consequences, from economic precarity to rising populism and political distrust.

Yet, automation is not a purely destructive force. Like previous technological upheavals, it carries the seeds of new possibilities. The printing press decimated the work of scribes but democratized knowledge. The steam engine displaced manual freight handlers but gave rise to global transport economies. The computer eroded clerical employment but unleashed the digital revolution. It is thus legitimate to ask whether AI and robotics could catalyze a more creative, less labor-dependent society — one where productivity gains are redistributed into freedom rather than unemployment.

This thesis situates itself within that paradox. It approaches automation not as a linear threat or opportunity, but as a dynamic, destabilizing force whose outcomes are profoundly shaped by institutional, political, and cultural choices. It asks whether we are indeed moving toward a world without traditional jobs, and if so, what new frameworks — economic, social, and existential — might emerge. Rather than predicting the future, the thesis critically examines the forces at play by drawing on economic theories, technological analyses, and policy debates.

The central problematic — *The Future of Work in the Age of Automation: Towards a World Without Traditional Jobs?* — emerges from a core historical tension. Historically, technological disruption has eventually been followed by institutional adaptation. New industries, new skills, and new forms of employment have gradually replaced the old. Yet today, the speed of technological change is outstripping the ability of institutions to respond. Educational systems cannot reskill workers fast enough. Labor laws lag behind platform economies. Policy frameworks designed for stable, long-term employment struggle to accommodate fragmented gig work and task-based labor.

Moreover, the very nature of technological change has shifted. Unlike earlier mechanical innovations, digital technologies have non-linear scaling effects. One algorithm can simultaneously perform tasks across dozens of industries, at global scale, eliminating the need for human labor at a speed and scope previously unimaginable. This asymmetry — between concentrated job destruction and dispersed job creation — exacerbates inequality and destabilizes traditional social protections.

At the heart of this transformation lies **cognitive automation** — the deployment of software that does not merely execute instructions, but learns, adapts, and in some cases, creates. Technologies such as OpenAI's GPT-4, DALL·E, and Midjourney are not confined to data processing; they are producing original text, visual design, software code, and strategic

recommendations. These systems often outperform human workers not by being “smarter,” but by being faster, cheaper, and infinitely scalable. They particularly affect entry-level and junior roles, potentially eliminating crucial rungs on the career ladder and altering patterns of social mobility.

International bodies such as the International Labour Organization [ILO] (2021 P 155) and the Organisation for Economic Co-operation and Development [OECD] (2023) have repeatedly warned of a "missing middle" in labor markets: the erosion of accessible pathways into stable employment. The disappearance of junior and support roles narrows the opportunity structure for new entrants to the workforce, widening divides between the privileged few and the precarious many. Labor market bifurcation, once a trend, now threatens to become a defining feature of advanced economies.

Adding urgency to this landscape is the growing decoupling between productivity and wages. Historically, economists assumed that technological advancement would naturally lead to rising living standards, as higher productivity translated into higher wages and more leisure time. Yet, as Piketty (2014) and Acemoglu and Restrepo (2021) demonstrate, the reality has been far more uneven. Capital returns have outpaced wage growth, concentrating wealth among asset holders while leaving wage earners increasingly marginalized. The benefits of automation are no longer distributed through labor markets as they once were.

This economic shift also raises profound questions about social cohesion. In most modern welfare states, access to healthcare, pensions, housing assistance, and other benefits is tied to employment status. If stable jobs become scarce, entire systems of social protection risk becoming obsolete. As scholars like Standing (2011) argue, the rise of a new "precarariat" — a class defined by chronic insecurity — is already reshaping the political landscape.

In response to these challenges, a range of policy experiments and theoretical propositions have emerged. Universal Basic Income (UBI) has been trialed in countries like Finland, Spain, and Canada, offering unconditional financial support as a buffer against labor market volatility. Robot taxes, lifelong learning initiatives, and public employment guarantees have also been proposed. Thinkers like Srnicek and Williams (2015) envision a post-work future where technology enables the redistribution of time and wealth, rather than exacerbating scarcity.

These ideas are contested. Some critics warn that UBI could erode work ethics, that robot taxes might stifle innovation, and that public employment programs could become bureaucratic and inefficient. Others see them as necessary adaptations to a world where labor may no longer serve as the universal basis of economic security and social legitimacy.

This thesis does not claim to resolve these debates. Its ambition is more modest but perhaps more urgent: to clarify the stakes, to map the competing narratives, and to offer a critical framework for thinking about what is being lost and what could still be gained. The future of work is not simply being written by technology. It is being negotiated — through policy choices, corporate strategies, educational reforms, and cultural shifts.

The structure of the thesis reflects this complexity. The first part traces the historical and theoretical development of automation, from the Industrial Revolution to the age of cognitive technologies. It examines how each wave of technological change has disrupted labor markets and challenged prevailing economic theories. The second part explores the paradoxical dynamics of job destruction and creation, analyzing how automation simultaneously displaces and generates employment, and how institutions struggle to keep pace. The third and final part looks forward, critically assessing the policy responses and economic models that might shape a sustainable and equitable post-automation future.

The fundamental question is no longer whether automation will transform work — it already is. The question is whether the future it creates will be more unequal and exclusionary, or whether societies can seize this moment to build systems that are freer, fairer, and more humane. The answer, ultimately, will not come from technology itself, but from the collective decisions we make about how to live, how to work, and how to share the benefits of the world we are remaking.

This thesis is divided into three main parts. The first examines the historical impact of industrial revolutions and the emergence of Taylorism, in order to understand the institutional roots of work automation. The second part explores the more recent transformations of the 20th century, marked by the introduction of industrial robots and the reorganization of work in a context of globalization. Finally, the last part examines cognitive automation and the digital revolution, analyzing how artificial intelligence is redefining the very contours of employment today. Together, these three periods allow us to understand the evolution of work as a historical, technical, and political process, the effects of which are far from neutral.

PART I: The Historical Impact of Automation on Employment

A. The early industrial revolutions and the emergence of taylorism

The Industrial Revolution, beginning in the late 18th century and extending into the 19th, was more than just a shift in how goods were produced—it marked a fundamental reordering of economic life, labor relations, and even time itself. For centuries, work had been embedded in agricultural rhythms and craft traditions, but with the rise of mechanized production and factory systems, a new paradigm emerged—one driven by machines, markets, and measurable efficiency (Allen, 2009, p. 20-42; Mokyr, 2009, p. 15–35).

What is often portrayed as an era of innovation and progress was, for workers, a deeply disorienting and sometimes violent transition. Traditional livelihoods were disrupted, cities submerged with displaced rural laborers, and entirely new forms of work discipline were created (Thompson, 1963, p. 200–220; Pollard, 1965, p. 170–190). As economic historians like **Robert C. Allen** and **Joel Mokyr** have emphasized, this revolution was not merely technological, but institutional—it gave birth to industrial capitalism as we know it today. During these transformations, one model came to define the new industrial quintessence: **The Taylorism**, or in other words the scientific management, as theorized by Frederick Winslow Taylor (1911) which aimed to rationalize every element of human labor. (**Allen, 2009, p. 135-136; Mokyr, 2009, p. 15–35**)

Rather than presenting this period as a neutral timeline of progress, this section draws on a range of scholarly interpretations to show how early automation restructured society, redefined labor, and provoked theoretical responses that still resonate in today's debates about artificial intelligence and digital disruption.

1. Mechanization and the changing nature of work

a) From agrarian economies to industrial powerhouses

Before industrialization, the majority of European populations worked on the land. Economic activity was local, seasonal, and largely organized around familial or guild-based units. As E.P. Thompson (1963) brilliantly analyzed, the transformation of craft work was as social as it was technical. Skilled artisans controlled not only their tools but also the pace and quality of their output. Yet by the turn of the 19th century, this system began to collapse under the pressure of new technologies such as the spinning jenny, the water frame, and, most decisively, the steam engine (Allen, 2009, p. 262).

This structural transformation in labor distribution is clearly visible in the historical evolution of employment by sector (illustrated in **Figure 1**). As agriculture declined, industrial and later service jobs reshaped the foundations of economic life.

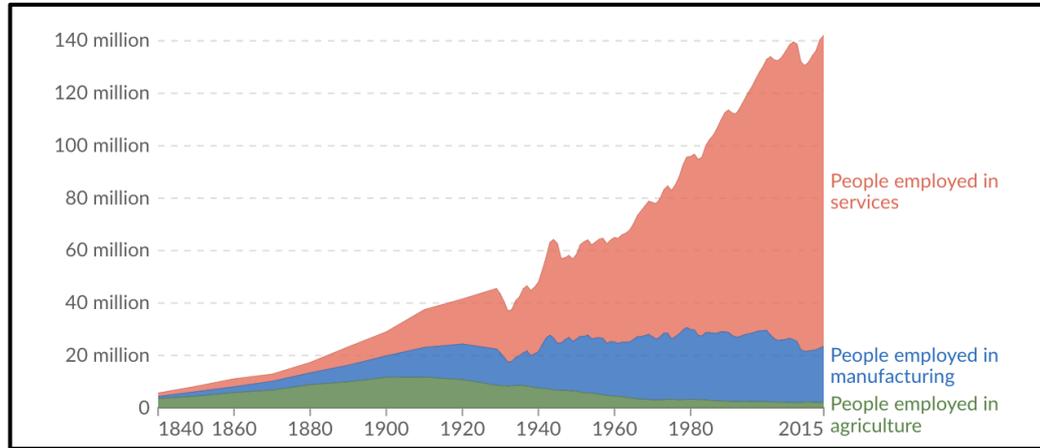


Figure 1. Historical evolution of employment by sector in the United States (1840–2015).

Source: Our World in Data. “Employment by Sector.” *OurWorldInData.org*. Accessed April 7, 2025.

The factory system that emerged centralized production and introduced a sharp division of labor. This wasn’t simply a change in tools; it was a change in **power dynamics**, as workers became dependent on factory owners for wages and lost control over their work processes (Braverman, 1974, p. 78–79; Pollard, 1965, p. 160-180). Historical labor studies, such as those by E.P. Thompson (1963) and Sidney Pollard (1965), show that the transition was not seamless. It was met with resistance, including strikes, sabotage, and the emergence of early labor unions.

At the same time, the industrial city—Manchester, Birmingham, Lyon—became both a symbol of opportunity and a site of hardship. The World Bank and the International Labour Organization ([ILO] (2020), P.2-6) have since drawn parallels between these early industrial cities and today’s megacities in the Global South, where rapid industrialization creates new forms of informal labor under harsh conditions.

b) Urbanization and labor demographics

The demographic consequences of industrialization were immense. Between 1800 and 1850, the urban population of Britain doubled (Engels, 1845, p. 90–96), a shift mirrored across much of Western Europe. Yet cities were largely unprepared for this influx. Friedrich Engels (1845) already described at that time the disastrous health consequences of industrial urbanization on the working classes. The resulting overcrowding, pollution, and lack of sanitation led to public health crises that disproportionately affected the working poor.

Reports from the time—later supported by historical demographic research—revealed how deeply class and labor divisions became spatialized. Industrial laborers were often housed in cramped tenements, worked from 12 to 16 hours per day, and had little to no protection from injury or exploitation (Engels, 1845, p. 91–95). As documented by Friedrich Engels in *The Condition of the Working Class in England* (1845), the new industrial order created a “mass of humanity” that was “crushed and broken” by the very technologies that were hailed as progress.

At the same time, mass production gradually reduced the cost of everyday goods, improving access to clothing, tools, and household necessities. As historians like Jan de Vries (2008, p. 85–135) argue, this sparked a “consumer revolution” even among the working class. However, these benefits were slow to materialize and never equally shared.

c) The decline of skilled artisanship

Among the most dramatic effects of industrialization was the systematic erosion of skilled labor. As Harry Braverman (1974) has argued, industrialization systematically broke down skilled labor into mechanized tasks, once the bearers of prestige and creative autonomy, found their roles fractured into repetitive tasks suitable for unskilled workers operating machines. The rise of wage labor reduced workers' agency and transformed them from producers into mere appendages of the production process (Braverman, 1974, pp. 85–88).

This transformation lies at the heart of Karl Marx's theory of alienation. According to Marx (1867), mechanized production alienated the worker not only from the product of their labor, but also from their own human essence—their capacity to create, to innovate, to find meaning in work. For Marx, industrial automation was not simply a technical advancement, but a political mechanism that served capital by taking away labor of its power. (Marx, 1867, p.270–290)

This loss of skill and control continues to be echoed in today's debates over algorithmic management and gig work platforms, where software dictates tasks, timings, and pay without human negotiation (Woodcock & Graham, 2020, p. 50–80).

2. Taylorism and the scientific management of work

a) The rise of scientific management

By the late 19th century, industrial production was facing new challenges: efficiency bottlenecks, labor disputes, and management complexity. In response, Frederick Winslow Taylor developed what he called **scientific management**—a method of breaking down every task into its simplest components and prescribing the most efficient way to perform each (Taylor, 2014, p. 63).

Taylorism was not just about saving time. It was about transferring control over work from the worker to management. Taylor believed that “the best way” of doing a task could be found scientifically and should then be enforced uniformly. This belief led to the widespread use of

time-and-motion studies, enforced routines, and training programs that aimed to create uniformity among workers.

This reorganization of labor had clear economic benefits. Productivity increased dramatically in industries that adopted scientific management. However, as economic historian Harry Braverman (1974, p. 85–86) later argued, Taylorism also **dehumanized the workforce**. Jobs became so simplified that workers lost all sense of mastery or engagement.

b) The human cost of efficiency

From a purely economic perspective, Taylorism represented a triumph of rationalization. But from a labor perspective, it was often experienced as alienation, monotony, and loss of autonomy. Workers became interchangeable parts in a system whose logic they no longer understood or influenced. Labor historians and sociologists have linked this fragmentation of tasks to a broader cultural shift—one in which the value of work was increasingly tied to speed, repetition, and obedience. Taylorism was not only about improving productivity, it also was a form of managerial control. As Stephen Marglin (1974) convincingly argues, the scientific organization of labor was designed less to improve efficiency than to reinforce hierarchical authority by separating conception from execution (Marglin, 1974, p.60–112).

Resistance to Taylorism came quickly, particularly from labor unions, socialist thinkers, and early workplace psychologists. Some industries experienced high turnover as workers refused to tolerate the mechanical demands of the system. Nonetheless, Taylor’s ideas were foundational for the emergence of **Fordism** in the early 20th century. Ford’s assembly line added consumerism to the equation, offering workers higher wages in exchange for greater control and standardization—a compromise that would define industrial capitalism for decades (Braverman, 1974, p. 86–88; 118–120).

3. Classical theories on the impact of technological progress

a) Ricardo and the machinery question

David Ricardo initially believed that technology would boost productivity and wages. However, in a significant revision to his thinking, he later acknowledged that machinery could, in the short term, reduce employment and suppress wages. His chapter “On Machinery” in *Principles of Political Economy* (Ricardo, 1821, p. 282–295) marks one of the earliest recognitions of what we now call **technological unemployment**.

Ricardo’s concern was not with machines themselves, but with how they altered the distribution of gains. In his view, capitalists benefitted first, while laborers suffered disruptions. His framework anticipated today’s concern with **who captures the benefits** of automation, a debate that institutions like the IMF and the World Bank continue to revisit in the context of AI and robotics (World Bank, 2019, p. 50-80).

b) Marx: mechanization and alienation

For Karl Marx, machines were never neutral. In *Capital*, he argues that technological innovation under capitalism is primarily used to extract surplus value and weaken labor’s bargaining power (Marx, 1867, p. 492–510). Machinery replaces workers not to free them, but to make them cheaper, more expendable, and more dependent on capital.

This dynamic is crucial to Marx’s theory of alienation, as noted earlier. By reducing skilled work to machine-tending, the capitalist system not only cheapens labor but erodes the human potential embedded in productive activity. Many modern critiques of gig work, platform capitalism, and AI governance draw implicitly on this Marxian concern—suggesting that **technology, when driven by profit, rarely empowers workers** (Braverman, 1974, p. 121; Zuboff, 2019).

c) Keynes and the “technological unemployment” hypothesis

In 1930, John Maynard Keynes famously predicted that within a century, technological progress would reduce working hours to 15 per week. In his essay *Economic Possibilities for Our Grandchildren*, he coined the term **technological unemployment**, referring to job loss caused by automation outpacing our ability to invent new roles (Keynes, 1930/2010).

As John Maynard Keynes (1930/2010) predicted in 1930, technological progress might eventually reduce the need for labor hours. Historical data confirms this trend: across major industrial economies, the average number of annual working hours per worker has steadily declined since the late 19th century (see **Figure 2**).

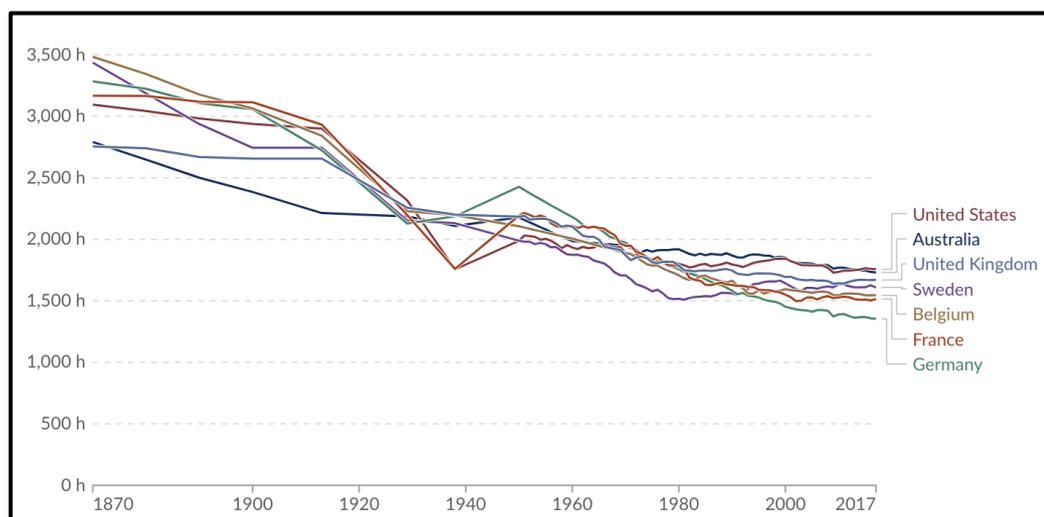


Figure 2. Average annual working hours per worker, 1870–2017, selected countries.

Source: Our World in Data. “Working Hours.” *OurWorldInData.org*. Accessed April 8, 2025.

Keynes was optimistic. He believed that productivity gains would eventually allow for more leisure and less stress. However, he also warned of **difficult transitions**, where workers might

suffer from dislocation, retraining gaps, and social instability. These transitions, Keynes argued, required state intervention and social protections—an idea that informed the rise of post-war welfare states (**Keynes, 1930/2010, p. 358–373**). The OECD’s contemporary calls for **inclusive labor policies** echo this Keynesian logic (OECD, 2023, p.173).

d) Schumpeter and creative destruction

Unlike Ricardo or Marx, Joseph Schumpeter saw disruption as **the essence of capitalism**. His concept of **creative destruction** describes how innovation constantly dismantles old industries while building new ones. For Schumpeter, layoffs and closures were not signs of failure but symptoms of renewal (Schumpeter, 1942, p. 130-156).

While this vision captures the dynamism of capitalist economies, it also implies a brutal social cost. The workers displaced by “destruction” are not always those who benefit from the “creation.” This insight has been reaffirmed by recent studies from the ILO and World Bank, which show that **reskilling and redistribution lag behind innovation**, especially in the Global South (ILO, 2021, p.155; World Bank, 2019,P 23-30).

4. Historical parallels and contemporary reflections

What becomes clear when tracing the arc from the 18th century to today is that **technological change does not unfold in a straight line**. It comes in waves, each bringing new tools, new anxieties, and new configurations of labor. The First Industrial Revolution displaced rural artisans; the Second created mass employment in standardized industries; the Third automated both blue- and white-collar work; and now the Fourth challenges the very notion of human uniqueness in labor (Perez, 2002, p. 8–31; Schwab, 2016, p. 1-20).

In every phase, the story is not just about machines, but about power—**who controls technology, who benefits from it, and who bears its costs**. That is why the study of past industrial revolutions remains essential. It reminds us that **automation is never only technical**. It is institutional, political, and deeply human.

Drawing on documentary analysis—across economic theory, historical accounts, and institutional projections—this part of the thesis shows how the current moment echoes older patterns while raising new questions. If history teaches anything, it is that **transitions are messy**, and outcomes depend less on machines themselves than on the **choices societies make in response** (Standing, 2011, p. 43–101; Rifkin, 1995, p. 1–50).

While the first industrial revolution laid the foundations for automation structured around manual labor and industrial discipline (via Taylorism), the 20th century marked a major shift: machines no longer simply mechanize movements; they reconfigure entire production lines. The transition to modern automation thus deepens the logic initiated in the 19th century, while

radically transforming forms of salaried labor (Braverman, 1974, p. 174; Marglin, 1974, p. 60–112).

B. Automation in the 20th-century workplace

While the first industrialization had initiated a disciplined and fragmented work model, the 20th century brought automation into a new era, more technical, more global. If the first wave of industrialization replaced craft with machinery and ushered in the factory system, the 20th century brought a second major transformation through automation—one that blurred the lines between human and machine labor more profoundly than ever before. From the post-war decades through the 1980s, automation reshaped the very architecture of production, ushering in an era defined by industrial robots, lean manufacturing, and digital control systems. This technological advance was not simply about mechanical efficiency; it altered the geography of labor, the meaning of skill, and the social contract between employers and workers (International Federation of Robotics, 2021; Nof, 1999, p. 1-12).

This section explores how 20th-century automation revolutionized production, particularly in manufacturing sectors, and triggered a cascade of structural changes in labor markets. Drawing on economic theory and institutional research, it examines the rise of industrial robots, the pursuit of standardization, the economic consequences of labor displacement, and the theoretical frameworks that attempted to make sense of growing inequality and polarization (Piketty, 2014, p. 473-492; Autor, 2015, p. 3-30).

1. Automation in the 1960s–1980s: industrial robots and standardization

a) The emergence of industrial robotics

The early 1960s saw the introduction of industrial robots, signaling the onset of a new industrial era. The installation of *Unimate* at a General Motors plant in 1961—the first commercial robot—demonstrated the potential of machines to perform repetitive tasks like welding with unprecedented speed, precision, and endurance (Nof, 1999, p. 24-56; International Federation of Robotics [IFR], 2021). Following its success, the automotive and manufacturing sectors quickly embraced robotic technology.

By the 1970s, robots evolved to manage more sophisticated tasks such as painting, packaging, and component assembly. The parallel development of Computer Numerical Control (CNC) systems further revolutionized production by embedding programmable logic directly into machinery (Mokyr, 2009, p. 15–35). Companies adapted their production processes to align with machine capabilities, fundamentally reshaping the organization of industrial labor (Braverman, 1974, p. 174).

b) The pursuit of standardization

As robotics became widespread, a broader managerial philosophy emerged: lean production. Popularized by Toyota, lean production emphasized the elimination of waste, task

simplification, and rigorous standardization (Womack, Jones & Roos, 1990, p. 47-105). Workers were now expected to adapt to the rhythms of machinery, reversing the earlier norm where machines were designed to complement human labor.

Standardization minimized the need for human intervention across full production cycles. Instead, workers were tasked with supervising and assisting machines in highly repetitive and segmented operations. In sectors like automotive manufacturing, this transition eroded the autonomy and craft-based skills traditionally associated with industrial employment (Sennett, 1998, p. 46–63).

c) Technological efficiency and competitive pressures

Beyond internal efficiencies, firms increasingly viewed automation as a strategic response to global competition. As labor costs rose in advanced economies, machines offered a means to sustain output levels while minimizing dependence on human workers (Perez, 2002). This process, known as **capital deepening**, involved expanding the technological base of production rather than the workforce itself (Piketty, 2014, p. 340–360).

While this strategy proved effective for enhancing output, it contributed to declining employment levels and fundamentally altered labor-management relations. Firms prioritized technological investments not only for productivity gains but also for financial competitiveness in a globalizing economy (Rodrik, 2011, p. 120–140).

2. Impact on jobs in manufacturing

a) Deindustrialization and labor displacement

The expansion of automation triggered profound changes in the manufacturing sector, long the bedrock of working-class economic security. In countries like the United States, the United Kingdom, and Germany, manufacturing employment plummeted. In the U.S., it fell from 30% of total employment in 1950 to under 15% by the early 1990s (Houseman, 2018, p. 11; OECD, 2019, p.56).

This phenomenon, often termed **deindustrialization**, disproportionately affected regions heavily reliant on industrial employment. Workers without access to higher education or reskilling opportunities found themselves especially vulnerable. Crucially, many of the jobs displaced by automation were not replaced, leading to enduring pockets of long-term unemployment and economic decline in former industrial strongholds (Gray & Suri, 2019, p. 135).

b) Labor market polarization

The collapse of traditional industrial employment contributed to a sharp polarization of the labor market. While high-skill sectors—finance, technology, consulting—expanded, many

displaced industrial workers were funneled into precarious, low-wage service jobs (Goos & Manning, 2007, p. 118–133; Graham & Anwar, 2019, para. 1-5).

This process, known as **labor market polarization**, hollowed out middle-income occupations. Roles that once conferred economic security and social status—such as machine operators, clerks, and mid-level supervisors—gradually disappeared, replaced by jobs offering little stability, few benefits, and limited prospects for advancement (Autor & Dorn, 2013, p.1553–1597).

c) The theory of skill-biased technological change (sbtc)

The labor market shifts of this period are best understood through the lens of **Skill-Biased Technological Change (SBTC)**. According to Katz and Murphy (1992), technological innovation disproportionately favored skilled workers while automating or devaluing routine manual and cognitive tasks. (**Katz & Murphy, 1992, p. 35–78**).

As machines assumed responsibility for repetitive functions, the value of analytical, managerial, and technical skills surged. Workers with college education or specialized training enjoyed rising wages and enhanced job security, while those without such credentials faced stagnant or declining real incomes. SBTC thus explains the widening earnings gap between high- and low-skill workers during the late 20th century (Acemoglu & Autor, 2011, p. 1043–1171).

3. Economic theories: kuznets curve and inequalities related to automation

a) Challenging the kuznets hypothesis

Throughout much of the 20th century, economists relied on the **Kuznets Curve** to explain the relationship between economic growth and inequality. According to Simon Kuznets (1955), inequality initially rises during industrialization but eventually declines as societies mature and wealth is redistributed more broadly (Kuznets, 1955, p. 1–28)

For a time, post-war prosperity seemed to validate this theory. Rising productivity coincided with wage growth and the emergence of robust middle classes in many industrialized nations. However, by the 1980s, the trend reversed. Despite ongoing economic growth, inequality began to surge across most developed economies (Piketty, 2014, p. 304–336).

Automation was among the key forces driving this divergence. As firms increased productivity through technology, they often simultaneously reduced employment levels, suppressed wage growth, and concentrated profits among shareholders and executives (Acemoglu & Restrepo, 2020, p. 3-5). The longstanding assumption that technological progress would naturally foster greater equality came under increasing scrutiny.

b) Piketty and the capital-labor imbalance

Thomas Piketty’s (2014) seminal work, *Capital in the Twenty-First Century*, provided a new framework for understanding these dynamics. Piketty argued that when the return on capital (r) outpaces overall economic growth (g), wealth becomes increasingly concentrated among asset owners.

In the context of automation, this imbalance was particularly pronounced. Firms investing heavily in capital-intensive technologies captured enormous profits, while workers received a diminishing share of the economic pie (Brynjolfsson & McAfee, 2014, p. 129). Piketty’s analysis shifted the debate from income distribution to wealth concentration, emphasizing that ownership of capital—factories, intellectual property, digital platforms—was the key driver of structural inequality (Piketty, 2014, p. 336–377).

This trend is particularly visible in the rising share of income going to the top 1% in many advanced economies since the 1980s (World Inequality Database, 2025, p.13-14) (see **Figure 3.**). By comparing data from 1980, 2000, and 2023, the figure highlights how wealth accumulation has increasingly favored the highest earners over time. This visual progression underscores Piketty’s core argument: when returns on capital exceed overall economic growth ($r > g$), income and wealth become more concentrated. The data is especially pertinent to this discussion because it demonstrates how technological change and automation—rather than reducing inequality—can intensify it in the absence of redistributive mechanisms.

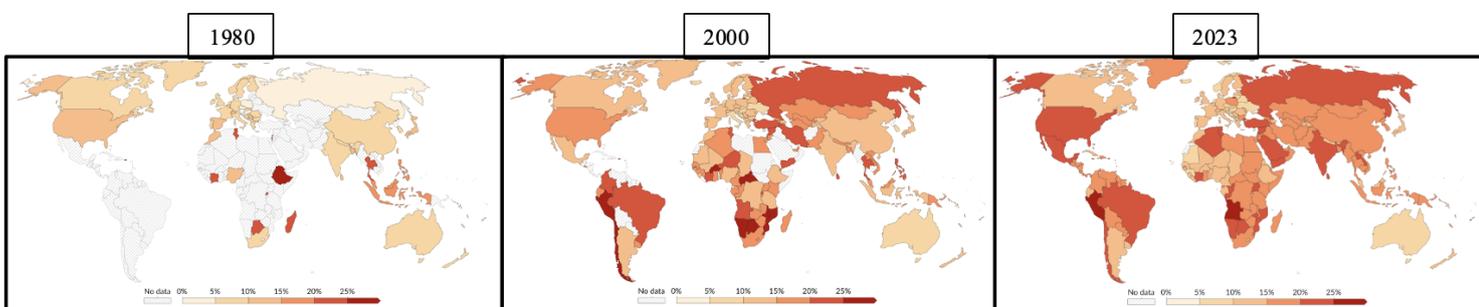


Figure 3. Share of national income held by the top 1% in selected countries. (1980-2023)

Source: **World Inequality Database.** “Top Income Shares.” Retrieved from <https://wid.world> (Accessed April 8, 2025).

c) Institutions, policy, and the distribution of technological gains

The rise of inequality in the late 20th century was not inevitable. During earlier periods, strong labor unions, progressive taxation, and expansive welfare states helped ensure that technological and economic gains were more widely shared (Rodrik, 2018, p. 120–140; Standing, 2011, p. 45–75).

However, from the 1980s onwards, neoliberal policies—deregulation, privatization, fiscal austerity—eroded these institutional supports. As labor protections weakened, automation

increasingly served as a tool for reducing costs rather than improving job quality. Wages stagnated, job security deteriorated, and wealth accumulated among a shrinking elite (Srnicsek & Williams, 2015, p. 127–150).

These developments underscore the crucial role of political and institutional frameworks in shaping the societal outcomes of technological change.

4. Automation, globalization, and labor fragmentation

a) Offshoring and technological displacement

The impact of automation was intensified by globalization. Firms simultaneously introduced machines to automate domestic production and outsourced remaining labor-intensive processes to lower-wage economies (Autor, Dorn, & Hanson, 2016, p. 205–240).

This dual strategy—**automate at home, offshore abroad**—enabled corporations to maximize efficiency and minimize labor costs. However, it also weakened national labor markets and constrained the ability of governments to regulate or support domestic industries. As production became more globalized, workers’ bargaining power declined significantly (Rodrik, 2011, p. 141-160).

b) Geographic and social consequences

These shifts were not experienced uniformly. Traditional industrial regions across North America and Europe—such as the American Rust Belt or the North of England—suffered chronic economic decline, depopulation, and rising social dysfunction (Case & Deaton, 2020, p. 141-143).

Meanwhile, global cities with strong technology sectors—such as San Francisco, London, or Munich—thrived, exacerbating geographic and social inequalities. Communities formerly anchored by stable, unionized employment witnessed surges in poverty, mental health crises, and political disaffection (Standing, 2011, p. 1-25; OECD, 2023, p. 1-26).

Sociologist Guy Standing identified a new class emerging from these disruptions: the **precariat**, a growing group of workers characterized by unstable incomes, minimal protections, and limited prospects for upward mobility. The rise of the precariat signals not merely an economic shift, but a deeper transformation of the very meaning of work, security, and citizenship in the 21st century (Standing, 2011, p. 26–42).

The changes observed in the 20th century herald the even more profound upheavals of the 21st century. Automation no longer only affects production lines; it is now attacking cognitive functions and the tertiary sectors. The digital revolution thus represents a new stage, where the line between human and machine is becoming increasingly blurred.

C. The digital revolution and cognitive automation

What the 20th century began to automate in factories, the 21st century is now extending to offices, services, and even thought. While earlier waves of technological change primarily affected manual and routine labor, the turn of the 21st century introduced a transformation of a different magnitude—one that now reaches into the very heart of white-collar work. As shown in the World Economic Forum’s 2023 report, businesses anticipate widespread adoption of digital platforms, artificial intelligence, and big-data analytics by 2027—accelerating the automation of cognitive functions across sectors (World Economic Forum, 2023, P.12-18) (see **Figure 4.**).

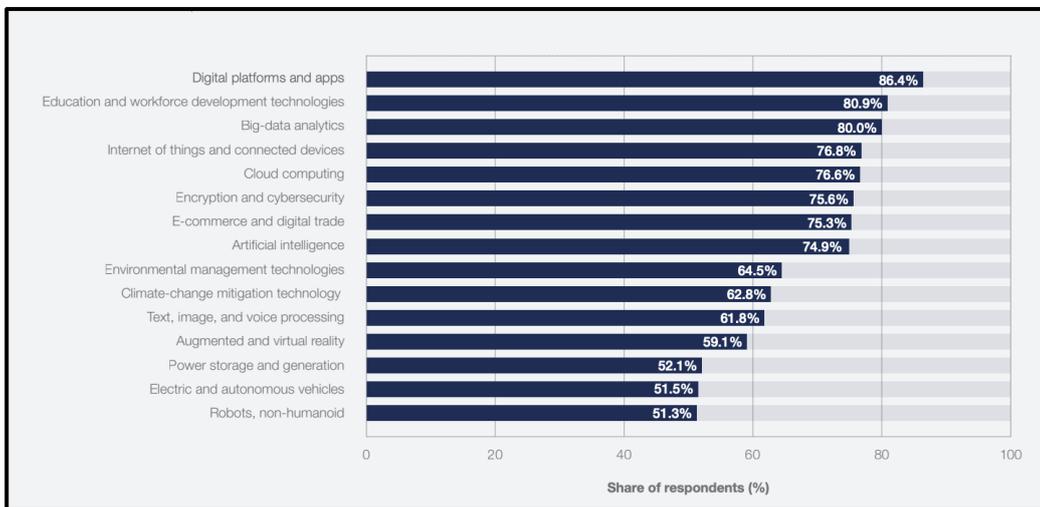


Figure 4. Technologies most likely to be adopted by 2027 (WEF, 2023)

Source: World Economic Forum (2023), *The Future of Jobs Report 2023*, Figure 3.2, p. 28.

Often referred to as the **Fourth Industrial Revolution**, this phase is defined by the **digitalization of knowledge work** and the **automation of cognitive functions**. Unlike earlier machines that merely replaced physical effort, today’s algorithms replicate human reasoning, analysis, and even creativity. The impact of this transition has been most evident in the **tertiary sector**, where tasks involving language, decision-making, and data interpretation are increasingly handled by machines (Brynjolfsson & McAfee, 2014, p. 12–15).

The diffusion of **artificial intelligence (AI)**, **machine learning**, and **advanced software automation** has disrupted professional environments long considered immune to mechanization. Law firms, banks, marketing agencies, and medical institutions now employ algorithms that can read, sort, respond, and generate content—at scale, with high precision, and at a fraction of the human cost (Susskind & Susskind, 2015, p. 145–170). This section examines the roots and implications of cognitive automation, from the technological infrastructure that enabled it to the profound social consequences it has begun to produce.

1. Rise of artificial intelligence and software automation in the 2000s

a) From task automation to artificial intelligence

In the early 2000s, breakthroughs in computational capacity, cloud storage, and algorithmic design paved the way for a new generation of software-based tools. Unlike previous systems limited to automating fixed sequences, these new tools could “learn” from data, adapt to patterns, and refine their performance over time (Russell & Norvig, 2010, p. 1–20). This transition marked the beginning of **machine learning**, the basis of most modern AI applications.

One of the key drivers behind this shift was the ability to process **big data**—immense volumes of structured and unstructured information that human analysts could not meaningfully interpret at scale (McKinsey Global Institute, 2017, p. 35–50). Algorithms, by contrast, could detect correlations, forecast behavior, and recommend decisions with remarkable speed. In industries such as **finance, logistics, healthcare, and customer service**, firms began to integrate AI into everyday operations—not just as support, but as core decision-making agents.

b) Economic drivers of digital automation

The appeal of digital automation was not merely technological—it was fundamentally economic. In highly competitive global markets, companies sought to reduce labor costs, improve accuracy, and increase operational efficiency (OECD, 2023, p. 70–90). Once developed, AI tools could be deployed at scale, providing a level of **scalability and standardization** that human labor could not match.

These systems were also tireless. Unlike employees, algorithms do not need breaks, salaries, or health benefits. For many firms, this presented an irresistible opportunity: not only to reduce human error and increase consistency, but also to restructure entire departments around software workflows. Entry-level roles that once served as steppingstones into professional careers—such as paralegals, junior analysts, or administrative assistants—were now being absorbed by intelligent systems capable of processing tasks in seconds (Susskind, 2020, p. 123–145).

c) The expansion of digital infrastructure

Supporting this shift was the rapid development of global cloud computing platforms such as **Amazon Web Services, Microsoft Azure, and Google Cloud**, which offered AI capabilities as a service (World Economic Forum, 2020, p. 11–20). This democratization of technology allowed even small businesses to access powerful automation tools without maintaining their own servers or IT teams.

The rise of platforms also blurred the lines between sectors. E-commerce firms became logistics giants; data brokers entered healthcare analytics; social media companies became ad-tech empires. In each case, **automation and data processing** were central. As businesses across

industries became increasingly digitized, the nature of work itself began to change—not just in what was done, but in how labor was evaluated, monitored, and valued. Labor was increasingly evaluated not by hours or outputs but by **data flows, system monitoring, and algorithmic performance** (Zuboff, 2019, p. 31–60).

2. Cognitive automation: impact on tertiary sector and service jobs

a) The automation of routine cognitive tasks

Cognitive automation targets tasks that are **rule-based, repetitive, and information-heavy**—traits common in many white-collar professions. Unlike earlier industrial technologies, AI does not replace hands, but rather minds. Algorithms now perform document review, fraud detection, customer queries, schedule optimization, and even aspects of **medical diagnostics** and **legal reasoning** (Susskind & Susskind, 2015, p. 145–170).

In the **financial sector**, for instance, algorithmic trading systems execute billions in transactions without human oversight. In **customer service**, AI chatbots handle thousands of interactions simultaneously, often with better response times than human staff. In **recruitment**, AI systems screen CVs, schedule interviews, and even conduct initial assessments—all without direct human involvement (OECD, 2021, 45–70).

The cumulative result is a quiet but far-reaching transformation of the workplace. Many traditional “first jobs” in offices—once essential for skill development and career progression—are being restructured or eliminated altogether. These entry-level tasks are precisely those that AI can perform with greatest efficiency.

b) Impact on the tertiary sector and office work

The tertiary sector, once insulated from automation, is now its most visible frontier. **Administrative roles, back-office support, and clerical functions** are increasingly handled by software. Even roles requiring professional judgment—such as journalism, education, and law—are being reshaped by digital tools that assist, augment, or outright perform core functions (Brynjolfsson & McAfee, 2014, p. 178).

This trend accelerated sharply during the **COVID-19 pandemic**, which forced many firms to digitize operations rapidly (ILO, 2021, p. 155). Remote work infrastructures replaced physical offices, and in the process, companies adopted automation to reduce reliance on human coordination. Some of these changes, initially framed as temporary, became permanent restructurings.

White-collar automation no longer threatens only low-skill work—it is encroaching upon the middle and even upper tiers of knowledge labor. What emerges is not just a reshaping of individual roles, but a fundamental redefinition of **what constitutes human work** in an era of intelligent machines.

c) Redefining human roles and skills

As machines handle more of the routine, the human role is being redefined. Skills such as **emotional intelligence**, **adaptability**, **creativity**, and **critical thinking** have become increasingly valuable—not because they are immune to automation, but because they complement it (Brynjolfsson & McAfee, 2014, p. 206; Susskind, 2020, 123–145). The worker of the future is not simply a performer of tasks, but a supervisor, designer, or interpreter of systems. This trend can be visible in the 2023 Future of Jobs Report (available in **Figure 5.**), which highlights creativity, analytical thinking, and technological literacy as the top growing skills in demand by employers.

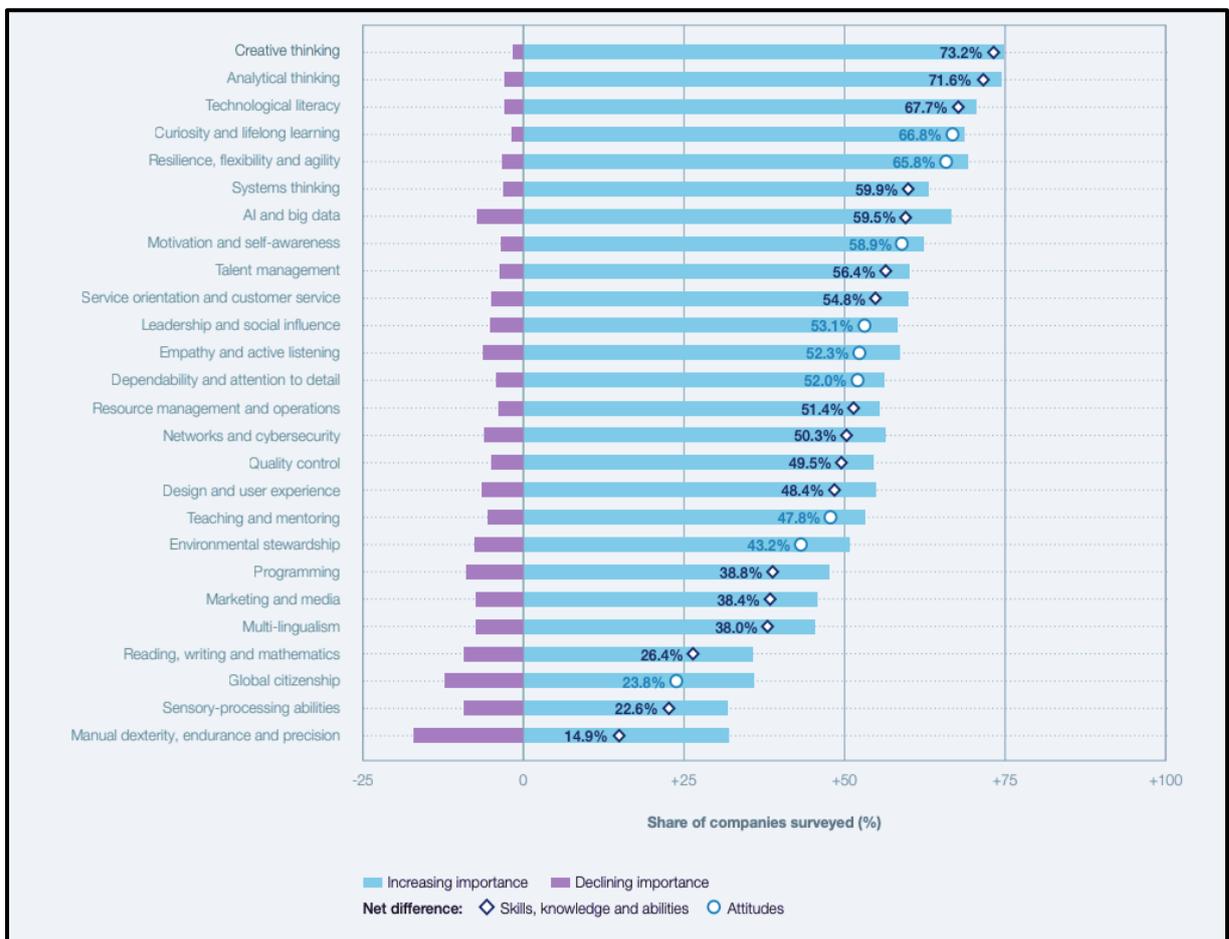


Figure 5. Skills on the Rise 2023–2027 (WEF, 2023)

Source: World Economic Forum. (2023). *The Future of Jobs Report 2023*, Figure 4.3, p. 44.

This transformation places new pressures on education systems, vocational training, and lifelong learning (OECD, 2021, p.212; UNESCO, 2021, p.23). In a world where jobs evolve constantly, workers must continuously update their skills to remain relevant. Firms are beginning to value adaptability over specialization, and soft skills are now often considered more essential than technical proficiency alone.

Yet this evolution also raises concerns about access and inequality. Those who can afford to retrain, upskill, or navigate complex digital ecosystems thrive. Those without these resources risk being left behind—adding a new layer to the already widening gap between different categories of workers (Standing, 2011, p. 26-42).

3. Job polarization: creation of skilled and unskilled jobs, decline of the middle class

a) The growth of high- and low-skill employment

The rise of cognitive automation has reinforced a trend first observed in the late 20th century: the polarization of the job market. **High-skill, high-income roles** in technology, data science, and software engineering are expanding rapidly (Autor, 2015, p. 3-30; Acemoglu & Restrepo, 2020, p. 44-46). At the same time, **low-skill, low-wage jobs** in care work, cleaning, and delivery persist—largely because they remain difficult to automate.

What is vanishing are the **middle-skill, middle-income jobs** that once formed the backbone of the modern middle class. Roles in accounting, administration, logistics coordination, and clerical work are increasingly absorbed by software (Brynjolfsson & McAfee, 2014, p. 153). As economist David Autor has noted, automation rarely replaces jobs wholesale—but it can **hollow out** the tasks that justified a role's existence, making it redundant or less economically viable (Autor, 2015 p. 3-30).

b) Declining middle-class stability

This erosion of the middle tier has serious implications. The **traditional career path**—start in a junior role, learn on the job, climb the ladder—is being disrupted. Many of the early-stage positions that trained future professionals have disappeared, breaking the ladder of upward mobility. Without stable entry points, many young workers face **precarious gig work, freelance contracts, and internships** instead of steady employment (Piketty, 2014, p. 473-492).

The result is greater volatility and precarity for young professionals. Many now enter the workforce through gig platforms, freelance contracts, or low-paid internships (Srnicek & Williams, 2015, p. 15-42). Without stable entry points, the next generation faces growing barriers to long-term security. Benefits like health insurance, pensions, and career development are increasingly tied to **independent navigation**, not institutional support (ILO, 2021).

This transformation has implications not just for labor economics but for society at large. The weakening of the middle class threatens **social cohesion**, increases political polarization, and undermines the economic model that sustained post-war prosperity in much of the West (Rodrik, 2018, p. 50-63).

c) The political and social implications of polarization

Beyond the economic dimension, job polarization is driving social and political unrest. In regions hardest hit by automation—where once-secure professions have vanished—citizens report declining trust in institutions, greater susceptibility to populist narratives, and increasing alienation from political processes (Standing, 2011, p. 26-42; World Bank, 2019, P. 6-31).

This mirrors, in a new register, the displacement experienced during earlier industrial revolutions. However, the scale and speed of the current changes, combined with the abstract nature of cognitive automation, make them harder to see—and therefore harder to address (Susskind, 2020, p.123–145).

Addressing job polarization will require more than reskilling programs. It will demand a rethinking of the **social function of work**, the **distribution of technological gains**, and the role of the state in protecting vulnerable populations in an era of rapid digital transformation (Srnicsek & Williams, 2015, p. 23-41; Van Parijs & Vanderborght, 2017).

D. Interim conclusion

Looking back at the transformations brought about by technological progress—from the earliest stages of mechanization to today’s digital age—one pattern consistently emerges: work changes, often dramatically, and not always in ways that benefit everyone equally (**Braverman, 1974; Allen, 2009**, p. 1–2, 135–136, 262). The first part of this thesis has explored how each wave of innovation reshaped the economy, sometimes creating new opportunities, but just as often displacing entire categories of workers (**Schumpeter, 1942, p.12-35; Standing, 2011, p. 26-42**). These shifts were never only technical; they were political, economic, and social (**Marx, 1867/1990, p. 322- 375; Piketty, 2014, p. 473-492**).

What’s different today is the speed and scope of the change. Earlier revolutions unfolded over decades, giving institutions time to adapt. The rise of artificial intelligence and cognitive automation, on the other hand, is moving much faster—and reaching into professions once thought to be untouchable (**Brynjolfsson & McAfee, 2014, p. 205; Susskind, 2020, p.123–145**). Jobs that rely on language, logic, and creativity are now being performed, at least in part, by algorithms (**Frey & Osborne, 2017, p. 254–280; World Economic Forum, 2023**). This raises new concerns about who stands to gain from these technologies—and who risks being left behind (**OECD, 2023, p.173; Rodrik, 2018, p.13-45**).

Unlike in previous periods, many of the jobs being lost today aren't being replaced by others of equal quality or accessibility. While new roles are certainly emerging in areas like data science, cybersecurity, and AI development, these often require advanced education or highly specialized training (**Autor, 2015, p. 3-30; Katz & Murphy, 1992, p. 35–78**). The middle of the job market—the stable, decently paid roles that supported the growth of the middle class—is shrinking (**Acemoglu & Restrepo, 2020, p.44-46**). And this shift is not happening evenly: it

affects some industries and regions more than others, deepening inequality and feeding uncertainty (OECD, 2021, p. 212; ILO, 2021, p.155).

This is the paradox we now face. Automation is creating and destroying jobs at the same time. In some areas, it's boosting productivity and opening doors to innovation. In others, it's pulling the rug out from under entire communities. Understanding this double-sided impact is essential if we hope to shape the future of work in ways that are fair and sustainable (Srnicsek & Williams, 2015, p. 35-54; Van Parijs & Vanderborght, 2017, p. 1-14).

The next part of this thesis will focus on that paradox in more detail. It begins with a closer look at the kinds of jobs most at risk—especially in manufacturing, logistics, retail, and administrative services. Then it moves on to explore where new jobs are coming from, and whether those roles offer genuine paths to stability. Finally, it addresses the biggest challenge of all: how to ensure that workers, governments, and institutions can keep up with the pace of change (OECD, 2023, p.173; Susskind & Susskind, 2015, p. 145–170).

Because if history teaches us anything, it's that technological progress doesn't guarantee progress for everyone. It's what societies choose to do in response that makes the difference (Keynes, 1930/2010, p. 358–373; Schor, 2010, p. 60-89).

Part 2: The paradox of automation: Job destruction and creation

Technological innovation has always had a complicated relationship with the labor market. On one side, it **drives growth, raises productivity**, and has historically **opened the door to entirely new industries**. On the other, it has repeatedly disrupted existing jobs, leaving some workers behind and testing the strength of our social systems. What's happening now with automation—especially through **artificial intelligence and robotics**—isn't just about machines replacing physical labor. For the first time, it's cognitive and professional roles that are under pressure, including ones we used to consider safe.

This shift isn't entirely new. If anything, it reflects patterns we've seen before during past industrial revolutions. **Joel Mokyr's (2009)** work shows how new technologies in the past wiped out entire job categories, while also laying the groundwork for new sectors to emerge. But these transitions weren't smooth or painless. Historically, they've been accompanied by rising inequality, social tension, and periods of economic insecurity. What makes the current wave more intense is the speed of change—and the fact that it's happening globally, all at once.

It's also worth pointing out that automation doesn't impact everyone equally. Jobs that involve a lot of repetition—like those in manufacturing, transport, or administrative roles—are especially vulnerable. Research by **Arntz, Gregory, and Zierahn (2016)** highlights how workers with lower levels of education are more likely to lose out, as they often have fewer opportunities to transition into new, **more resilient types of employment**. Worse still, training programs and upskilling opportunities are unevenly distributed, which only deepens existing inequalities—both social and geographic.

This part of the thesis looks at how these patterns are unfolding today. By combining historical lessons with present-day data, we will explore which sectors and groups are facing the greatest risk, and how economic theory helps make sense of these shifts. As **Brynjolfsson and McAfee (2014)** argue, the goal isn't to resist innovation—it's to make sure we design policies that spread the benefits of progress more fairly, so we're not just innovating for a few, but for everyone.

A. Job destruction in the face of technology

1. Sectors most affected by automation

a) Manufacturing

Manufacturing is probably the clearest example of how automation can reshape an entire sector. It's been happening for decades now starting with basic mechanization and evolving into something far more sophisticated. Today, **industrial robots and AI-powered systems** have taken over tasks that used to be done by people on factory floors, especially those that are repetitive and routine. In a lot of cases, machines simply do the job faster, cheaper, and

with fewer errors. This vulnerability is well-documented by Autor, Levy, and Murnane (2003), who note that routine-intensive jobs are **the easiest for machines to imitate**.

What's striking is how consistent this trend has been, especially in regions that once depended heavily on factory jobs. Take the American Midwest, for example. Cities like Detroit, which were once the heart of the automobile industry, saw massive declines in employment starting in the 1980s. This phenomena often referred to as the "**Rust Belt**," was in majority due to automation. Research by **Acemoglu and Restrepo (2020)** found that for every robot added per 1,000 workers, employment dropped by up to 0.34%, while wages declined by 0.5%, underscoring automation's profound labor displacement effects. That's not just an economic shift—it's something that affects entire communities. (Acemoglu & Restrepo, 2020, p.1279–1333)

And this isn't unique to the U.S. In parts of Europe, especially where traditional industries like textiles and steel were strong, automation has led to similar patterns. Even though overall productivity has gone up, fewer people are needed to do the work, which means fewer jobs. So we end up with this strange paradox: factories are more efficient than ever, but people are being pushed out. For instance, between 2000 and 2014, employment in European manufacturing fell by nearly **3.5 million jobs**, despite output in many sectors continuing to rise. (OECD, 2019, p.46)

Of course, it's not all bad news. Some roles have become safer and more specialized. New kinds of jobs have appeared too—like robot technicians or systems analysts—but the big issue is accessibility. Most of the people who lose their jobs don't have the skills or the time to just switch careers. Reskilling sounds great on paper, however, in reality, it's a long, difficult process, especially for older workers or those without a formal education.

So, while automation in manufacturing has definitely brought gains in terms of output and innovation, it's also created a real need for policies that help workers adapt. Otherwise, we risk repeating the same mistakes—where progress comes at the expense of the people who can least afford it.

b) Transportation and logistics

If there's a sector where the future of automation feels especially close, it's transportation and logistics. From autonomous trucks to drone delivery systems, the pace of change here is honestly a bit overwhelming. What used to feel like science fiction just a decade ago is now being tested on highways and city streets. For millions of workers—especially truck drivers, warehouse staff, and taxi operators—this shift could be life-changing, and not necessarily in a good way.

In the U.S. alone, there are over 3.5 million truck drivers (**U.S. Bureau of Labor Statistics, 2022**). Many of them don't have college degrees, and their jobs have long been seen as stable, even if demanding. But with companies like Tesla and Waymo making serious progress on self-driving freight, that stability is now under threat. A study by **Arntz et al. (2016, p. 23)** suggests

that transportation roles in high-income countries are particularly exposed, partly because these jobs follow standardized routines that machines can easily replicate—and because labor costs are high enough to justify the investment in automation.

There's also a strong regional dimension to this. In areas where the economy depends heavily on logistics—think port cities or highway hubs—the rollout of driverless technology could hit especially hard. **These aren't just individual job losses**; entire communities could feel the effects. Spatial inequality could deepen as jobs vanish in places that don't have strong digital or service economies to fall back on (OECD, 2023, p.173).

However, Automation in this sector has the potential to reduce accidents, improve delivery efficiency, and create new jobs in system maintenance, software development, and fleet management. But again, there's a catch: the people losing their jobs may not be the ones best positioned to fill these new roles. Without targeted training and long-term support, we risk replacing one set of challenges with another (Bessen ,2019, p. 10).

In short, the transportation sector shows us the double-edged nature of automation—yes, there's progress, but it comes with a cost. And unless we actively manage the transition, a lot of people could be left behind.

c) Retail and service work

Retail and personal service jobs are changing faster than most people expected. In many stores and restaurants, things like self-checkout kiosks, AI-powered customer service, and even robots that **restock shelves** are becoming normal. From a business perspective, these tools are efficient—they save time and reduce costs. But there's a downside: they're replacing a **huge number of entry-level positions** that used to be the first stop for people entering the labor market, especially young workers and those without formal qualifications (OECD ,2019, p.56).

Brynjolfsson and McAfee (2014) have warned about this trend for a while. According to them, while digital innovation helps boost productivity, it often compresses the job market at the lower end. In other words, the tech that makes stores more efficient often makes jobs disappear. **COVID-19 made this worse**. Faced with lockdowns and distancing rules, companies rushed to roll out contactless solutions. But instead of going back to pre-pandemic staffing levels, many businesses stuck with automation. For example, **McDonald's and Walmart installed thousands of self-service kiosks** across their locations, dramatically reducing the number of front-line staff needed (ILO, 2021, p.155 ;Brynjolfsson & McAfee, 2014, p. 153)

On the surface, this kind of innovation seems like progress. But in practice, it creates a big gap. These “**stepping-stone**” jobs have always been more than just income—they're often how people gain experience, build confidence, and move up. Without them, it becomes harder for vulnerable groups to break into the workforce, and harder still for them to advance. It's one of those cases where efficiency can quietly undermine social mobility.

d) Administrative and clerical jobs

Clerical and administrative jobs used to offer something many other sectors couldn't: stability. For a long time, they provided reliable careers, especially for women, and didn't always require a college degree. But that safety net is quickly disappearing. With automation tools like **robotic process automation** (RPA), AI-based scheduling apps, and advanced document scanning systems, many of the tasks that once kept full teams busy can now be done by software (Bessen, 2019, p.15; OECD, 2021, p.97).

James Bessen's research (2019) shows how this has played out over time. Tools like optical character recognition (OCR) and digital file classification have steadily **reduced the need for manual office work**. These aren't dramatic overnight changes—but over decades, they've reshaped how organizations function. Today, one Human Resource generalist can handle what used to be the workload of an entire team. It's efficient, yes—but it also means fewer job openings in a sector that once absorbed large numbers of workers.

Another major shift is digital literacy. It's not just an advantage anymore—it's the baseline. If you can't use productivity software or navigate technological platforms, your chances in this field drop fast. The OECD (2021, p.97) notes that women in clerical roles are especially vulnerable if they don't get targeted support. And this isn't just about job loss—it touches broader issues: Who gets access to training? Who is excluded by default? And what happens to equity in the workplace when the digital divide grows?

2. Processes of job destruction: historical trends and economic forecasts

a) Historical continuity

Workers have experienced job displacement through technology numerous times throughout history. Machines during the **First Industrial Revolution** took over the work of skilled artisans by performing their duties faster at lower costs. The transformation led to authentic social conflicts. During the Luddite movement in early 19th-century Britain, people demonstrated their fear that technological advancements were destroying traditional ways of living while threatening their personal identities (Thompson, 1963, p. 43-64; Mokyr, 2009, p. 15–35).

Historian Joel Mokyr (2009) describes this period as a full-scale social transformation that went beyond machine adoption in the workplace. Mechanization brought about **the downfall of guild** systems across centuries while shifting power relations and altering how labor received its value. The extensive societal transformation became a pattern which has occurred during every technological innovation cycle.

The 1970s through 1980s brought about another significant period of change. During this period computers together with microelectronics and early automation systems began their entry into office spaces and manufacturing facilities. The rise of innovation led to the elimination of many middle-management and administrative staff members specifically in finance and administration sectors (Braverman, 1974, p. 45-71; Rifkin, 1995, p. 52-84). The technological

advancements that brought digital careers and new sectors to life simultaneously eliminated the stable middle-level positions which used to sustain the middle class after World War II. This historical pattern of work elimination followed by reorganization continues to emerge across different technological revolutions demonstrating an ongoing connection between technology and job elimination.

b) Accelerated disruption and polarization

The main distinction between current automation trends stems from how fast and extensive they operate. According to Frey and Osborne's (2017) study nearly 47% of all U.S. jobs face an imminent risk of automation. The current wave of automation now affects positions beyond factory work and manual labor. The fields of paralegal work, radiology and legal assistance have started to see impacts from automation even though these roles were historically viewed as protected from automation (Frey & Osborne, 2017, p. 254–280).

Susskind (2020) takes it further, warning that as AI systems become more advanced, they're not just copying tasks—they're starting to take over areas that involve judgment, pattern recognition, and even creativity. The transformation is profound because it modifies our understanding of human abilities in professional environments.

The separation of skilled jobs into higher-paid positions and low-wage positions is known as **labor market polarization** by economists. The impact of automation extends beyond job replacement of unskilled workers because it drives the workforce into two distinct sectors: professional high-income fields such as **software engineering and data science and basic low-wage positions** in delivery work and caregiving roles (Autor, 2015, p. 3-30; Acemoglu & Restrepo, 2020, p. 2-5). The middle-income jobs which sustained the middle class during the past have vanished from the employment market.

The result? The gap between people continues to grow beyond financial differences into a difference in opportunities. The public educational system together with job training institutions face difficulties to maintain their effectiveness. If no effective interventions are implemented the gap will expand further so the labor market will function based on initial starting positions.

c) Global trends and pandemic acceleration

The COVID-19 pandemic created an acceleration of automation beyond its effects on health systems. Companies **viewed automation as a necessary solution** when lockdowns and labor shortages and supply chain disruptions occurred. Acemoglu and Restrepo (2021) explain how economic downturns enhance machine adoption through what they term the “robocalypse” effect.

The pandemic period led companies to boost their automation investments in warehousing and retail and manufacturing sectors. The implemented technologies maintained operational

stability while causing a quicker shift of employees out of their jobs. The crisis revealed how much **we depended on labor-intensive** systems before showing how quickly those systems could be replaced.

Global economic impacts spread across nations with unequal effects. Wealthier countries maintain the ability to adjust through their possession of infrastructure alongside capital and digital competencies. These economies face different circumstances from others across the globe. The World Bank (2019) issued a **warning about premature deindustrialization** since developing countries will lose their factory jobs before their industrial base reaches full development. The use of low-cost labor markets makes developing countries vulnerable to automation taking jobs before their workers establish stable career paths.

Digital access inequalities became visible at their most extreme during the pandemic. The professionals who worked in high-paying jobs successfully transitioned their work into remote arrangements. The majority of workers in service and manual labor positions lacked any remote work alternatives so they experienced much greater job loss consequences. (ILO, 2021) The result? The gap expanded between workers who could work safely and those who lost their employment opportunities. Future labor market developments make inclusive and coordinated policy measures essential for addressing automation's expanding role in employment.

3. Theoretical interpretations of technological job displacement

a) Technological unemployment (keynes)

John Maynard Keynes first presented his concept of **technological unemployment** during 1930, and this idea continues to be highly relevant in present times. The essay *Economic Possibilities for our Grandchildren* by Keynes (1930/2010) described how **technological advancements might create a temporary job shortage** before new employment opportunities emerge. His vision remained positive in general, but he cautioned about an intense adjustment period during which numerous workers risked becoming obsolete.

Today's world exhibits the same characteristics as the transitional period Keynes predicted. Education systems and labor market institutions cannot match the speed of modern technological progress that has become much faster. The job market has created disadvantages for numerous workers especially those who perform routine tasks and those who lack training opportunities. New positions such as data analyst or cybersecurity expert have appeared, but they need specialized knowledge and digital abilities that many people cannot acquire (OECD, 2023).

The current economic situation demonstrates exactly the kind of permanent disruption that Keynes predicted would occur when adaptation rates fall behind technological advancements leading to substantial economic and individual damage (Susskind, 2020, p. 123–145; Keynes, 1930/2010, p. 358–373).

b) Skill-biased technological change (SBTC)

The **skill-biased technological change (SBTC)** theory explains why certain individuals succeed in the modern technology-driven economy, but others remain in disadvantage. Goldin and Katz (2009) state that technological development creates advantages for workers who have received **advanced education** to operate new technology yet simultaneously reduces employment opportunities in lower-skilled positions (Goldin & Katz, 2008, p. 3–23).

The emerging wage gap along with diminishing job quality becomes observable through various indicators. **The industries of finance, IT and biotech** experience both salary growth and employment increase for their skilled professionals. Routine-based work such as clerical support and assembly line production has become more automated. The economic process creates labor market polarization because high-skill jobs that pay well increase while low-skill service jobs endure and the middle class **continues to disappear** (Autor, 2015 p. 3-30; Acemoglu & Restrepo, 2020, p. 1-5).

The success of individuals in this economic transformation depends heavily on their educational background according to SBTC. **Vocational training systems** within nations which are strong prove essential for handling economic disruption. Limited access to education combined with outdated educational systems results in workers becoming more susceptible to being left behind. **The gap between individuals** extends beyond their individual abilities because it reflects the allocation of public resources toward workforce development.

c) Routine-biased technological change (RBTC)

The focus of **routine-biased technological change (RBTC)** differs from SBTC because it examines which **specific tasks** become automated during technological advancements. The theoretical framework developed by Autor, Levy and Murnane shows that tasks which involve routine procedures together with **rule-based operations** remain most susceptible to automation (Autor et al., 2003, p. 1279-1330 ;UNESCO, 2021; Standing, 2011, p.76-89).

The middle-skill job sector including bookkeeping together with administrative support and factory positions experienced a dramatic reduction in numbers. The job sector containing both low-skill manual positions and **high-skill analytical roles** showed greater resistance to automation. Studies indicate that tasks demanding adaptability alongside communication skills and problem-solving capabilities remain challenging for machines to duplicate (Brynjolfsson & McAfee, 2014, p. 193–195).

The concept of RBTC emphasizes the nature of tasks performed in the workplace rather than focusing on educational qualifications or professional titles. The importance of **"soft skills"** including creativity and emotional intelligence alongside social interaction now surpasses technical abilities according to current workplace requirements (Susskind & Susskind, 2015, p. 145–170).

d) Creative destruction (schumpeter)

From a broader, macroeconomic perspective, **Schumpeter's theory of creative destruction** reminds us that disruption is baked into the DNA of capitalism. In *Capitalism, Socialism and Democracy*, he argued that innovation always comes with a cost: old industries collapse so new ones can emerge (Schumpeter, 1942, p.112-143).

We see this all around us—coal mining, print newspapers, traditional retail—all shrinking or vanishing as new tech-based models take over. The innovation economy offers new opportunities, but the benefits rarely reach everyone equally. The people who lose their jobs or businesses are often **not** the ones who harvest the rewards of what's coming next (Acemoglu & Restrepo, 2019, p. 3-30).

Acemoglu and Robinson (2012) warn that if this process isn't managed carefully, it can lead to real social and political backlash. When disruption hits too fast and social protections are too weak, we risk rising **populism, labor unrest, and institutional instability**. For creative destruction to work in everyone's favor, it needs to be balanced by thoughtful policies—policies that help workers transition, support education, and ensure no one is permanently left behind (Acemoglu & Robinson, 2012, p. 70–75; Standing, 2011; OECD, 2023, p.173).

4. Case studies in automation-driven job loss

a) U.S. manufacturing decline

Industrial work underwent profound changes during the period from 2000 to 2010 when the U.S. manufacturing sector lost more than five million jobs. The main factors behind U.S. industrial job loss deserve analysis instead of simply **blaming globalization or offshoring** because automation played an equally important role. The rise of robotics and programmable machines redefined production while also streamlining it as shown by Autor and his coauthors **Dorn and Hanson (2016, p. 205–240)**. The evolution of industrial production systems replaced human workers who needed years of practice to achieve precision through automation.

Manufacturing changes affected areas most seriously where the sector operated as both economic activity and social foundation. The manufacturing industry's decline left deep social impacts on communities located in **Detroit and Youngstown**. The loss of jobs was coupled with the disappearance of middle-class status that these positions originally provided (**Frey & Osborne, 2017, p. 254–280**). The consequences of technological advancements spread across communities with unusual patterns of distribution. National production rates grew while wages remained stagnant and employment numbers rose in these affected regions. The case demonstrates that technological advancement leads to economic expansion which fails to benefit all areas of society with equal measure (Rodrik, 2018, p.1-45).

b) Logistics and amazon warehouses

When it comes to modern logistics, it's hard to avoid talking about Amazon. The company has become a symbol of digital-age efficiency, with warehouses that are practically choreographed by algorithms. Inside these facilities, **small, flat orange machines called Kiva robots** zip around the floor, lifting and moving entire shelving units to bring items directly to human workers (Dzieza, 2021, para. 12–17). These robots—guided by floor sensors and QR codes—don't just save time, they completely reshape how the warehouse operates. From the outside, it looks like a perfect harmony between man and machine.

The warehouse environment presents complex challenges that differ from the organized system that appears outside. Amazon maintains an extensive workforce, yet its jobs exist in different forms. Automation **hasn't gotten rid of jobs entirely** since it has made existing roles more demanding. The reduced workforce needs to manage higher volumes in shorter periods while under constant observation (Susskind, 2020, p. 123–145). Journalist Josh Dzieza reports that workplace pressure has turned into a situation where both burnout and employee turnover rates remain high. Robots do not replace workers because the pace they set exceeds human capabilities.

c) Retail banking automation

Retail banking might seem like a more “stable” industry, but it's quietly gone through a dramatic transformation. The rollout of **ATMs in the 1980s** started the shift, and now mobile apps, online platforms, and AI-driven advisors are doing what tellers used to do—only faster and cheaper (Bessen, 2019, p.15).

At first, ATMs actually led to more branches being opened, since they reduced operating costs. But in the long run, as Bessen (2019, p. 16–17) explains, the writing was on the wall: **routine banking roles began to shrink**, especially as customers embraced digital services. This shift is visible in banks like **ING** and **Belfius**, which have actively pushed forward with **digital-first strategies**. Both institutions have streamlined their physical presence and invested heavily in mobile apps and online tools, allowing customers to carry out most everyday banking functions without ever visiting a branch.

Today, most people rarely set foot in a branch. And for those still working in retail banking, the job has evolved. Tellers are now expected to provide digital support and tech-savvy service, not just cash handling. It's another example of how automation doesn't always wipe jobs out—it just quietly rewrites them.

d) Legal and paralegal services

Law as a practice continues to transform despite its historical position as an area untouched by automation. Legal tech platforms now perform three primary functions which include document scanning and contract generation as well as legal case prediction. The tools now redefine how

legal firms operate. Software now performs the tasks which previously belonged to both paralegals and junior associates (Susskind & Susskind, 2015, p.145–170). According to Susskind (2020), we’re witnessing a deep restructuring of legal work. The profession isn’t going away, but it’s **being divided** between high-level legal strategy and the increasingly automated “back-end” tasks. Firms are now looking for graduates who not only understand the law but can also navigate digital tools. It’s not that lawyers are being replaced—it’s that the skill set is shifting. Those without the right technology fluency are finding it harder to break in or move up.

Together, these case studies show that automation doesn’t look the same in every industry. In manufacturing, it’s about replacement (Acemoglu & Restrepo, 2020, p.4-6). In warehousing, it’s about intensity (Dzieza, 2021, para. 9–11). In banking, it’s about obsolescence (Bessen, 2016, p. 1-6). And in law, it’s about restructuring. What ties them all together is the need for new kinds of thinking—from both employers and policymakers. Because whether it’s a robot arm, a software system, or an AI algorithm, the tools may be different—but the impact on workers is very real.

5. Social and demographic impacts

a) Age, gender, and education

The effects of automation differ among different groups of people. Certain groups in society encounter automation risks to varying degrees and the most vulnerable members of society face the greatest damage. The most vulnerable population includes older workers together with individuals who lack formal education and women who work in administrative and clerical positions (OECD, 2023, p.173). The OECD’s data is pretty striking— As we can see in **Figure 6**, workers with lower levels of education face significantly higher automation risks, with over 50% of individuals with only primary education in high-risk jobs. That’s a huge gap. When you think about jobs like clerical work, which have historically offered stability for women especially, it becomes obvious how uneven the impact really is (OECD, 2023).

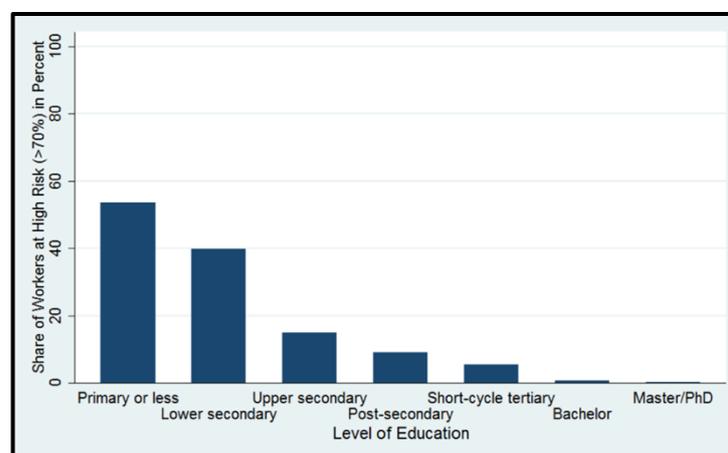


Figure 6. Share of Workers with High Automatibility by Education

Source: **Arntz, M., T. Gregory and U. Zierahn (2016)**, “The Risk of Automation for Jobs in OECD Countries: A Comparative Analysis”, OECD Social, Employment and Migration Working Papers, No. 189, OECD Publishing, Paris, p.20. <http://dx.doi.org/10.1787/5jlz9h56dvq7-en>

We have to consider the age aspect in this situation. The advice to retrain or learn new technological skills remains challenging for older workers since they may not find this feasible. The workforce nears retirement age, and most workers have not touched a computer since the 1980s and few organizations provide them with the opportunity to acquire new skills (ILO, 2021 P 155). The concept of lifelong learning remains prominent, yet various systems fail to establish genuine learning possibilities for all individuals.

Age together with gender and education levels create a compound effect that produces a severe disadvantage. The three factors create a cumulative disadvantage which makes adaptation more difficult while reducing job market readmission chances and visibility. The goal of creating work policies that benefit all individuals requires proper consideration of overlapping elements. Our efforts to close the gap will become pointless because we are not addressing this overlap (Standing, 2011).

b) Geographic inequality

Automation demonstrates how its effects spread across regions in addition to individual and demographic factors. The reality in smaller cities and former industrial towns contrasts with the new job opportunities found in technological hubs such as **San Francisco or Berlin**.

Automation has brought a gradual disappearance that goes beyond mere technological progress to these specific locations. According to **Autor, D., Dorn, D., and Hanson, G. (2016)** places dependent on only one or two major industries such as coal mining or auto manufacturing face challenges to develop new economic models. The job loss problem extends beyond employee layoffs because these areas face insufficient resources to recover from the crisis. No access to fast internet. The surrounding area lacks nearby universities. Few chances to retrain (OECD, 2023).

The economic transformations go beyond mere financial alterations. People experience emotional changes because of how automation impacts their sense of world positioning. The abandoned regions typically experience intense feelings of anger together with disappointment toward the system. Workers experience both neglect and abandonment from their employers. The negative emotions of resentment maintain their strength because they influence voting decisions and trust relationships and future-oriented perspectives (Case & Deaton, 2020, p. 141-143).

c) Psychological and social consequences

The statistical data about job loss rates and automation risk scores and productivity statistics receives more attention than other metrics. Every statistical figure represents a person who faces

a complete life transformation after losing their employment. Your income changes along with your personal identity (Schor, 2010).

The findings of Case and Deaton (2020) about “**deaths of despair**” remained deeply ingrained in my mind. The authors establish that unemployment leads to increased suicide rates as well as drug abuse and alcohol consumption deaths. This outcome proves devastating even though it fits the available data. The disappearance of work results in the loss of daily routines and both purpose and stability in life. The loss extends beyond financial aspects in communities where employment directly connected to personal identity such as factory towns or mining regions. The fundamental organization of people's lives becomes disordered as a result (Case & Deaton, 2020, p. 141-143)

From a psychological standpoint, **Maslow’s hierarchy of needs** can explain the following: At the base, people need food, shelter, and safety, but just above that, they need to belong, feel good about themselves, and have a purpose. Work provides everything (Maslow, 1943). It’s not just a check it’s a role, a way to be recognized, a place to be in the world. It can be seen in **Figure 7** that the removal of work can affect nearly every level of human need, from the most basic to the most important (**Booth, 2023, p. 1-4**).

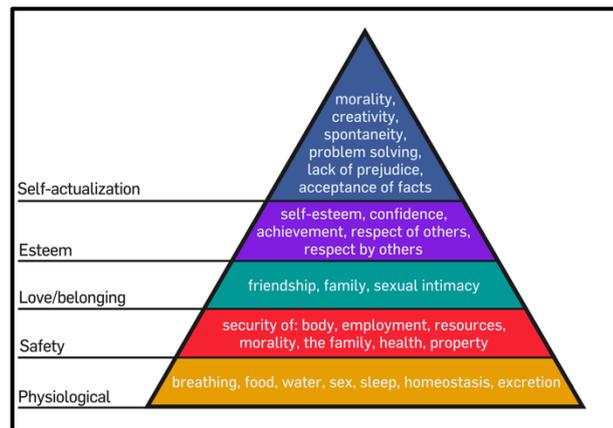


Figure 7. *Maslow’s Hierarchy of Needs*

Source: Wikipedia contributors. (2023, October 19). *Maslow's hierarchy of needs.* Wikipedia.
https://en.wikipedia.org/wiki/Maslow%27s_hierarchy_of_needs

Perhaps the hardest to handle is the powerlessness that comes with automation. It’s easy to feel like you don’t matter when your job is suddenly outsourced, or replaced by software, and hiring decisions are made by algorithms you don’t understand. Like you are just a number in a system that you did not ask to be part of (Zuboff, 2019). In the end, work gives rhythm to our days, meaning to our actions, and connection to others. When it disappears—and especially when it disappears without support or alternatives—the social and emotional consequences can be just as damaging as the financial ones.

6. From displacement to opportunity

However, the effects of automation on the labour market are undoubtedly uneven. Sectors such as manufacturing, retail, transport, and clerical work—especially those tasks that are routine—are being rapidly changed and often leaving those who are most vulnerable at risk of displacement (Autor, 2015, p. 3-30; Acemoglu & Restrepo, 2020; Brynjolfsson & McAfee, 2014, p. 187–190).

Theoretical frameworks from **Keynes (1930)**, **Schumpeter (1942)**, and modern labor economists help to explain these shifts. They show how innovation can both disrupt and renew, and how inequality tends to increase when adaptation is dependent on education, location, or digital literacy. (Goldin & Katz, 2008, p. 3–23; Autor et al., 2003, p. 1279-1330; Standing, 2011; Keynes, 1930/2010, p. 358–373).

These case studies and demographic patterns indicate that job loss is not just about money—it is also about the individual’s identity, self-esteem and the social fabric.

The real challenge is not to stop progress but to guide it—through inclusive policies, lifelong learning and protection of those who are most affected (OECD, 2023; Van Parijs & Vanderborght, 2017). If we do that, automation is not just a threat; it can be a tool for growth that is shared.

However, it is also clear that automation has undoubtedly taken away many jobs. History shows that innovation often creates new positions, businesses, and possibilities. Now we will turn to the second half of the paradox, namely job creation and the emergence of new industries.

B. Job creation: emerging new sectors

When we discuss automation, we are usually talking about what we are losing, jobs, stability, even sometimes the identity. That is a real and valid concern. But it is only half the story. What often gets overlooked is what we’re gaining. Every major technological shift in history has resulted in both the loss and creation of jobs. Of course, jobs disappear, yes, but new ones are created—and sometimes in areas that no one could have predicted. This is what **Joseph Schumpeter** called creative destruction—a process in which old industries are destroyed and, in their place, new systems of production and employment emerge (Schumpeter, 1942).

We are currently experiencing one of those transitions. We are seeing traditional sectors such as manufacturing, clerical work, and even transportation being reshaped or in some cases, replaced, as automation and AI continue to evolve. But at the same time, completely new types of work are appearing. Just a decade ago, roles like machine learning engineer, data ethicist, or cloud architect were practically unheard of. Now they are some of the fastest-growing job titles

globally. Even the World Economic Forum predicts that by 2025, **97 million** new roles will emerge in response to this kind of technological advancement (World Economic Forum, 2020).

These aren't just niche roles limited to **Silicon Valley** either. Digital tools are becoming part of almost every industry—from farming to fashion. What's happening isn't just about new technology—it's about a whole new way of organizing work. Instead of fixed offices and **9-to-5** schedules, we now have remote teams, gig platforms, and AI-assisted workflows. The very definition of a “job” is shifting, and so are the skills people need to succeed in this new environment (Susskind, 2020, p.123–145).

Not everyone possesses equal opportunities to access new possibilities. The new job opportunities mainly need applicants who possess digital literacy and formal education and reliable internet access which exist only in certain parts of the population. Modern technology brings new possibilities to society while simultaneously creating the risk of intensifying existing social inequalities when proper attention is not paid to the issue. According to **Brynjolfsson and McAfee (2014)** people who can match their capabilities to technology instead of performing tasks next to it are most likely to succeed in the new economy. This privilege is not accessible to everyone. (Brynjolfsson & McAfee, 2014, p. 209)

This study requires a detailed examination of job creation because of its importance. The advancement and technological progress coexist with multiple obstacles that create blind spots. When examining growing sectors it becomes essential to evaluate what types of jobs emerge as well as the demographics of workers they attract. The following segment of the thesis investigates these questions by studying the potential advantages and intricacies of employment in automated workplaces.

1. Technology-driven job creation

a) The rise of new digital roles

People cannot deny the fast changes happening in the job market. Machine learning engineers along with cloud architects were practically unknown to most people in the past but today they populate job listings extensively. The economic transformation extends beyond the introduction of a small number of additional job positions since it represents a complete change of direction for the economy.

The World Economic Forum (2020) predicts that AI specialists together with data analysts and digital marketing experts will become the most sought-after global workers by 2025. These technical company roles no longer remain limited to technology organizations since they have evolved into critical positions that span various sectors.

b) Cybersecurity in critical infrastructure

This labor market expansion stems from technology's widespread penetration into all industrial sectors. The fundamental operations of day-to-day activities in healthcare facilities and banking operations and public services now rely heavily on technology. The implementation of technology in organizations creates risks that threaten their security. **Cyberattacks** are no longer theoretical events since they occur in the present day.

The **CHU UCL** network suffered a complete shutdown of digital systems when three hospitals in Namur experienced a major cyberattack in May 2022 (RTBF, 2022). Medical personnel returned to documentation through paper-based methods which resulted in major disruptions to patient care services. Such incidents illustrate the critical need for cybersecurity experts who must protect both technology firms and essential public institutions.

c) The importance of data science

Data science has emerged as a significant field that grows at the same level as cybersecurity. The continuous generation of daily data exceeds human abilities to analyze it so businesses seek qualified professionals to interpret this data. Businesses need data scientists together with analysts and business intelligence professionals to convert statistical information into strategic decision-making assets because they are in high demand. Data-driven organizations perform better than their competitors according to **Deloitte (2020, p. 3-15)** through their analysis of performance metrics. Organizations now invest their funds in acquiring both technological infrastructure and skilled personnel who understand how to harness these systems effectively.

d) Access and inequality

The majority of people lack sufficient skills together with proper access to capture these new employment opportunities. Most new roles in the job market need specialized education and access to digital equipment as well as advanced formal training. The authors of **The Second Machine Age, Brynjolfsson and McAfee (2014)**, claim that people who successfully work alongside intelligent machines instead of competing against them will become the primary winners in this new economy. The requirement to fulfill this task remains challenging for most people who hold routine work experience and who lack access to sophisticated digital educational opportunities (Brynjolfsson & McAfee, 2014, p. 207).

Technology generates employment opportunities, but it simultaneously transforms work concepts in ways which might be complex to understand or difficult to achieve fairness in. The actual issue is not about the number of jobs that exist but rather *who will perform them*.

2. Automation and productivity gains

a) How automation changes the nature of work

When we talk about automation, the conversation often stops at job loss. But that's not the whole story. One of the more overlooked aspects is that automation doesn't just eliminate jobs—it also changes the nature of work and can boost overall productivity. And in the long run, higher productivity can actually create **more employment**, just not always in the same places or forms (Acemoglu & Restrepo, 2020, p.1-46).

b) Sectoral examples: healthcare and retail

Machines now handle work tasks that are repetitive, time-consuming or physically dangerous. Automation of these tasks enables people to shift their attention to creative, decision-making and emotionally intelligent roles which algorithms currently cannot duplicate. A good example of this is in healthcare. Hospitals use artificial intelligence to handle patient scheduling duties and to analyze lab results and organize digital medical records as part of modern healthcare operations. The decrease in administrative tasks enables healthcare professionals to dedicate more time **toward their core responsibility of patient care**. Hospitals employ automated triage systems that determine the order of emergency cases for doctors to evaluate first without wasting vital time (OECD, 2023).

The retail industry demonstrates this phenomenon. At first glance self-checkout kiosks and automated stock monitoring systems appear to destroy jobs. These systems actually redirect workplace duties toward tasks that involve customer assistance and inventory replenishment and digital order management. The evolution of retail jobs toward technology-based and human-oriented responsibilities prevents their disappearance. Research from **McKinsey (2021)** shows that customer-facing roles in retail could gain importance because excellent service becomes a fundamental competitive factor in a digital business environment.

c) The rebound effect

There's also a bigger economic mechanism at play here. In a study by **Autor and Salomons (2018)**, the authors found that while automation *did* reduce employment in the sectors directly affected, it also led to increased productivity, which stimulated overall economic growth. That growth, in turn, created demand in other parts of the economy—restaurants, leisure, education, and digital services, to name a few. Economists call this the “**rebound effect**.” Basically, when machines help us work faster and better, we produce more value, which boosts consumption and fuels the need for other kinds of jobs (Autor & Salomons, 2018, p. 22-25).

d) Institutional impact on outcomes

However, this does not mean it is guaranteed to occur. The creation of more productive systems does not automatically result in improved employment opportunities and higher salaries for all workers. Shareholder profits and corporate gains which are not reinvested in training or social programs will likely increase the distance between high-income individuals and others. That's

why institutions matter. The future of shared growth through automation depends on how public policy and corporate responsibility and education systems guide its implementation. **Acemoglu and Restrepo** explain that automation does not follow a predetermined path because its direction depends on design choices and target audiences (2019).

3. Platform work and the digital gig economy

a) The emergence of gig platforms

Technology created new types of jobs which exist outside the boundaries of high-tech research facilities and coding schools. The growth of the platform economy enables people to perform work from their vehicles and kitchens and laptops. The rise of apps such as **Uber, Deliveroo, TaskRabbit, Fiverr, and Upwork** has transformed job recruitment processes by enabling worldwide earners to find employment outside traditional employer frameworks. The platform economy operates through algorithms to manage on-demand work that includes food delivery alongside logo design and document translation and image labeling for AI model development (Srniczek, 2017).

The first observations about platform work reveal numerous positive aspects. The necessary requirements for working through this platform include only a smartphone and reliable internet access together with a willingness to perform tasks. Platform work functions as a vital economic opportunity for people who live in regions with limited stable employment opportunities. Through platform services people in **India, Kenya and Brazil** can work with international clients without needing traditional gatekeeping services (Graham & Anwar, 2019, para. 1-5). Food delivery apps throughout Europe became essential during **the COVID-19** pandemic because they maintained employment for people as other industries completely stopped operations (OECD, 2021, p.121-148).

b) Precarity and legal uncertainty

This operational model succeeds for some users although it presents **major difficulties** to them. The lack of benefits including health insurance and paid leave and unemployment protection remains a challenge for many gig workers. Platform workers face income volatility because app algorithms can make sudden changes that affect their earnings. The earnings of an **Uber driver** could drop unexpectedly when the system chooses different drivers or modifies pricing settings without explanation. Workers have no power to bargain for changes or express their needs as a group. The independent contractor classification assigned to platform workers prevents them from forming unions or obtaining improved working conditions (**Woodcock & Graham, 2020, P.65-75**).

Recent legal debates show just how **unclear the status of gig work** really is. In countries like **Spain and the UK**, courts have ruled that some platform workers should be treated as employees, not just freelancers—forcing companies like Deliveroo and Uber to rethink their

business models (De Stefano & Aloisi, 2018). These cases highlight a bigger issue: the traditional frameworks we use to regulate work don't always fit the way people work today.

c) The evolution of platforms

Despite the existing uncertainty gig platforms continue to exist without signs of disappearance. The platforms are currently undergoing development. Some platforms have added professional tiers that enable skilled freelancers like **software engineers** and **video editors** to generate full-time income by working with international clients. Some platforms are developing communities and providing basic benefits which indicates a slow transition toward more sustainable business approaches (Vallas & Schor, 2020). Marketplaces such as **Malt** in Europe and **Toptal** in the U.S. demonstrate evolutionary progress through specialized worker connections that deliver long-term contracts instead of short-term gigs.

The most recent gigs which result from automation processes have directly influenced their creation. **AI system training** requires human workers to perform image labeling and write example texts and correct automated outputs through various platforms. These invisible jobs serve as the foundation for smart technologies yet receive minimal payment and operate in concealed environments (Gray & Suri, 2019, p. 33). These jobs demonstrate how digital labor operates as an intersection between human effort and artificial intelligence systems.

Platform work demonstrates imperfections but represents the evolving work landscape by offering flexible and accessible opportunities despite its fragmented nature. The current challenge involves developing methods to achieve fairness and sustainability alongside inclusive practices which benefit the large number of people already working in this sector.

4. Creative destruction in the modern economy

a) New roles replacing old ones

Schumpeter's concept of creative destruction is no longer theoretical because we can observe it happening throughout our modern world. Industries in decline give space for new ones which grow rapidly to take their place. Streaming platforms have eliminated **DVD rental stores** from existence but simultaneously opened opportunities for user experience designers and algorithm engineers and content curators who focus on digital media daily use experiences (Schumpeter, 1942, p.43-57).

Renewable energy transition serves as a strong demonstration of the power behind modern technological development. The global move toward clean energy technologies together with fossil fuel abandonment has driven significant growth in solar installation work and wind turbine maintenance jobs and climate consulting careers. Global employment in renewable energy sources increased from **7.3 million in 2012** to **12.7 million in 2021** according to the International **Renewable Energy Agency** (IRENA, 2022). Such employment indicates that

investments in renewable sectors generate beneficial outcomes. These positions exist beyond short-term labor opportunities because they support ongoing structural changes in the economy.

b) AI's unexpected job creation

Artificial intelligence transforms the job market by producing new work opportunities in addition to performing automated operations. Today organizations employ AI ethicists to create fair algorithms while data labelers train machines to detect facial features and vocal tones as well as emotional expressions. **The World Economic Forum (2020)** indicates that advanced digital tools require two new essential roles which emerged less than five years ago.

The economic landscape transforms because old job positions disappear while new ones emerge unexpectedly which makes today's economy challenging to understand. Modern education demands training in multiple jobs because permanent career positions no longer exist. Many people today adapt to changes by moving forward rather than fighting against them (Brynjolfsson & McAfee, 2014, p. 195).

5. Policy considerations: ensuring equitable transition

a) Education and infrastructure

Automation-based job creation holds promise only when people can gain entry into these positions. Without inclusive policies the benefits of progress will primarily reach a small elite while the majority of society remains behind. **The government** along with **education systems** and employers hold substantial responsibilities in this matter (World Bank, 2019, P.97-103).

First, digital education and upskilling must be more accessible. Not just for young professionals, but also for adults who need to retrain mid-career. As **the World Bank**, 2019, p.119-123) notes, lifelong learning must become a core part of how we structure modern labor markets.

Second, there is the question of access. In many rural or low-income areas, people are still held back by something as basic as the lack of reliable internet. If we're serious about giving everyone a fair shot in a digital economy, universal broadband must be part of the equation. **The OECD (2021, p.89)** has highlighted this as one of the most immediate barriers to equitable participation in digital work—especially for remote jobs and online learning.

Our society must create support systems for individuals who experience transition periods. Real support must be provided to workers who experience industry disruptions because vague reskilling promises lack substance. A combination of income support and subsidized retraining together with labor market services must be available to help people transition. The “flexicurity” models of **Denmark** and the **Netherlands** demonstrate successful approaches through their combination of adaptable hiring systems with protective workforce regulations and active employment programs (European Commission, 2020).

b) Legal frameworks for modern work

Labor laws also need to evolve. Gig workers, freelancers, and platform-based workers currently fall into legal grey areas in many countries. They're not traditional employees, but they're not fully independent either. This leaves them without benefits, social protections, or even the right to collectively bargain. Some countries, like **Spain** and the **UK**, have started to reclassify platform workers to ensure basic rights—but these are just first steps (De Stefano & Aloisi, 2018, p. 471–504). We need frameworks that recognize the complexity of modern work, rather than forcing it into outdated categories.

And finally, we can't forget the bigger picture. **As Daron Acemoglu (2021)** reminds us, the direction of technological change isn't neutral. It's shaped by policies, incentives, and values. If we reward companies for replacing workers instead of empowering them, then we shouldn't be surprised when inequality grows. But if we invest in people, in inclusive innovation, and in shared prosperity, we can shape an economy where technology works for everyone—not just for the most prepared.

6. Beyond disruption

It's easy to get caught up in what automation is taking away—jobs, routines, even a sense of security in some cases. But that's only half the story. At the same time, we're seeing entirely new kinds of work, industries, and opportunities begin to take shape. **The world of work isn't just shrinking—it's shifting.**

Of course, this transition won't be smooth for everyone. The gains won't reach all corners of society automatically. But if the right support systems are in place—through inclusive policies, accessible training, and thoughtful regulation—we can build a future of work that's not only more efficient, but also fairer, more adaptive, and more human.

We will follow up by looking at how some of these ideas are being put into practice—through real-world strategies and case studies that show what an inclusive transition can look like on the ground.

C. Slow adaptation and the skills challenge

When people talk about automation and digital transformation, it's often with a sense of excitement—new tools, faster systems, better outcomes. But what's talked about less is how hard it is for real people to keep up with all this change. While technology moves forward at lightning speed, the systems that help us prepare for it—like schools, job training programs, and even workplace support—aren't moving nearly as fast.

For many workers, it's not a lack of motivation that holds them back. It's time, access, and support. Learning new skills is hard enough but learning them while juggling a full-time job,

raising a family, or dealing with economic uncertainty? That’s even harder. And this challenge isn’t limited to a single country or sector, it’s showing up everywhere, from factories in Belgium to call centers in **Nairobi**.

This part of the chapter takes a closer look at the reality behind the buzzwords. First, we explore just how fast technology is changing—and why that pace is creating so much pressure (A). Then, we dig into the growing gap between what workers know and what employers actually need (B). Finally, we look at the bigger picture: how this mismatch is shaping the structure of labor markets, deepening inequality, and putting some people permanently at risk of being left behind (C).

Because at the end of the day, automation isn’t just about machines. It’s about people—and whether or not we’re giving them a fair shot to grow with the future, not be pushed out by it.

1. Speed of technological change and workers’ lack of preparedness

a) An unprecedented pace of change

The past twenty years have seen an explosion in technological development—especially in areas like automation, artificial intelligence, and data analytics. What makes this wave different from previous ones is its scope and speed. Innovations like **ChatGPT** or **AI-powered** diagnostics have moved from lab prototypes to mass-market tools in under two years. For workers, this means less time to adapt and less warning before skillsets become obsolete. According to the **World Economic Forum (2023)**, **85% of businesses** globally plan to adopt new technologies such as big data, AI, and cloud computing by 2027, yet most report that their workforce is not adequately prepared to handle these tools.

Historically, institutions had time to absorb and respond to technological change. Today, by the time a university updates its curriculum, the tools it’s preparing students to use may already be outdated. **Brynjolfsson and McAfee (2014)** describe this tension as a “*race between education and technology*,” where schooling systems evolve incrementally, while technology leaps forward at exponential speed. This mismatch puts even the most motivated workers at a disadvantage. (Brynjolfsson & McAfee, 2014, p. 190)

Adding to the that, the **International Federation of Robotics (IFR, 2022)** reports that industrial robot installations worldwide increased by **31% in 2021** alone. In some countries like South Korea and Singapore, there are now more than **1000 robots per 10,000** manufacturing employees (**IFR, 2023**). As automation scales across industries, the timeline for workers to transition shortens further.

b) Technological illiteracy across demographics

The digital divide persists across demographic lines—especially age, education level, and rural-urban residency. In the EU, **nearly 42% of adults aged 55–74** report having “low” or “no” digital skills, compared to only **17% of younger adults** (OECD, 2022). In rural areas,

broadband access remains patchy, and fewer workers receive digital training from their employers. This imbalance severely limits the adaptability of certain populations just as technological demands are increasing.

In developing countries, the gap is even starker. According to **UNESCO (2021)**, fewer than **30% of secondary schools** in Sub-Saharan Africa offer any kind of computer science or ICT training. Meanwhile, in high-income countries, digital tools are often embedded in daily life, creating “digital natives” who are more likely to succeed in tech-driven labor markets. These disparities reinforce global inequalities and limit upward mobility for millions.

For older workers in both North and South, fear or lack of confidence around digital tools can discourage engagement with even basic technologies. This creates what sociologists call “**technological alienation**”—a sense of disconnection from the systems shaping one’s economic future. In psychological terms, this is linked to higher levels of anxiety and lower job satisfaction, particularly among mid-career professionals (**Pew Research Center, 2020**).

b) Institutional inertia: why support systems lag behind

One of the most persistent obstacles in preparing the workforce is the slow pace of institutional adaptation. While policymakers have increasingly recognized the importance of digital upskilling, implementation remains inconsistent. Curricula are often developed years in advance and rely on lengthy accreditation cycles, making them poorly suited to meet real-time labor market demands.

A **2022 OECD** report revealed that in over half of its member countries, fewer than **30% of secondary schools** offered structured courses in coding, data literacy, or AI concepts (OECD, 2022, p.89). Meanwhile, only **1 in 5** vocational education programs includes modules on digital literacy. Even where these courses exist, there is often a shortage of qualified teachers, or access is limited to urban centers.

The problem is not just in schools. Adult learning systems are also struggling to meet the demand for mid-career upskilling. The **European Training Foundation (2023)** found that only **29% of adults** across Europe participated in any form of structured digital training in the past year. This participation rate drops significantly in low-income and rural populations, deepening labor market exclusion.

2. Gaps between available skills and market needs

a) A global mismatch

There is something deeply frustrating happening in labor markets around the world: **millions of people are looking for jobs, and millions of jobs are unfilled**. It seems like a simple problem to solve, unfortunately this is not the case. The core issue isn’t a lack of effort on either side, but a fundamental **disconnection between what employers need and what workers are equipped to offer**.

This gap is growing fast. According to the **World Economic Forum's *Future of Jobs Report (2023)***, nearly **60% of global companies** say skills shortages are holding back their growth plans. In the U.S., the National Federation of Independent Business found that **4 in 10 small businesses couldn't fill open positions in 2022**, largely due to a lack of qualified candidates (NFIB, 2022). Meanwhile, Germany—a country renowned for its vocational education—reported over 1.7 million job vacancies in 2021, with significant shortages in skilled professions such as IT, healthcare, and logistics (Annex 1) (**Bundesagentur für Arbeit, 2021**).

It's not just technical roles either. Even in customer service, logistics, and construction, companies report that new recruits often lack the mix of **digital and problem-solving skills** now needed in order to succeed. According to ManpowerGroup's (2023) *Talent Shortage Survey*, **77% of employers globally** are struggling to hire talent with the right blend of hard and soft skills (**LinkedIn, 2022, p. 12**).

There's a classic tool in labor economics called the **Beveridge Curve**, which charts the relationship between **job vacancies** and **unemployment rates**. Under normal conditions, the logic is simple: when there are lots of job openings, unemployment should fall, because people find work. But lately, that relationship isn't holding up the way it used to (Barlevy, Faberman, Hobijn, & Şahin, 2024, p. 83–106).

As the chart below shows in **Figure 8**, especially after COVID-19, the curve has shifted outward—meaning **job vacancies are high**, but **unemployment hasn't dropped as expected**. Economists interpret this as a sign that something deeper is going on: the people looking for work **don't have the skills** required for the jobs being offered. This is a textbook case of **structural mismatch** in the labor market.

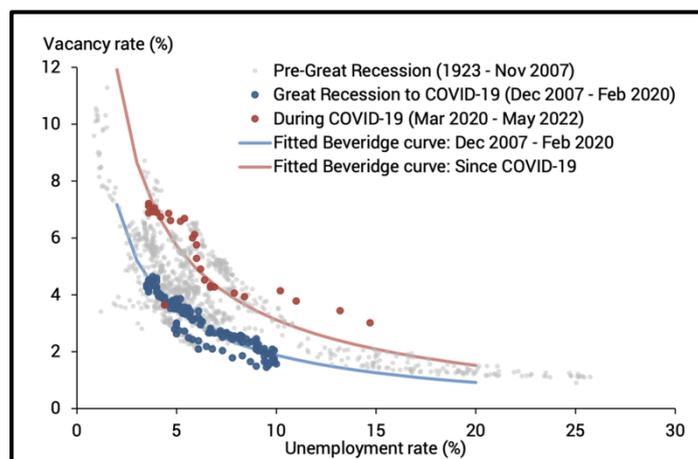


Figure 8. Shift in the U.S. Beveridge Curve Before and After COVID-19

Source: Barlevy, G., Faberman, R. J., Hobijn, B., & Şahin, A. (2024). The shifting reasons for Beveridge Curve shifts. *Journal of Economic Perspectives*, 38(2), 83–106. <https://www.jstor.org/stable/27301887>

b) Beyond technical skills: the missing soft edge

When people hear “skills gap,” they often picture someone who can’t code or use Excel. But in reality, the problem goes deeper. Employers today aren’t just looking for hard skills—they’re **hiring for adaptability, emotional intelligence, critical thinking, and communication.**

A recent *LinkedIn Global Talent Trends* report found that **89% of hiring failures are due to a lack of soft skills**, not technical ones (LinkedIn, 2022, p. 12). Why? Because in a fast-changing economy, it’s not enough to know how to do one task—you have to learn, unlearn, and relearn constantly. This is especially important in hybrid roles that combine customer service with tech use, or leadership with data-driven decision-making.

Yet, very few education systems or training programs make these skills a priority. They’re often seen as “extras,” or assumed to come naturally. But research from *McKinsey & Company (2020, p.9)* argues the opposite: in a digitized economy, these competencies are not soft at all—they are **core to employability**, especially as automation is taking over routine tasks.

c) Outdated systems in a changing world

The world of work has changed dramatically—but most of the institutions preparing people for it **haven’t**. Many schools still teach for the jobs of yesterday: focused on memorization, rigid structures, and standardized outcomes. But today’s jobs are fluid, team-based, and evolving. And today’s workers need to **adapt, collaborate, and solve problems in real time.**

A major challenge lies in the outdated models that shape our education and training systems. They were built for a time when most people trained once—early in life—and worked in the same field for decades. That model is no longer sustainable. In fact, the *OECD (2021)* notes that adults will now need to **reskill four to five times** throughout their working lives just to stay relevant.

But systems haven’t caught up. The same *OECD Skills Outlook (2021)* reported that more than **half of adults across member countries lack essential digital skills**, and very few have access to flexible, career-aligned training⁸. Meanwhile, only **19% of companies worldwide** offer structured lifelong learning opportunities (OECD, 2021, p.212).

This mismatch creates a frustrating situation for workers: they’re willing to adapt, but the infrastructure to help them do so is either missing or not accessible.

3. Education that doesn’t deliver

a) Degrees without direction

For decades, earning a university degree has been seen as a reliable pathway to stable, high-quality employment. And in many ways, that remains true. Higher education continues to open doors and shape critical thinking. But as the labor market evolves faster than ever, the link between academic qualifications and employability has started to weaken—not because

education no longer matters, but because what's being taught and what the economy demands aren't always aligned.

In many countries, a growing number of graduates are finding themselves **underemployed or unable to find work** in their fields. According to *Eurostat (2022)*, the youth unemployment rate among university graduates in Spain reached **28%**, one of the highest in Europe. In South Africa, graduate unemployment doubled between 2010 and 2020 (World Bank, 2021, P. 89-90). These numbers don't mean higher education has failed—but they do suggest a widening **gap between classroom learning and real-world skills** (Eurostat, 2022, para.4).

b) Outdated curricula, fast-moving markets

One major factor behind this disconnection is the speed of economic and technological change. While sectors like artificial intelligence, green energy, and digital platforms are growing rapidly, university curricula often **take years to update** due to bureaucratic and accreditation cycles. In this time, industry needs can shift dramatically.

A 2020 report by the *McKinsey Global Institute* found that **up to 40% of European graduates** do not work in a field related to their studies, largely due to this lag between education and labor market evolution (McKinsey & Company, 2020, p.12). Employers increasingly report that new hires, even those with advanced degrees, lack the **practical, cross-disciplinary, and digital skills** needed to succeed on the job (ManpowerGroup, 2023).

This doesn't mean universities are doing nothing. Many institutions are innovating and adapting—offering more internships, entrepreneurship programs, and digital courses. But they're also balancing research, academic freedom, and societal responsibilities. Change is happening—it just isn't fast enough to match the needs of a dynamic global economy.

c) The case for stronger collaboration

Rather than framing the issue as failure, it's more helpful to see it as a call for **stronger alignment between education, industry, and government**. Employers can work with universities to co-design program of studies that are both academically rigorous and professionally relevant. Governments can incentivize adaptive learning pathways that encourage lifelong reskilling, not just front-loaded education in early adulthood.

For example, *Finland's National Skills Strategy* emphasizes continuous cooperation between polytechnics and industry partners, resulting in **shorter feedback loops** between labor needs and program design (European Commission, 2020). This type of model respects the core mission of education while making it more responsive to social and economic change.

Ultimately, universities remain vital institutions—not just for skill development, but for citizenship, research, and critical thought. But in a world where **technical change is constant**, their role in **employability must evolve alongside** their traditional academic goals.

4. What's actually working

While much of the conversation around the skills gap focuses on what's going wrong, it's just as important to highlight **what's working**. Around the world, some countries, institutions, and companies are taking bold and innovative steps to bridge the divide between what people know and what the labor market needs.

These aren't just theories—they're **concrete strategies** that offer useful lessons for others. The examples that follow show that with the right mix of **political will, cross-sector collaboration, and inclusive design**, the future of work can be more equitable and resilient.

a) Singapore: investing in lifelong learning

Singapore is often cited as a global leader in workforce development, and for good reason. Its **SkillsFuture initiative**, launched in 2015, gives every citizen access to subsidized, flexible training throughout their career—whether they're just starting out or retraining midlife.

According to *SkillsFuture SG (2021)*, more than **540,000 individuals** engaged in supported programs in a single year, with options ranging from data science to digital marketing and advanced manufacturing. What makes the system work is not just funding—it's **responsiveness**. Programs are regularly updated to reflect industry needs, and employers are directly involved in shaping course content.

This model shows how national policy can promote not just “education,” but **continuous, accessible skill-building** that adapts with people's lives (World Bank, 2019).

b) Denmark: the “flexicurity” model

Denmark offers a different, but equally powerful approach. Its famous “flexicurity” model balances flexible hiring and firing with **strong worker protections** and **state-sponsored reskilling**. When workers lose a job, they're not left behind—they're supported through retraining programs designed in partnership with unions and employers (European Commission, 2020).

As a result, Denmark maintains **one of the highest job mobility rates in Europe**, without the long-term unemployment spikes seen in other high-income countries (OECD, 2020). Rather than trying to prevent economic change, the system helps people **move with the change**—while keeping social cohesion intact.

This shows that it's possible to **embrace innovation without sacrificing security**—a balance many countries are still struggling to find.

c) Rwanda: closing the digital divide from the bottom up

While most success stories come from wealthy nations, Rwanda offers an inspiring example from the Global South. In partnership with the **World Economic Forum and Digital Opportunity Trust**, Rwanda launched a “Digital Ambassadors” program to train **young people in digital skills** and then deploy them to rural areas to train others (World Economic Forum, 2020).

By 2020, over **100,000 citizens**—many in hard-to-reach communities—had received digital literacy training (UNDP, 2021). Importantly, this initiative wasn’t just about access to tools. It was about **empowerment**—equipping people to participate in the digital economy on their own terms (Smart Africa Secretariat, 2021, para. 1-4).

Rwanda’s case proves that with the right partnerships and localized strategies, even countries with limited resources can make huge strides toward **inclusive digital transformation** (Digital Opportunity Trust, 2021).

D. Interim conclusion

The second chapter has taken us deep into the heart of the labor market's current transformation. We have seen how automation is both dismantling and creating jobs, often faster than institutions and individuals can adapt. New sectors are booming, but access to them remains uneven. Education systems struggle to catch up, and even well-intentioned reskilling initiatives often miss those who need them most. This misalignment between labor supply and demand is no longer just an economic issue—it is social, political, and personal.

The consequences are already visible: persistent structural unemployment, rising inequality, and mounting pressure on public systems to respond. And yet, within this complex landscape, we’ve also encountered real solutions—national strategies, public-private partnerships, and global case studies that show progress is possible. What matters now is scale, accessibility, and the political will to act fast enough.

But the question that looms even larger is: **what kind of future are we heading toward?** If automation continues at this pace, if technology keeps outpacing policy, then we’re not just looking at a changing labor market—we’re confronting the possibility of a new economic paradigm altogether.

This brings us to the next chapter, which shifts from the present challenges of transition to the **future of economic thinking**. How do existing economic models handle the idea of widespread automation? What role can governments play in ensuring both stability and equity in the age of intelligent machines? And perhaps most provocatively: are we approaching a world where traditional work is no longer central to our lives?

In Chapter 3, we explore these questions through the lenses of economic theory, policy experimentation, and bold societal reimaginings. If the first chapters have laid out the disruption, the next chapter asks—**what comes after?**

Part 3: Transitioning Towards an Uncertain Future

The last chapter of the book examines the work of the future after discussing both the negative and positive impact of automation on employment and explaining how workers and institutions have only slowly and inconsistently adapted. **Automation's growing penetration** in economies has shifted the focus from adaptation strategies to proactive development of automation systems (Ford, 2015, p. 274)

The chapter explores both **economic and political** aspects of this change. What mechanisms should we implement to control productivity enhancements that primarily benefit small groups of people? Can we create equitable distribution systems in an automated world where production rises but employment numbers decrease? Which countries demonstrate the best response to automation challenges through their public policies and which measures prove most effective for cushioning its effects? Is a post-work society on the horizon or is this concept still a distant dream?

The section avoids providing set solutions but instead encourages **thoughtful consideration**. This section merges **academic theories** with **practical tests** to create essential knowledge about labor market transformations along with the fundamental shift of work as a vital human and economic foundation.

A. Economic models facing automation

People have used work-based income as the **foundation of economic systems** for multiple decades. Machines are taking over an increasing amount of labor while performing tasks at **higher speeds and lower costs**. This issue transcends technological aspects. This challenge affects both the economic structure and the social framework of our society deeply.

Artificial intelligence and **robotics** continue to improve in capability, so they establish a new relationship between work and productivity. With this development we now achieve higher output at the same time as reducing the number of employees needed for production (**Acemoglu & Restrepo, 2020, p.1-20**). The idea appears remarkable when viewed in theoretical terms. Real-life situations present several complicated dilemmas because of this situation. The beneficiaries of these advantages **remain unclear** to many people. When jobs become obsolete how should society manage the consequences? How will we maintain social fairness and economic stability during progress?

Economists together with policymakers and tech industry leaders now face essential challenges to transform basic economic systems. The scarcity of **traditional employment** opportunities requires us to develop alternative systems for income distribution. When productivity increases yet wages fail to grow adequately how will we prevent widening income disparities (Brynjolfsson & McAfee, 2014, p. 129)?

This section discusses various economic models which attempt to resolve these questions. This section will evaluate various concepts such as **Universal Basic Income** alongside **Robot Taxation** and **Post-Scarcity economics** to explore how governments and thinkers are redesigning value and security distribution in a world with potentially jobless citizens.

1. Rethinking redistribution: universal basic income and other proposals

a) universal basic income: a safety net for the age of automation

Imagine waking up every month knowing you'll receive a fixed amount of money—no matter your job, income, or circumstances. That's the core idea behind **Universal Basic Income (UBI)**. It's simple, bold, and for some, revolutionary: give everyone a guaranteed income, unconditionally, and trust people to make their own choices.

The growing acceptance of UBI logic has emerged because of automation advancements. Many see Universal Basic Income as an answer to economic uncertainty because it provides stability for people whose **jobs might disappear or transform beyond recognition**. The intention behind UBI is not to push people into inactivity. The policy allows people to choose between educational pursuits and caregiving and entrepreneurial ventures or part-time employment without being trapped by financial insecurity (Van Parijs & Vanderborght, 2017; Standing, 2017).

The main arguments against UBI include its high cost and concern that the program would decrease workers' motivation levels. **Philippe Van Parijs** together with **Guy Standing** demonstrate that UBI would simplify welfare systems while granting individuals independence from exploitative work and decreasing their career anxiety about starting new businesses.

According to Standing (2017):

“UBI is not a utopian dream, it's a practical tool to give people more control over their time, their choices, and their dignity”

b) Robot tax: making automation pay its share

The increasing replacement of human workers by machines has brought forth the innovative solution of **robot taxation**. The tax proposal from **Bill Gates (WEF, 2017)** suggests that automation companies should pay additional taxes to compensate for reduced payroll taxes and fund retraining initiatives alongside universal benefit programs like UBI (Maisto, Pistone & Turina, 2024, p. 109). The fundamental reasoning shows that robotic replacements result in a reduced tax base. Since robots and algorithms are taking control of human work activities it follows that they should contribute financially in some way.

The global robotics sector undergoes rapid transformations while nations adopt distinct approaches to manage this evolution. According to the **International Federation of Robotics (2021)**, there were over **3 million industrial robots** operating worldwide in 2020, with **Asia**

accounting for 71% of new installations—a sign of the region’s aggressive move toward automation. China recorded a 20% increase in robot adoption, while South Korea maintained its position as the world leader in robotization with over **1000 robots per 10,000 manufacturing employees**, and more than **342,000 units in operational stock**. The **Figure 9** shows that China installed more than 168,000 industrial robots in 2020 than four times the number installed in Germany making it the dominant player in global automation (International Federation of Robotics, 2021).

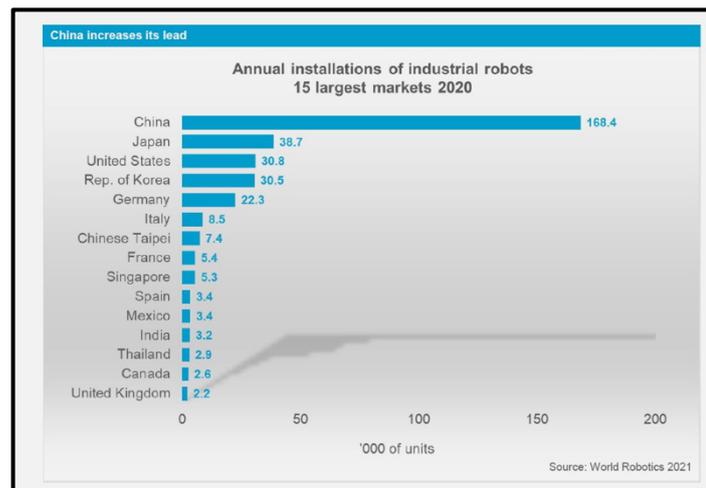


Figure 9. Annual Installations of Industrial Robots in the 15 Largest Markets (2020)

Source: **International Federation of Robotics. (2020).** *Record 2.7 million robots work in factories around the globe.* <https://ifr.org/ifr-press-releases/news/record-2.7-million-robots-work-in-factories-around-the-globe>

Different governments have implemented policies to distribute the speeded-up acceleration across society more equitably. **South Korea** has established tax breaks for businesses that put significant investments into automation as a means to encourage them to think about the social impacts from fast robot implementation and minimize human labor losses in at-risk industries. **(TaxFitness, 2023).**

Supporters of robot tax implementation maintain that the approach does not target innovation but instead seeks to **restore social balance** between workers and **technological advancements**. The accumulation of wealth from automation demands that society receives a share of the generated funds. Critics express concern that the implementation of this policy may either **reduce technological development** or **lead businesses to shift automation** operations outside the current jurisdiction.

There’s no global consensus yet, but debates are growing. In **the European Parliament**, several motions have been introduced to study and regulate the impact of AI and robotics on taxation and labor markets (European Parliament, 2017). The United States has started to

implement digital and tech-related levies through **San Francisco and Seattle** as pilot programs to fund social initiatives and promote inclusive innovation (Hern, 2017, para. 2-4).

2. Post-scarcity economy theories

a) Scarcity: a foundation being challenged

The foundation of classical economics rests on the fundamental principle of scarcity. The supply of goods and services together with available time never reaches sufficient levels. The existence of prices and competition and markets and inequality emerges because of this fundamental condition. This fundamental principle formed the basis for **all economic systems** including international trade and household financial management.

The fundamental principle of scarcity no longer applies to certain essential products in life. The **post-scarcity** economy debate presents a future economic model in which new technologies make essential goods and services so inexpensive that they become nearly free. The abundance of certain items including energy, data, digital content, and food in specific situations has made them immune to **traditional economic constraints**.

The world begins to shift away from price-based distribution toward a system that distributes resources based on sharing capabilities. Economist **Jeremy Rifkin** predicts that automation, clean power, and online platforms will drive us toward a future where the production cost of "**making the next copy**" of something approaches zero for online courses, e-books, and solar power. Everything changes because of this development (Rifkin, 2014, p.12-45).

b) Signs of post-scarcity are already here

We may not live in a **post-scarcity world** yet, but we're already seeing parts of it appear—especially in the digital world. Think about it: the entire content of **Wikipedia**, tens of thousands of academic courses, software tools like Linux and Blender—all are available for free, to anyone with an internet connection. That's revolutionary. In the past, knowledge was locked behind tuition fees or elite institutions. Today, a teenager in **Nairobi** can learn Python or physics from the same videos as a student at MIT (Benkler, 2006, p. 1-8).

Education is perhaps one of the most powerful examples. Platforms like **Coursera**, **edX**, and **Khan Academy** have opened the doors to learning for millions. And while they don't eliminate inequality on their own, they represent a new logic—where opportunity doesn't always have to come with a price tag (Shirky, 2010, p. 1-24).

This shows us that post-scarcity isn't just a utopia—it's already reshaping lives. The challenge now is making sure that access doesn't stop at the screen. Because digital inclusion still depends on having electricity, connectivity, time, and support to learn.

c) But the world isn't abundant everywhere

Of course, many essential resources are still governed by scarcity. **Food production** might be growing, but hunger persists. Medical advances exist, but healthcare access remains unequal. **Clean water, safe housing, emotional care**—these are not always scalable or free.

Even in wealthy countries, scarcity shows up in new ways: attention fatigue, data monopolies, algorithmic gatekeeping. In a way, we've shifted from scarcity of supply to scarcity of trust, time, and dignity. Post-scarcity, then, isn't just about making more stuff. It's about redefining what we value—and how we get it.

That's where thinkers like **Kate Raworth** step in. In her *Doughnut Economics* model, she argues that our goal shouldn't be limitless growth but rather thriving within limits—making sure everyone has enough, without overshooting our planet's capacity (Raworth, 2017).

d) Distribution is the real battle

Post-scarcity, when it happens, won't matter much if it benefits only a few. Let's take energy. Solar power is cheaper than ever before. The **International Energy Agency** (2020) reports that solar is now “the cheapest electricity in history” in some parts of the world. But that doesn't mean every family can install panels on their roof. Distribution—of infrastructure, finance, and political will—is still the bottleneck.

Or consider digital work. The tools to create, share, and learn are abundant—but the time, security, and recognition needed to use them well are still rare for many workers. For someone juggling multiple jobs or living in rural areas without broadband, “**abundant resources**” can feel out of reach.

That's why post-scarcity must be linked to policy. Countries like Rwanda have made real strides by training young people in digital skills and sending them to underserved communities as “**Digital Ambassadors**” (WEF, 2020). Meanwhile, cities like **Barcelona** are embracing the idea of digital commons—public digital infrastructure and participatory technology—to empower their citizens (Krewer & Warso, 2024, p. 2)

e) Between tech utopia and human realities

Some thinkers, like **Paul Mason (2015)**, envision a world where automation makes work optional, and creativity becomes our main occupation. Others, like **Erik Brynjolfsson and Andrew McAfee (2014)**, urge caution: unless we design for equity, abundance might only make the rich richer. What's clear is that we're heading into a hybrid economy. Some goods—like information, software, and clean energy—are approaching post-scarcity. Others—like housing, care work, and justice—remain deeply constrained. And the value of work itself is being redefined. (Brynjolfsson & McAfee, 2014, p. 203)

If we want the benefits of abundance to be shared, we need more than good code. We need inclusive institutions, public oversight, and an ethical compass. As history shows, technological change doesn't guarantee fairness. It only creates the possibility of it (Brynjolfsson & McAfee, 2014, pp. 198–205).

B. The role of public policies in adapting to new challenges

Society depends on public policies to adapt to new challenges that emerge. Public adaptation has been necessary throughout the technological progression. Every major technological advancement — starting with **industrial revolutions** and extending to **modern digital times** — has forced governments to defend citizens while promoting national economic development. The convergence of automated speed with artificial intelligence unpredictability and extensive reach creates an unmatched challenge because millions of people will become abandoned without proactive policies. The present public policy system requires achieving an appropriate balance between technological advancement and **social cohesion** (OECD, 2021, p.212).

Can equal opportunities coexist with free innovation? The most critical aspect involves preparing people for employment in a workforce that experiences **continuous changes**. This section examines how governments address existing gaps and tensions through their creative experiments as well as economic assistance and legislation (ILO, 2022, p.20).

1. Legislative responses to automation

a) The early legal vacuum: technology outpacing regulation

Technology development has historically been faster than legal frameworks that attempt to regulate it, but this gap became significantly larger with automation and artificial intelligence. The legal systems that exist today were originally designed to manage a world where employers maintained physical oversight of workers while contracts remained stable, and tasks remained centered on human activities.

Through the establishment of platform work platforms like **Uber, Deliveroo, and TaskRabbit**, developers challenged the traditional employee classification system. This situation led to intense legal battles across California. The **Dynamex** ruling (2018) first labeled gig workers as employees to grant them benefits including minimum pay and health insurance coverage and additional perks (California Supreme Court, 2018, p.1-9). In 2020, **Proposition 22** passed after platform businesses used intense lobbying to secure an exemption from employee reclassification. The situation shows that delayed regulations typically harm vulnerable employees.

b) Europe's early moves: building anticipatory regulation

The **European** region approached automation and artificial intelligence threats through methodical and forward-thinking measures before the **United States** started addressing these dangers. **The AI Act of 2021** represents a pivotal achievement because instead of banning new technologies the EU opted to control them based on their risk levels (European Commission, 2021, p. 22–23).

The **European Commission (2021)** established three criteria which high-risk systems, including algorithmic hiring and workplace monitoring tools, need to satisfy. The criteria include human oversight together with auditability and transparency standards.

Different countries have initiated specific national programs that focus on labor regulations besides AI-specific rules. Spanish legislation, the "**Ley Riders**" law (2021), **transformed 70,000** platform workers into employees who gained access to social protection benefits including unemployment insurance (Ministerio de Trabajo, 2021). **Italian businesses** now need to disclose how their algorithms affect salary determination and workplace regulations through a new transparency law passed in 2022 (Colletti, 2022, p. 11). Europe demonstrates effective regulation of emerging work models through its proactive method which sets global standards for future regulatory frameworks despite ongoing enforcement obstacles.

c) The United States: a fragmented and reactive strategy

The United States prioritizes technological progress over regulatory oversight. The **National Artificial Intelligence Initiative Act** of 2020 was enacted to coordinate and accelerate federal investments in AI research and development, establish public-private partnerships, and prepare the workforce for AI integration across all sectors of the economy (U.S. Congress, 2020).

The discussion about **Universal Basic Income (UBI)**, portable benefits, and automation taxes exists primarily within academic studies. Yet, some local governments experimented. **New York City** passed a law that requires automated employment decision tools to undergo bias audits starting from 2023 (NYC Council, 2021, para. 4-7). The plan to impose taxes on major tech companies in San Francisco faced brief consideration before social program funding efforts became inactive (Ford, 2015, p. 268).

The disorganized nature of this system leaves employees unprotected against fast technological transformations while rights remain widely different between locations.

d) China: aggressive automation with minimal worker protection

China presents an alternative approach for development. **Made in China 2025** and the **New Generation Artificial Intelligence Development Plan of China** view automation as both a national strategy and an essential strategic objective (State Council of China, 2017, para. 1-5). The installation of more than **168,000 industrial** robots across China by 2020 outpaced the

total number of robots found in the next four countries combined (International Federation of Robotics, 2021).

The Chinese government implements its labor strategy through state-led reskilling initiatives along with social control mechanisms instead of rights-based protection for workers. The Chinese government pushes or compels workers who lose their jobs due to automation to join state-run training facilities according to **Ding**. Labor unrest receives suppression rather than negotiation under this system (Ding, 2020, p. 8-20).

Social absorption of major automation depends on limited worker self-governance but results in minimal worker freedom.

e) Emerging lessons: regulation is a choice, not a fate

The examples demonstrate that automation itself does not create an inevitable outcome. The choices made in policy formation determine whether automation generates empowerment or creates precarious conditions for workers.

- **Governmental anticipation** through early legislation in European countries enables worker protection to persist during fast-paced technological transformations.
- **Lack of regulation in the U.S.** creates an environment where corporate interests gain priority over societal stability.
- **The Chinese government** implements automation through state control yet provides no equivalent safeguards, which leads to the preservation of social order but restricts civil rights.

Automation exists as a value-driven process instead of an impartial one. The established values determine our approach between innovation versus dignity, growth versus equity, and economic speed versus human well-being.

2. Economic policies to protect workers

a) Universal basic income (ubi): a safety net for technological uncertainty

Modern automation drives changes in labor markets and people begin to consider Universal Basic Income (UBI) as both a solution for **poverty reduction** and a **protection against structural instability**. UBI enables people to acquire **survival benefits** without work requirements so they can choose retraining or caregiving and endure changes in their lives without becoming impoverished (Van Parijs & Vanderborght, 2017, p. 1-7).

b) Finland's ubi experiment: a bold but limited attempt

During 2017-2018 Finland conducted an extensively monitored UBI trial to investigate how **unconditional cash** transfers would affect employment and social well-being during an automated economy transformation. The Finnish government supported this initiative through the Social Insurance Institution to deliver **€560 monthly** stipends to **2,000 unemployed** citizens

without any work obligations or administrative requirements (Kangas et al., 2019, p. 10). The participants maintained their monthly stipend payments regardless of taking part-time or full-time employment since this welfare system deviated from **conventional programs** that typically reduce financial assistance when recipients earn income.

The evaluation results demonstrated ambiguous but important results. The employment outcomes of recipients demonstrated **modest growth primarily** through part-time work and entrepreneurship but there was no substantial change in full-time employment statistics. Participants experienced substantial **enhancements in their overall well-being** because they reported decreased stress and increased future confidence along with improved health and enhanced life satisfaction. The research results dispute conventional thinking about work disincentives in conditionless financial assistance by demonstrating that **stability** enables people to enhance their **economic and personal choices**.

Critics pointed out that the trial's restricted scale focused on unemployed participants prevented broader economic outcomes regarding entrepreneurship and consumption development (Kangas et al., 2019, p. 13). Political changes stopped expansion plans demonstrating how policy reforms need both successful research results and political backing to succeed. The UBI experiment conducted in Finland serves as a significant benchmark to examine innovative income security approaches during the automation age.

c) Extending insights: Stockton's seed project

Several pilot initiatives worldwide demonstrate the effectiveness of UBI-like systems through additional evidence. **The Stockton Economic Empowerment Demonstration (SEED)** program in California gave **125 low-income residents \$500 monthly payments** throughout 2019 to 2020. Recipients received unrestricted funds which they could manage as they saw fit.

Research findings from one year of the program revealed that participants found full-time employment at a **12-percentage point higher rate** than control group members (West et al., 2021, p. 10). Recipients experienced decreased anxiety levels and better mental health while gaining increased freedom to achieve personal and professional objectives. The research findings negate the typical concern that basic income programs decrease work motivation because financial security leads people to become **more active contributors to the economy**.

2. Lifelong learning credits and individual training accounts

Instead of providing financial assistance the alternative strategy for technological disruption focuses on providing lifelong educational opportunities to people. Workers in quickly changing economies need to learn new skills and transition between various industrial sectors multiple times throughout their careers. Education needs to transition from its traditional early-life focus to become accessible at all stages of a person's career.

a) Singapore's SkillsFuture program: building a culture of lifelong learning

Singapore launched the **SkillsFuture** initiative in 2015 to become one of the most extensive national programs for establishing lifelong learning systems worldwide. All Singaporean adults who are employed or unemployed receive **SGD \$500 (approximately €340)** in training credits from the start while the government periodically increases funding through national budget announcements (SkillsFuture Singapore, 2021, p. 6-15). The approved courses in multiple industrial sectors including digital skills and data analytics and healthcare and creative arts receive funding from these credits.

The SkillsFuture program serves as a funding scheme but also operates as a carefully designed national strategy. Employers receive incentives for workforce development through grants along with tax deductions and education provider partnerships as part of this initiative. Education institutions including universities and polytechnics and private providers have structured their programs according to industry requirements which guarantees their relevance during times of automation and digitalization (OECD, 2019, p.45).

The early outcomes have been promising. By 2020, over **half a million Singaporeans** had utilized their SkillsFuture credits at least once, with notable uptake among mid-career professionals seeking transitions into growth sectors like **IT and healthcare** (World Bank, 2019, P.98-101). According to the surveys, the participants reported that they not only acquired new skills, but they also gained **increased self-assurance when facing the turbulent job market**. Importantly, the program fosters a cultural shift: in Singapore, continuous learning is increasingly seen as a civic responsibility and an essential part of **economic citizenship** (SkillsFuture, 2023, P. 5-10).

however, the model's success is underpinned by singapore's unique context: a highly centralized government, strong public trust in institutions, and a historically interventionist approach to economic planning. skillsfuture will have to be carefully adapted when implementing it in other political, economic, and cultural environments.

b) comparative perspective: France's CPF initiative

France's Compte Personnel de Formation (CPF) is also another example of the trend of creating individualized and portable education rights. The CPF, which was created in 2015, is a program that provides workers with an **annual training budget** that they can save and use to pay for accredited courses throughout their careers (France Compétences, 2021). Although CPF shares **Singapore's objective** of empowering individuals, it differs by being closely tied to labor rights and the social security system, reflecting France's tradition of state-mediated employment protection.

Both programs show that treating education as a lifelong public good, rather than a one-time investment early in life, is critical for building economic resilience in an era where jobs—and skills—are constantly evolving.

3. Job guarantees and public sector employment

although much has been written about financial support models like universal basic income, another important approach is to guarantee the right to work itself. in the context of increasing automation, job guarantees offer a different vision: securing meaningful employment through direct public investment, especially in sectors that create social and environmental value.

a) India's MGNREGA: work as a citizenship right

India's **Mahatma Gandhi National Rural Employment Guarantee Act** (MGNREGA, 2021), introduced in 2005, remains one of the world's largest jobs guarantee programs. It entitles every rural household to **100 days of paid work per year**, usually in infrastructure projects like rural roads, water conservation systems, and reforestation (Ministry of Rural Development, 2020).

Although not intended to address automation at the start, **MGNREGA** shows that employment can be considered a **basic citizen right** rather than a **market outcome**. Besides income support, it has contributed to poverty alleviation, strengthening of rural infrastructure, and enhanced women's participation in the workforce. However, challenges such as delayed **wage payments**, **bureaucratic inefficiencies**, and corruption have raised concerns about the program's long-term sustainability (Dreze & Khera, 2017, p. 555–572).

b) South Korea's green new deal: future-proofing employment

In a more technologically advanced context, **South Korea's 2020 Green New Deal** shows how job guarantees can be adapted to face automation and climate change at the same time. The program plans to create **1.9 million jobs** by investing in renewable energy, smart infrastructure, and ecological restoration (South Korea Ministry of Economy and Finance, 2020).

this is unlike the traditional public works programs, **south korea's green new deal** focuses on equipping workers with future-proof skills, particularly in digital technologies and green industries. this forward-looking approach reflects the necessity of designing job guarantees that not only absorb displaced workers but also align with strategic economic transformations toward sustainability.

c) Key challenges and conditions for success

However, the idea of job guarantees is not without challenges. Some of the critics point out that there are potential risks of **inefficiency**, **over-bureaucratization**, and **mismatches** between the jobs that are created and the needs of the community. Sustainable financing models are crucial, and for this reason, robust taxation systems and broad political consensus are necessary (UNDP, 2022).

Moreover, the success of such programs depends heavily on their ability to remain **dynamic**—**adapting to new sectors**, incorporating worker feedback, and avoiding one-size-fits-all solutions. As automation accelerates, job guarantees must also be increasingly tied to emerging fields like **renewable energy, elder care, digital infrastructure, and public health**, rather than clinging solely to **traditional manual labor** models.

Job guarantees provide societies with a transformative solution to address automation-driven unemployment by delivering financial support together with personal honor and meaningful activities and community integration.

4. Portable benefits systems: adapting social protection to non-standard work

The evolution of work structures toward freelancing and platform-based employment has rendered the traditional employer-specific benefits model less suitable. Portable benefit systems function as flexible worker-centered solutions that maintain access to healthcare and pensions and unemployment protections which move with workers between different employment situations throughout their lives.

a) Washington state's portable benefits initiative

Washington State made history in 2017 by introducing the first serious proposal for portable benefits that would protect workers in the **gig and contract economy**. The proposed model required companies employing independent contractors to pay benefits costs proportionately into individual portable accounts (Rolf, 2018, p.1-4).

Through this system workers could obtain necessary protections including **healthcare coverage and paid leave and workers'** compensation benefits despite their employment being scattered across multiple jobs (Berg et al., 2018, p. 94). The initiative encountered political barriers to complete implementation yet established a significant social precedent because it demonstrated that platforms in the gig economy could share social responsibility without altering employment status definitions.

Washington State demonstrates an essential transition by understanding that flexible work arrangements need to **protect basic security** alongside providing freedom to workers (West & Lansang, 2020, p. 1-31).

b) Belgium's smart cooperative model: collective insurance for freelancers

Smart Cooperative in Belgium demonstrates a different yet equally groundbreaking method to provide benefits to freelancers through their Smart system. The platform **Smart Cooperative** serves as a shared administrative and insurance platform for freelance workers after its

establishment in the late 1990s. Freelancers maintain complete control over their projects yet obtain group benefits which include health insurance along with pension savings and salary administration services (Degryse, 2016, p. 29).

Workers create temporary employment agreements with Smart which establishes the company as their formal employer for **project-based work** so they can maintain flexible independence while receiving standard employment benefits (**Eurofound, 2020, p. 75**) Through collective resource sharing the cooperative minimizes administrative costs and distributes risks throughout its extensive network of independent workers (Drahokoupil & Piasna, 2019, p.11).

The Smart model proves that worker-led institutions can develop portable benefits without requiring **state-level imposition**.

c) Lessons for the future of work

The two systems demonstrate essential knowledge about social protection reform in current labor market conditions through their distinct state-operated and cooperative-operated approaches. Key among them (OECD, 2020 , p.42):

- **Flexibility** needs to accompany security measures so workers can choose flexible work arrangements without losing their health insurance and retirement savings and workplace safety protections.
- **Shared responsibility is essential:** Both platforms and governments must contribute to funding and managing benefits for non-standard workers.
- **New institutional models are needed:** Systemic reform and institutional creativity must be employed through state legislation or mutual cooperatives to address work realities with fragmented employment patterns.

Portable benefits systems will prove essential for economic stability as well as social cohesion and work dignity because they enable workers to navigate between multiple employers and short-term contracts and self-directed gigs.

5. Challenges and limitations of policy responses

a) Political resistance and deep-seated cultural narratives

The urgent need for updated **social protections** identified by economic rationality is frequently met with political resistance that causes reform efforts to become delayed or diluted or completely derailed. The introduction of UBI and shorter workweeks and automation taxes challenges widespread societal beliefs about work and meritocracy and individual worth. **The United States** remains among countries where people doubt automation will produce widespread inequality despite increasing evidence of its existence. The concept of employment persists as a dual entity that includes both economic activity and moral value linked to **individual virtue** (Lowrey, 2018, p. 20-15).

The argument for **Universal Basic Income** (UBI) exposes deep cultural conflicts that exist in society. Many opponents of UBI view it as handout assistance which they claim leads people to lose their work ethic and develop dependency problems. Scientific studies about basic income experiments across **Finland** (Kangas et al., 2019, p. 5) and **Stockton's SEED** (West et al., 2021, p. 10) program in the United States along with **Kenya's** (Haushofer, Reisinger, & Shapiro, 2020, p.5) initiative prove these worries about welfare dependency are unfounded. The ongoing cultural narrative which links social value to paid employment continues to block policymakers from adopting new policies. For reform initiatives to move forward the deeply held societal beliefs about work-related dignity and societal contribution must receive direct attention through public dialogue and political leadership.

b) Global inequality and uneven capacity to adapt

The destructive impact of automation operates unevenly across the world thus intensifying pre-existing economic gaps that exist between different nations and their regions. **Wealthy nations** possess better **fiscal flexibility** and **technological infrastructure** which enables them to implement worker retraining programs and automation taxes and expanded welfare models. The automation threat poses a special challenge to developing countries because they possess weak institutions together with restricted resources according to the **World Bank (2019, p. 120-124)**.

According to **the World Bank (2019)** Sub-Saharan Africa faces manufacturing job losses estimated at **80 million** because of automation-driven reshoring. **European nations** can transition away from manufacturing losses by establishing investments in digital economy sectors, yet numerous African states remain unable to support even minimal education and healthcare services. The local success of **Rwanda's "Digital Ambassadors Program"** which trained thousands to boost digital literacy demonstrates the substantial challenge because significant funding and infrastructural gaps prevent large-scale replication (World Economic Forum, 2020).

The internal economic disparities between different regions throughout countries are predicted to grow wider. **Urban centers** maintain superior connectivity and higher educational standards which creates better automation-related opportunities for their inhabitants yet **rural workers** together with informal sector workers face increased marginalization. Automation poses a threat to create a lasting **worldwide division** between those who benefit from technological advancements and those who do not when adequate redistribution plans are absent.

c) Technological change moving faster than policy innovation

A major hurdle exists because technology advances faster than the methodical consensus-building nature of policymaking. **Automation technologies** alongside **artificial intelligence** and **platform-based economies** continue to progress at an exponential rate yet legislation struggles to keep pace with these changes through disjointed and delayed responses (Mazzucato, 2018).

The European Union faced extensive delays in creating regulations for platform-based gig work services that included **Uber, Deliveroo and TaskRabbit**. During the time when serious legal discussions about platform work began millions of employees were already working in insecure unprotected labor situations. The initial attempts at regulating the gig economy failed because policymakers applied incorrect traditional labor standards that were inappropriate for digital business models (European Commission, 2021, p. 12–13).

Robot taxation proposals that emerged as a solution to automation social costs have faced challenges in their adoption since technological shifts such as **AI-driven services** replace manual work have created new **challenges for policymakers** (International Federation of Robotics, 2021).

The ongoing imbalance demands that governance systems adopt more predictive and adaptable operational models. According to **Mariana Mazzucato (2018)** governments should take the lead in directing innovation pathways instead of operating in reactive mode. The proactive governance approach becomes visible through **South Korea's Ministry of Science and ICT** which provides strategic funding for AI research projects that support national employment targets (Ministry of Science and ICT, 2020). Societies will remain trapped in reactive responses to technological disruptions unless they implement fundamental governance transformations.

C. Post-work society: reality or utopia?

People have relied on work for survival since ancient times, but the institution goes beyond basic sustenance. Work structures our daily activities while determining social positions and provides numerous people with essential value and social integration (Gorz, 1980, p. 31-33). **Our educational systems** as well as **social support** structures and identity concepts have developed through the fundamental connection to employment. The modern economy faces historic pressure on its traditional work-based system because of automation together with **artificial intelligence** and **advanced robotics** (Brynjolfsson & McAfee, 2014, p. 11–13).

Automation advances beyond repetitive task management to question the basic economic necessity of human labor in production processes (Acemoglu & Restrepo, 2020, p.1-20). The increasing machine capability to perform human-specific cognitive emotional and technical tasks has started to dismantle the core principles of the "**work-centered**" society (Susskind, 2020, 123–145). The consequences of maintaining high production levels become evident when there are fewer workers needed to support these levels. The disappearance of lifelong employment as a standard practice raises vital questions about human dignity together with personal fulfillment and social unity (De Stefano, 2016, p. 471–504).

The discussion about a **post-work society** moves beyond science fiction because it has become a serious subject for both **economic experts and social theorists** as well as government officials (Standing, 2017, p. 115-132). Is it feasible to envision an upcoming society where traditional employment does not determine status and meaning and income? Automation might liberate people to develop education while performing care tasks and

pursuing **creative interests** and **civic involvement** or could intensify present-day social gaps by abandoning numerous people to social isolation (Mason, 2015).

The section avoids delivering simple responses to its questions. This section investigates the conflict between technological feasibility and human requirements by exploring whether work-independent living remains a realistic possibility or exists only as a distant dream that conceals severe new threats.

1. Redefining work in a post-automation age

a) Work as identity and citizenship

Since the dawn of industrialization work has served functions beyond wage earning because it establishes both personal identity and citizenship status (Castel, 1995, p. 15). **Multiple cultures** establish work as the foundation for acquiring social benefits (health insurance and pensions) as well as obtaining voting rights and determining personal worth (Gorz, 1980, p. 32). **The traditional Protestant work ethic** presented work as a moral duty which linked dignity to productivity levels (Weber, 1930/2002, p. 32-56).

Automation's gradual elimination of manual and cognitive work has slowly detached work from its traditional relationship with personal identity. The increasing takeover of human responsibilities by intelligent systems creates an immediate need to address how productivity without mass employment affects people's sense of belonging and identity (Susskind, 2020, p.123–145).

Philosopher **André Gorz** was among the first to warn of this rupture. In his book *Farewell to the Working Class* (1980) he predicted that employment needs would decrease, and that people would become alienated when they were forced to rely only on work to achieve dignity. Gorz advocated for post-industrial societies to disconnect personal dignity from wage labor while searching for alternative ways for people to engage with society (Gorz, 1980, p. 4).

This is no longer just theory. Manufacturing and logistical sectors have witnessed the **disappearance of permanent positions** through the introduction of temporary staffing arrangements and automated systems and flexible work arrangements (OECD, 2023, p.173). The end of permanent employment has destroyed **conventional life achievements** such as pensions and mortgages and professional development so that society must redefine what it means to become an adult.

The economic impact of automation extends to cultural frameworks because it transforms our understanding of social involvement as a full participant. In addition to this, the expansion of the gig economy makes the sense of vulnerability worse. According to **Valerio De Stefano** (2016, p. 471–504), although gig work is seen as flexible, it isolates workers, deprives them of career advancement and disembeds them from collective bargaining and community. Consequently, many workers find themselves between technological progress and existential uncertainty: highly connected yet profoundly alienated.

The crisis of meaning is not a by-product—it is becoming one of the main social outcomes of an automated economy (Susskind, 2020, 123–145). If it is not resolved, it might contribute to the growth of “**quiet quitting**,” political radicalization, and the general deterioration of mental health.

b) New forms of invisible labor

Although people often assume that automation is going to substitute for human labor, a closer look reveals that new, invisible labor is being created behind the machines.

Artificial intelligence technologies do not operate autonomously; they need vast amounts of human input in the form of data labelling, content moderation, and training set cleaning . In their book ***Ghost Work***, **Mary Gray and Siddharth Suri (2019)** expose the existence of millions of microtasks, including clicks, classifications, and verifications performed by workers who earn less than the minimum wage, receive no benefits and receive no credit (Gray & Suri, 2019, p.8).

The “**ghost labour**” economy shows a worrying paradox: the more a technology appears to be a “**smart**” and “**seamless**” technology, the more likely it is that it will hide an amount of low-paid human work.

The implications are serious. First, they challenge the story of **fully autonomous systems**. Second, they reveal new forms of exploitation that involve the fragmentation of work, the concealment of work, and the removal of rights from work. If the future of work is going to be more and more invisible and precarious then ensuring that labour standards are decent becomes even more important.

Thus, automation does not eliminate the need for labor—it reconfigures it into forms that are easier to ignore.

c) Opportunities for redefining work: the case for reduced workweeks

Some societies are now in the process of rethinking the way we structure our work as a result of these disruptions. They instead ask if technology can allow us to work less and live better instead of **opposing automation** (Schor, 1992, p.47-72).

Iceland’s four-day workweek trial which lasted from 2015 to 2019 serves as a potential future example. Reducing working hours without any decrease in pay had a positive effect on production, reduced pressure and enhanced personal and professional life quality (Haraldsson & Kellam, 2021, p.3). The trial received positive feedback from public services, private companies and trade unions.

The success of these results has inspired countries such as **Spain, Belgium and New Zealand** to start testing similar models. According to **Rutger Bregman**, economic experts, if technology

can help increase output while decreasing labor, then the traditional 40-hour workweek becomes an illogical practice (Bregman, 2017, p. 38).

If we introduce shorter workweeks, then technological gains could be transferred from corporate profits into social wellbeing. More time could be made available for caregiving, civic engagement, creative pursuits and education which are activities that markets have traditionally undervalued (Piketty, 2020 P 473).

However, there is a risk that automation could lead to an increase in **working hours and intensification of work demands** instead of providing free time unless policies and collective bargaining are put in place (ILO, 2019 P 16-20).

d) Toward a new social contract for the future of work

Automation calls for economic reform but above all, a new social contract. The decline of full-time employment necessitates the redefinition of rights and responsibilities as well as rewards for society.

Basic income schemes, universal healthcare, lifelong learning entitlements, and stronger protections for non-traditional workers are all pieces of this puzzle (Standing, 2017). Cultural shifts also need to happen deeper than this, including recognition of unpaid care work, support of community-based initiatives, and the recognition of **leisure as a public good**.

The goal of post-industrial society, according to philosopher **André Gorz**, should be autonomous time, that is, the freedom to do something other than what is necessary for survival (Gorz, 1980, p.5). Without these new definitions, machines will be freed, but people will remain trapped.

The real issue, therefore, is not whether machines can work for us—but whether we can redefine work as more than just **survival, as involvement, satisfaction and membership**.

2. UBI and shorter work weeks: foundations for a new social contract

a) UBI: income without the wage-work link

The Universal Basic Income (UBI) experiments demonstrate to us that employment is not the only way to earn income. The basic concept of UBI delivers essential financial support to citizens without conditions to enable them pursue activities that lack monetary value including caregiving and artistic expression and community service.

UBI pilots in Kenya demonstrate that lowering financial risks leads to **more business creation, better attendance in schools** and stronger **community involvement** (Haushofer, Reisinger, & Shapiro, 2020, p.2). The implementation of UBI acts as a catalyst for people to participate in activities that truly matter to them rather than promoting idle behavior (Banerjee et al., 2019, p. 27).

Economist **Philippe Van Parijs** believes UBI provides a foundation for a new social agreement that breaks down employment barriers to define dignity (Van Parijs & Vanderborght, 2017). The shift toward automated work processes enables society to acknowledge **multiple forms of societal contribution** which exceed paid employment.

Critics state that running large-scale UBI programs requires **specific funding mechanisms** together with thorough design to prevent **widening regional living cost inequalities** (Martinelli, 2017). Current trials of UBI demonstrate encouraging results yet executing a large-scale implementation of UBI will be among the essential post-work policy issues.

b) The promise and pitfalls of the 4-day workweek

The 4-Day Workweek has emerged as a leading proposal for distributing productivity advantages through reduced working hours. Another society approach to redefine work involves decreasing work hours instead of removing it completely. The 4-day workweek has become one of the leading concepts for distributing **productivity gains more equally among workers** (Knight, 2021, para. 2).

The trial conducted in **Iceland between 2015 and 2019** established itself as a notable benchmark. The trial involved **2,500 public-sector** employees who moved to **35-36 hour workweeks** without receiving lower compensation. The results? The majority of workers reported **unchanged productivity levels** alongside improved **well-being after the change** (Haraldsson & Kellam, 2021, p.3). Modern Iceland operates with flexible work schedules that benefit nearly 90 percent of its workforce.

The 35-hour workweek legislation in France which started in 1998 serves as an educational case study (Chemin & Wasmer, 2009, p. 487–524). The implementation strategy targeted work distribution and life quality improvement yet its outcomes were inconsistent. Some business areas demonstrated **solid productivity levels**, yet employers used **informal overtime** systems which sometimes led to tensions among staff members. Cultural attachment patterns within specific industries influenced the outcomes of these initiatives because workers in these sectors maintained their preference for extended working hours (Askenazy, 2013, p. 323-347).

The experiments show that **shorter workweeks** generate **positive results** when businesses demonstrate **flexibility** across different sectors and when employers support these changes and their employees back them culturally. Organizations that focus on creative work together with services and knowledge sectors show better success rates when they **cut working hours without sacrificing productivity** (Schor, 2010, p.12-43). Healthcare organizations along with manufacturing operations need thorough reorganization processes to adjust to shorter workweeks because their work requires strict time frameworks.

c) Rethinking the social contract: beyond "jobs" to "contribution"

Shorter workweeks and UBI demonstrate a fundamental reevaluation of the social contract. During the industrial period being a **"good citizen"** generally involved maintaining a complete

employment schedule (Marshall, 1950, p. 45-102). The automation revolution will probably necessitate new ways for people to demonstrate their contribution and obtain value from society.

Economic participation formed the foundation which **T.H. Marshall** used to establish full citizenship according to sociological analysis. The modern thinker **Rutger Bregman** alongside other experts advocate for the importance of caregiving along with community work and creative activities as fundamental social pillars which do not necessarily adhere to **traditional labor market frameworks** (Bregman, 2017, p. 210-228).

These models gain increasing acceptance because society no longer considers work reduction or alternative contribution methods as extreme concepts. People see these adjustments as fundamental because human work no longer stands as the sole and essential source of value generation in the economy.

3. Between utopia and reality: what a post-work society could look like

a) Dreams of leisure and liberation

A society free from work-related burdens represents a long-standing dream of human history. According to economist **John Maynard Keynes** in the 1930s technological advancement would enable people to work **only 15 hours per week by the end of the century** (Keynes, 1930/2010, p. 358–373). The economist foresaw human beings obtaining freedom from economic need which would lead them toward cultural **advancement friendship and philosophical exploration**.

In Fully Automated Luxury Communism **Aaron Bastani** describes how **solar energy** alongside AI and automation systems will create abundant resources that satisfy all material needs (Bastani, 2019, p. 37). **The hypothetical world** brings about plentiful resources so people can pursue their creative interests while remaining free from wage demands.

Even the optimistic perspectives about automation fail to address the fundamental problem of who controls these systems. According to Shoshana Zuboff in *The Age of Surveillance Capitalism* technological advancement does not automatically lead to **human freedom**. Automated systems and artificial intelligence systems tend to strengthen the control of a small number of powerful corporations when there is no democratic oversight. **Google** and **Amazon** and **Meta** extract behavioral data to generate what Zuboff calls “**surveillance revenues**” which transforms human experience into profit. Such technologies will likely increase social inequality and strengthen control systems instead of spreading prosperity unless fundamental changes occur (Zuboff, 2019, p. 584- 592).

Technological advancements tend to create deeper **social inequalities** because they lack proper governing structures. Productivity enhancements from the Industrial Revolution created **long-lasting labor abuse** until protective measures were established. The goal of liberation through

technology exists in reality yet requires political will combined with new social arrangements and societal transformations to define value creation and sharing.

b) Reality check: persistent inequalities

Automation promises efficiency yet the actual implementation produces unequal results. The **International Labour Organization** reports that informal employment affects about **60 percent** of workers worldwide in situations that are often unsafe (ILO,2022, P.9). The introduction of automation technology has failed to reduce skill-level disparities between advanced and entry-level positions throughout many **Global South territories**.

The **COVID-19 pandemic** exposed all existing social and economic disparities to clear view. Frontline healthcare staff along with delivery and retail employees faced restrictions on working remotely but tech professionals and knowledge workers found easy transitions to remote work arrangements. These "**essential workers**" maintained the functioning of economies but received minimal protection and inadequate compensation during their essential work (ILO, 2020).

Automation has caused particular harm to both workers with low education levels and minority workers within developed nations. According to **McKinsey Global Institute (2019, p.44)** research automation could replace up to **14 percent** of the global workforce which consists mainly of routine manual workers before **2030** unless adequate retraining programs become available (McKinsey Global Institute, 2019, p.44).

The various social divisions demonstrate that automated wealth generation does not automatically translate to better living standards across all sectors of society. The absence of **labor protection laws** together with **distribution programs** and **free education systems** would transform a post-work society into one that divides between wealthy areas and economically insecure zones.

c) The new values: time, care, and autonomy

Employment no longer serves to define identity and worth which means new social values need to take its place. Several alternative values have been proposed by **scholars and social theorists**:

- Time sovereignty emerges as a fundamental indicator of well-being in a post-work future because it allows individuals to dedicate their time to creative activities or community work or personal growth. According to **Kathi Weeks** reclaiming time stands as a fundamental step toward freeing workers from their "**work-centered**" identity created by **capitalist systems** (Weeks, 2011, p.78-112).
- **Economist Nancy Folbre** emphasizes that caregiving activities which society has traditionally undervalued need to be recognized as foundational elements for any humane economic system. Social resilience endures through activities that include

childrearing and elderly care and youth mentoring despite their lack of monetary returns. (Folbre, 2001, p. 5)

- A post-work society has the potential to transform democracy through enhanced participatory citizenship which leads to more active involvement in local projects and collective governance and cultural activities. The digital platform "**Decidim**" implemented in Barcelona demonstrates how technology allows broad public engagement in decision-making processes (Barandiaran et al., 2024, p. 62-86).

These theoretical changes receive support from real-world examples. **The Ontario Basic Income Pilot (2017–2019)** found that participants with secured basic needs exhibited better volunteering rates and education enrollment along with improved mental well-being (Ferdosi et al., 2020, p.1-19). The human tendency towards idleness does not exist since people actively redirect their time toward societal engagement after securing their basic needs.

Basic need fulfillment seems to lead people away from becoming idle and toward greater social involvement and creative expression and generosity.

d) Managing transition: the role of public policy

The shift to a post-work society will not unfold spontaneously because it carries multiple potential dangers. A careful and comprehensive public policy framework is needed to handle this transformation.

Key strategies include:

- **Basic income security programs** and similar **cash transfer systems** to help people escape the need for employment so they can transform their lives free from survival concerns. The recipients of **UBI during the 2017–2018** trial period in Finland reported superior life satisfaction and improved mental health results without showing major job-related improvements (Kangas et al., 2019, p. 5).
- **Through public funding** of caregiving sectors governments can create jobs while developing social resilience as population ages. Scandinavian countries lead the way with substantial public investment in childcare and eldercare services which generates both social value and economic gain (Esping-Andersen, 2009, p. 105).
- The educational system needs transformation to develop students' critical thinking abilities as well as their ethical knowledge and creative skills and civic awareness in addition to technical competencies for current labor needs. The Finnish "**phenomenon-based learning**" approach serves as an example of educational transformation which focuses on comprehensive development (Sahlberg, 2015).

- **Democratizing Technology:** Public ownership models together with cooperative platforms and regulations against monopolies should be used to distribute benefits of AI and automation throughout the population. The "**Platform Cooperativism**" movement as defined by **Scholz (2016)** advocates for transforming the gig economy into networks controlled by workers.

Strong public institutions in Denmark enable citizens to move between jobs and industries without significant fear through their "**flexicurity**" model (OECD, 2020, p. 42). The Digital Ambassadors initiative of Rwanda demonstrates that emerging economies can manage technological transformation for inclusive growth through intentional policy development. (World Economic Forum, 2020).

The success of a post-work society will depend on how well people imagine change together with political bravery to develop new systems that go beyond productivity value.

4. Is a post-work society feasible—or desirable?

a) The promise of automation: freedom from labor?

The vision of abundant resources enabling people to choose between work and leisure has captured the imagination of economists and technology experts and future thinkers for centuries. Future thinkers including **Kevin Kelly** and **Ray Kurzweil** predict technology will automate most responsibilities so humans can dedicate themselves to creativity alongside leisure activities and well-being (Kurzweil, 2005, p. 43; Kelly, 2016, p. 43). According to their optimistic scenario machines would take care of the bulk of responsibilities so humans could concentrate on activities that bring personal meaning while growing both intellectually and emotionally.

Buckminster Fuller along with other historical figures supported technological advancements that would enable society to operate with minimal human effort and allow people to select their activities instead of performing necessary work (Fuller, 1969, p. 28). Modern movements such as "**Fully Automated Luxury Communism**" continue to promote utopian ambitions by focusing on abundance generation through green energy combined with AI and 3D printing technologies (Bastani, 2019, p. 31).

The achievement of this promise does not occur naturally. Technology-based revolutions create initial increases in social inequality which ultimately leads to advantages for all people. During the initial stages of the first and second Industrial Revolutions factory owners accumulated most of the wealth as factory workers maintained miserable living conditions for multiple decades (Piketty, 2014). Without adequate regulations and redistribution policies automation may strengthen existing social structures instead of dissolving them.

The technical capacity for an automated future without labor exists through automation yet political and institutional decisions will determine whether this freedom is achieved.

b) Risks of unequal technological transition

According to **Shoshana Zuboff** automation will likely intensify economic class disparities rather than minimize them unless proper checks are put in place (Zuboff, 2019) Modern technological progress might bring forth more economic inequality while simultaneously creating a large number of unstable positions and social conflicts that deepen divisions between people. Modern algorithms alongside artificial intelligence systems presently control hiring operations and policing functions and resource management systems, yet they preserve racial biases alongside economic biases instead of working to eliminate them (Eubanks, 2018, p. 11–12).

Middle-skill positions including administrative and manufacturing along with clerical work have vanished at a higher rate than new job opportunities have emerged according to **OECD** research which puts substantial segments of the workforce at risk (OECD, 2019, p.56). The new economic platforms **Uber** and **Deliveroo** which proponents describe as "**future work models**" have actually generated employment instability instead of secure job options (De Stefano & Aloisi, 2018, p. 7).

The supposed "**end of work**" would evolve into a humanitarian disaster instead of a liberating force if technology and capital remain in the hands of an elite minority who marginalize and underemploy the majority of the population. The equitable transition depends on achieving universal access to technological benefits.

c) Conditions for a post-work society

The transition to a workless future requires multiple essential factors to make this vision actual rather than theoretical. For technological abundance to be truly equitable among all people. All people should obtain equal benefits from productivity advances that include renewable energy and AI services and digital infrastructure. The public investment of **South Korea in national broadband infrastructure** provides a successful model because it delivers benefits of digital economies to the entire population regardless of their socioeconomic status (ITU, 2019, p. 7).

Second, education systems must be reimagined. Schools and universities should develop **educational programs** that focus on adaptability together with **lifelong learning abilities** and **emotional intelligence** and creative thinking skills because these human abilities will remain essential for meaningful participation in a **post-labor society**. Finland demonstrates an effective approach to education through its problem-solving and interdisciplinary thinking framework that prepares citizens to thrive in automated job markets (Sahlberg, 2015).

Public policies should establish guarantees which provide dignity together with participation and meaningful activities that transcend wage-based employment. The Finnish basic income experiment demonstrates how financial security improves well-being without changing employment statistics significantly. The trial participants achieved **better scores in happiness and trust and life satisfaction** measures although their employment statistics remained almost identical (Kangas et al., 2019, p. 5).

Productivity at high levels remains possible according to Iceland's experimental workweek program which produces positive outcomes for both work-life balance and mental health of employees (Haraldsson & Kellam, 2021, p.6).

Work reduction along with income decoupling demonstrate real-world effectiveness as practical solutions that have proven successful in practice. State intervention must be purposeful in order to prevent these breakthroughs from being confined to a small number of wealthy nations which would worsen global inequalities.

d) A new meaning for human flourishing

A post-work society requires economic life to be redefined for its true purpose. According to **André Gorz**, true freedom emerges from the possibility of meaningful personal activity selection which is free from the necessity of survival work (Gorz, 1980, p. 4–5). According to **Gorz's** perspective as well as **David Graeber's** analysis many contemporary jobs lack social importance and personal fulfillment thus requiring a separation of dignity from work productivity (Graeber, 2018, p. 8–10).

When technology fulfills basic requirements, humans can focus on education and creativity and civic participation along with environmental protection as their primary objectives. The UK's "**Transition Towns**" initiative showcases how local economies built on sustainability and mutual aid can prosper even under capitalist frameworks (Hopkins, 2008, p. 54).

The post-work society risks transforming into a **dystopian system** of widespread unemployment and economic uncertainty and social disconnection if markets operate independently. The successful transition to a post-work society requires specific policies which include wealth distribution through taxation and robot taxes as well as investments in social infrastructure along with cultural changes that recognize diverse contribution beyond paid employment.

The post-work society will either become a reality or remain a fantasy based on the choices that societies make about their collective direction.

D. Interim conclusion

Automation now represents an active transformative power which reshapes economies as well as societies and our concepts of work. The connection between labour work and income alongside social standing continues to deteriorate although new opportunities exist while severe dangers persist.

Economic models including **Universal Basic Income** and **robot taxation** and **wealth redistribution** reform work to address potential social inequalities caused by technological acceleration. Real-world experiments show that there exists no single solution which can solve all problems. Different economic environments significantly impact policy innovations because cultural elements along with political systems and economic frameworks determine their success or failure. Three real-world examples of **Finland's basic income trial** and **South Korea's robot tax modifications** and **Singapore's lifelong learning programs** demonstrate that successful work adaptation requires flexible adaptive approaches which learn through iterative processes rather than following inflexible blueprints. All experiments demonstrate that societies cannot receive a post-work future by default since they must take active responsibility for its construction.

The discussion about a post-work society requires us to consider factors extending beyond economic aspects. The move toward **obsolete labor forms** intensifies the need for immediate **action to redefine human dignity** together with social cohesion and purpose. Societies of the future need to establish their core values around creativity along with caregiving education civic engagement and ecological stewardship because these areas require human contributions that cannot be automated.

The primary lesson teaches that technology does not predetermine our destiny. We have the ability to steer this technological force forward by **creating wise public policies** and **inclusive institutions** while transforming culture and using collective imagination. The future direction between increased freedom and fairness or intensified inequality and alienation depends heavily on present-day political decisions alongside ethical choices.

The cultural dimension stands equally important as technological aspects in the work transformation process. This thesis will conclude by synthesizing automation's challenges and opportunities before suggesting economic inclusion pathways for the future.

General Conclusion: Shaping a Human Future in the Age of Automation.

This thesis discusses one of the most significant economic and social changes happening right now which is automation and its impact on future employment. We established at the beginning of this paper that automation technology provides substantial benefits for production and innovation yet simultaneously generates serious threats to employment and social equality and economic harmony. **The first chapter** reviewed the past patterns of technological evolution which has consistently reshaped labor markets through initial pain before generating future possibilities. **The Fourth Industrial Revolution** stands apart from previous industrial revolutions because of its magnitude and speed of change. The current economic and social changes affect almost all industries as they reshape how people live and conduct business activities.

The second part of this paper examined the present situation. Many workers find themselves unable to capitalize on the emerging fields of data science alongside artificial intelligence and cybersecurity. The gap between educational programs and labor requirements combined with slow institutional adjustments and inconsistent reskilling opportunities makes numerous workers susceptible to job loss. Automation does not affect all regions equally because certain urban centers succeed while numerous rural and post-industrial areas continue their decline. Without intervention strategies these trends could worsen existing social inequalities instead of helping them decrease.

The third section explored different potential future developments. The research presented economic models consisting of **Universal Basic Income** and **robot taxation** as methods to distribute automation benefits equitably. The concept of a post-work society received critical analysis about its feasibility since it seeks to decouple formal employment from dignity and social contribution. These inspiring but challenging concepts show the necessity of strong public policies combined with cultural transformation and political dedication to achieve them.

The three chapters demonstrate how automation exists as a human-made decision rather than an unavoidable future condition. The effects of these changes exist in a state of uncertainty because institutions and policies and defended values determine their outcomes.

Three essential principles must guide us through this transition period:

- **The future workforce** requires investment into continuous learning because standard educational frameworks must focus on developing adaptable minds along with creative thinking abilities and critical thinking skills to survive in a dynamic economy.
- **Universal Basic Income** and **progressive taxation** must be developed properly to build inclusive safety nets which support resilience without impeding innovation.

- **The social value of work** needs expansion to include caregiving alongside creativity and civic participation and community-building because these activities create the foundation for social well-being.

The future course of work and society will emerge through human decisions rather than technological development. Do we aim to construct economic systems that boost every person's success or maintain the existing trend of wealth distribution that narrows opportunities?

Humanity has the choice to either resist change while utilizing courage with imagination and solidarity to lead the transformation. The most important lesson from historical developments reveals those technological transformations present society with opportunities of immense scale. The path of change stands as a critical decision point instead of an inevitable process. We find ourselves at this critical decision point right now. Our mission extends beyond adjusting to change because we need to create a future that stays deeply human.

Final Reflection

The future will result from **our collective effort** as we move toward an unprecedented period of technological transformation. The economic disruptions caused by automation artificial intelligence and digital transformation enable society to reevaluate work and contribution and social flourishing. This thesis has proven that job elimination is not the actual concern because it is a matter of ensuring dignity and purpose and access to **opportunities for everyone**.

Technology offers immense power. The power that technology presents requires human values including **fairness along with solidarity and creativity** to determine its appropriate use. The promise of automation risks turning into new exclusionary systems if we fail to implement deliberate governance and cultural imagination.

Through strategic actions the current systems could enable new opportunities for inclusive growth and human self-expression and fulfillment. The story of future work will emerge from human decision-making and legislative actions as well as our collective vision for a fair creative and resilient society.

"The future of work is uncertain, but one truth endures: progress without purpose is empty, and technology without humanity is meaningless."

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