Shaping Labor Landscape: Working Hours, Policy Evolution, and Technological Advancement from the Industrial Age to the Digital Era

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Abstract. This paper examines the intricate interplay of technology, social policy, and working hours in Western society, spanning a historical trajectory from the industrial age to the digital age. The evolution of working hours is shaped by a confluence of technological advancements and legislative and political interventions of laws and policies. In the digital era, there has been a significant improvement in work efficiency, accompanied by the widespread adoption of remote and flexible work arrangements. However, the development of digital technology has also introduced challenges, particularly in delineating the boundaries between professional commitments and leisure time. The objectives of this study are to retrospectively examine the impact of technology and policies on working hours during the industrial age, predict the future influence of technology on the future of work, and propose strategies for policy adaptation to address the challenges brought by flexible working hours in the digital age. The research findings suggest a substantial enhancement in future work efficiency; however, a proportional reduction in working hours may not be inevitable. Achieving the goal of enhancing public welfare requires a coordinated approach to address challenges stemming from problematic labor practices and social structures that impact workers, particularly in terms of their psychological process of reference generation and adjustment. As such, forthcoming technological advancements are anticipated to significantly boost work efficiency, but the length of working hours may not necessarily decrease. To enhance the well-being of the population, it is essential to improve necessary labor standards and consider the psychological wellbeing of workers. This paper offers insights into the dynamic relationship between technology, policy, and working hours, providing a foundation for anticipating and addressing the challenges posed by the evolving nature of work in the digital era.

Keywords: Working Hours; Labor Law and Policy; Technology Advancement; Digital Age; Industrial Age.

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1 INTRODUCTION

In the digital era, the rapid progress of digital technology has brought about a substantial enhancement in work efficiency, ushering in the era of convenient remote work. However, the simultaneous rise of flexible employment has introduced a certain ambiguity in demarcating the boundaries between work and life. This shift raises notable concerns, including the possibility of overworking and a decline in overall quality of life. The length of working hours serves as a fundamental factor influencing both socio-economic structures and individual well-being. Against this background, this paper aims to investigate the influence of technology and policymaking on working hours in the industrial age and its implications for such debate in contemporary digital society. Additionally, it seeks to delve into the essential considerations in the formulation of policies aimed at reducing working hours. By scrutinizing the historical development of working hours during the industrial era, this research aims to offer valuable insights, fostering a comprehensive understanding of the intricacies surrounding working hours in the current digital age. This exploration is deemed critical for effectively navigating the challenges and leveraging the opportunities embedded in the present socio-economic landscape.

2 LITERATURE REVIEW

2.1 The Advancement of Technology and Work Hours in the Industrial Age

Existing literature has investigated the evolution of working hours from the perspectives of academic theory, policy-making process, and empirical data analysis. Specifically, empirical, and historical studies have suggested that the advancement of technology has a significant impact on changing average working hours. Spencer adopts a historical and critical approach in examining the contemporary debates on automized industrial production [1]. According to Marx, technological advancements within capitalist societies did not primarily serve to decrease work hours or improve work quality. Instead, it prolonged working hours and led to substandard working conditions. To address this issue, Marx advocated for the development of communism and technological automation. Mill, on the other hand, put forth the notion that by transitioning to socialism and implementing economic constrains, technology could enhance the quality of life. In addition, granting workers ownership stakes in firms emerges as a potential means to restore the dignity of labor. Keynes emphasizes the importance of developing ethical frameworks around technology. Nyland has highlighted that the reduction in working hours is caused by the worker protests and the state's intervention in the labor market [2]. In the same vein, Bimber reviews existing research on Marx's theory of technological determinism and reveals how technology influences society from a macro perspective [3]. The author emphasizes the profound impact of technology on social change. The article highlights, firstly, that technology is an independent force, implying that individuals will use their ideas to harness their consciousness, thereby controlling

the scope of social change brought about by technological progress. In other words, what truly determines social change is not merely technology itself but also the ideologies of the individuals manipulating its applications. Secondly, it posits that societal development will adapt to technological advances. Thirdly, technological progress can also lead to unpredictable consequences.

Moreover, a substantial body of scholarly work has delved into the role of technology in the present digital economy. Relevant media article discusses the profound impact that new technologies have had on our lives, cities, and society [4]. The author argues that transformations of work time have existed long before the digital age, starting from the early days of hunting in human history to the agricultural era of cultivation, then transitioning to the industrial society where people worked in factories, and finally arriving at the present era of remote work patterns in the digital age. It unveils a historical pattern wherein the ways people work undergo significant changes alongside societal transformations. In modern and contemporary history, the primary catalyst for changes in people's work patterns is technological progress.

Likewise, Jhaveri analyzes the impact of AI on the labor market [5]. The research indicates that the implementation of AI will enhance productivity, leading to short-term decreases in costs and employment. However, in the long run, employment is expected to increase as AI creates more job opportunities. Since AI cannot perform all tasks independently, individuals will be required to maintain and develop these technologies. The evolving trajectory of work suggests that workers will have control over AI tasks, leading to a significant reduction in working hours. Cascio discusses how technological development has impacted work and organizations [6]. The author identifies three core technological eras in human history: the Agricultural Age, the Industrial Age, and the Digital Age. During the Agricultural Age, people harnessed the power of natural elements, and those who controlled resources held core economic power. In the Industrial Age, there was a concentrated application of industrial power, leading to a more complex economic structure. In the Digital Age, the focus of work shifted to the digitization of data, information, knowledge generation, and the provision of products and services. People pursue the decrease of marginal costs and efficient economic activities. The Digital Age is further divided into three stages: enterprise computing (based on large calculators), end-user computing (based on personal computers), and strategic computing (based on communication technologies). In the present society, information and communication technologies are becoming ubiquitous. Christensen categorizes technology into two types: sustaining technology and disruptive technology [7]. The former denotes incremental improvements based on existing foundations, while the latter represents a revolutionary process leading to sustained technological advancement, disrupting the existing social structure.

2.2 The Impact of Social Policy on the Evolution of Working Hours

In general, social policies pertaining to labor standards and social welfare have greatly influenced in the changes in working hours. Pullinger enhance the nuances of policies aimed at reducing working hours, drawing on and extending an existing conceptual framework for designing policies for voluntary working time reduction [8]. The paper

points out that the policy should provide individuals with high levels of freedom to manage their time through diverse working time patterns. It advocates for enhancing job security, improving financial welfare, and encouraging the reduction of high-income families while increasing financial support for low-income people to promote social equity.

Labor regulations concerning minimum labor standards, working hours, and working conditions are significant driving forces for work arrangements in the present global economy. Kallis discusses the advantages and disadvantages of reducing working hours, with a focus on whether it is possible to reduce working hours without affecting economic development [9]. The author critically reviews theoretical and empirical literature, indicating that reducing working hours can provide job opportunities and reduce unemployment. It is believed that although there are certain risks associated with reducing working hours, these risks are worthwhile. Therefore, crises can lead to policies of shortened working hours, citing the example of President Roosevelt's large-scale part-time work program during the Great Depression in 1933. While acknowledging that such plans might not be the optimal national-level solution to economic crises, the author argues that, at the enterprise level, reducing working hours to decrease total salary expenditures is a viable strategy. Cross highlights the necessity for a genuine redistribution of work and leisure time, contingent on a shift in individuals' perceptions of leisure [10]. The author explores the ideological factors underpinning the establishment of the eight-hour workday. Historically, employers resisted reducing working hours, fearing impacts on productivity and competitiveness. Industrialization led to a desire for consumer goods among workers, prompting a departure from traditional workday leisure patterns to embrace standardized factory discipline. The significance of the eight-hour workday lies not just in efficiency or individualism but in representing a unified norm, clearly distinguishing work hours from leisure. Economic recessions may prompt shortened working hours to create jobs. In the UK, proponents believed an eight-hour workday could combat both structural and cyclical unemployment, fostering the rise of shift work. Reduced hours improve productivity, provide more leisure, boost consumer spending, and aid economic development.

2.3 Social psychology as a mechanism of adapting working hours

Certain social policies and regulations may first impact public psychology regarding people’s expectations of average working hours and welfare. Individuals with higher social status typically work longer hours. People working more than the standard working hours often seek to reduce their hours, while those working fewer hours than the average tend to increase their working time [11]. Therefore, individuals in economically successful countries pursue shorter working hours. Likewise, higher marginal tax rates caused European people’s inclination to reduce work time. The author notes that employees often cannot autonomously choose between higher wages or longer leisure time due to coordination failures between employees and employers. Consequently, national policies can serve as a coordination mechanism to intervene in working conditions in the labor market.

Additionally, if extra work is associated with higher pay, individuals are inclined to increase their working hours.

Most notably, working conditions and standards can be gendered in the sense that women tend to undertake lower-paid and more insecure job positions. Antal points out that women usually engage in less paid work within a family compared to men, as women often take on responsibilities such as caring for children and managing household tasks, which can reduce their overall working hours [12].

Other important factors include urban amenities and living environments. Working hours across the local labor market can be adjusted by the real wages and amenities [13]. Research shows that when actual wages decrease by 10%, workers' working hours tend to increase by 0.42%. It is suggested that workers tend to accept lower wages with higher living costs where better amenities are provided. Furthermore, other factors such as housing prices also contribute to variations in working hours. Moreover, social networks significantly affect people's psychological expectations and job satisfaction. The widespread willingness to reduce working hours in European societies, attributed to the "social multiplier effect", raises questions about the intricate interplay between psychological attitudes and work hours [14]. Antal suggests that individual working hours and efficiency are influenced by the altitude of interpersonal relationships, particularly the expectations and perceptions of family, friends, and colleagues [15].

3 THE EVOLUTION OF WORKING HOURS THROUGH THE LENS OF LABOR LAW AND REGULATION

During the first industrial revolution spanning from 1750 to 1800. The working hour experienced a substantial increase. The maximum average weekly working hours was about 67 hours each week. However, since the early 19th century, the working hours dramatically declined. Skidelsky points out that throughout the late 19th century and 20th century, legislation and the labor movement played pivotal roles in reducing working hours [16] [17]. On the one hand, the legislative department launched a series of regulations to rule the working hours in manufacturing industries. For example, in 1874, the Factory Act raised the minimum working age to 9, limited the working day for women and young people to 10 hours in the textile industry, and reduced the working week for these workers to 56 and 1⁄2 hours. On the other hand, work unions across different sectors championed the protection of labor rights and advocated for reasonable working hours. In the UK, unions successfully advocated for this reduction in working hours for industrial workers, implemented in countries across Europe. For instance, in 1935, printing unions negotiated a 44-hour week shift system in provincial newspapers. In 1944, The Trades Union Congress (TUC) called for legislation forcing industry negotiators to agree to the 40-hour week or have it imposed by the Ministry of Labor. It can be conducted that during this period, legal restrictions on working hours were primarily driven by moral considerations, such as alleviating the substantial work burden on children and women and meeting the demands of workers.

Research indicates that from 1870 to 2017, there has been a significant reduction in working hours in some developed countries. For instance, in Germany, the annual average working hours decreased from approximately 3,284 hours to around 1,354 hours. In contrast, for certain developing countries such as India, the average annual working hours changed minimally from 2077 hours in 1970 to 2117 hours in 2017. The article suggests that working hours are influenced by productivity, with improvements in productivity primarily driven by technological innovation. An analysis from the global perspective provides insights into understanding the changing working hours and conditions [18]. Pérez-Sánchez focuses on the international division of labor among the United States, the European Union, and China, arguing that the core-peripheral structure of the global production network leads to unequal amounts of workloads and working hours in different countries, as people in developed countries work less while people in developing countries face pro-longed work time [19]. However, it's important to note that the international division of labor extends beyond these specific regions, and the study's conclusions may not fully capture the broader global context.

From the perspective of economic sectors, data shows a dramatic decline in the average working week in manufacturing across the world. In the late 19th century, working hours were about 60 per week while, by the start of World War I, working hours were around 55 hours per week. After World War I there was a dramatic decrease in working hours in the West, accompanied by the introduction of the eight-hour workday and the forty-eight-hour workweek, in both Western Europe and in the Western Offshoots (including the United States, Canada, Australia and New Zealand). By the start of the second half 20th century, working hours in manufacturing were generally somewhere between 40 and 48 hours a week. Since then, the decline in working hours has to a substantial degree stalled. In the most recent period, there is some evidence that they are beginning to increase again [20].

3.1 Primary Socio-economic Drivers of the Changes in the Working Hours

The evolution of working hours is influenced by both technological advancements and governmental interventions. Technological progress has significantly altered working hours, as it motivates the evolution of human society from agrarian communities to the industrial era, and now into the digital age. Each monumental shift in societal structure has been shaped by an enhanced human understanding of the world, driven by the transformative impact of disruptive technological reforms. The reason disruptive technology leads to societal change is its ability to reshape work patterns. In the industrial era, workers were mandated to be present at designated workplaces, establishing a clear demarcation between work and leisure hours. Concurrently, the advent of mechanical production significantly extended working hours, fueled by employers' conviction that longer hours correlated with increased output. Currently, humanity has achieved tremendous progress in the field of digital technology, encompassing areas such as artificial intelligence, big data, and the Internet of Things. However, there remains untapped potential in our exploration of digital technology. Technological advancement has not only introduced new challenges but also necessitated an ongoing search for solutions.

Legislative and policy interventions better coordinate relations between workers and employers and address changes in societal structures and upheavals. Changes in societal structures and upheavals, as well as studies on productivity, fundamentally contributed to the reduction of working hours. Changes in societal structures refer to the emergence and development of labor unions. Throughout history, labor unions have played a significant role in upholding basic rights for workers, advocating for reduced working hours, and improving working conditions. Societal upheavals primarily involve wars and economic recessions. Western governments decided to reduce average working hours after world war I and II as compensation for the extra workload people had made during wartime. Similarly, during the Great Depression, the government advocated for shorter working hours to create more job opportunities. As scholars delved deeper into productivity studies, it became evident that shorter working hours could lead to higher efficiency, prompting employers to begin shortening working hours.

The digital era has introduced many benefits to people, such as higher work efficiency, flexible working locations and the reduction of the gender inequality. However, it has also brought new challenges, that is, the blurring of boundaries between work and leisure, and shifts in economic structures due to the development of artificial intelligence. Policies that were effective during the industrial age may no longer be sufficient. Hence, with the ongoing development of society and technology, the challenges of the digital era will gradually become more apparent, and humanity may need to address a new phase of social transformation in the future. The highly developed technology has gradually led to the replacement of humans by artificial intelligence. In the near future, the changes are that the way we work will completely transform into the scenario envisioned by Karl Marx, where the working-class controls technology. Consequently, the varying working standards among different worker groups may give rise to conflicts of interest among different demographics and groups. However, these conflicts are not irreconcilable, as the government can gradually address them through the formulation of laws and policies in tandem with societal structural changes. It is important to note that such adjustments need to comprehensively consider various social factors because, in today's intricate social systems, neglecting any factor could significantly impact policy outcomes.

By modifying wage structures, advocating for gender equality, promoting social welfare, and strategically planning urban development, a gradual reduction in working hours can be achieved. Firstly, employment and labor policies will cause changes in working hours. For instance, higher marginal tax rates encourage workers to opt for reduced working hours, as additional work yields proportionally less extra income. Therefore, an increase in marginal tax rates can effectively contribute to a reduction in overall working hours. Secondly, studies indicate that women are more inclined towards jobs with shorter working hours, often due to their additional responsibilities in caregiving for family members. Although remote work and flexible schedules can alleviate gender inequalities to some extent, policymakers need to further advocate for gender equality and provide additional social subsidies to families to minimize gender disparities in the workplace. Thirdly, the incorporation of more recreational facilities in urban areas can influence workers' expectations of working hours, subsequently reducing the overall time spent at work. Fourthly, the concept of social multiplier effects

suggests that a change in societal perceptions can lead to a chain reaction, influencing both corporate decisions and workers' expectations regarding working hours. Policymakers can leverage social multiplier effects by adjusting public sentiments, endorsing flexible work arrangements, and supporting pioneering companies in implementing a four-day workweek, creating a positive societal impact.

In this context, the formulation of policies and laws plays a crucial role. Reflecting on the evolution of working hours during the industrial age, it is argued in this article that crafting appropriate policies and laws can effectively address emerging problems and challenges. Therefore, policymakers and legislators must delve into potential social issues that future technological developments might bring, laying the groundwork for constructing a future society. By comprehensively addressing these potential problems, and considering various societal factors, such efforts contribute to balancing technological advancement with social stability. These endeavors are essential to guide society toward a more just and sustainable direction, ensuring that technological development aligns with societal values. The formulation of policies and laws serves as a strategic tool to steer technological progress responsibly and mitigate any adverse social impacts.

4 CONCLUSION

This article reviews the impact of technology and policies on working hours during the industrial era. The early stages of technological development in the industrial era led to a significant increase in working hours. However, with the emergence of human rights movements and a deeper understanding of work efficiency and economic development, the labor standards and relevant regulations have been advanced for the benefit of workers to work more efficiently within shorter hours. With the development of technology, the future is anticipated to witness a significant increase in work efficiency. The advancement of digital technology enables remote work, allowing workers to engage primarily in operating and maintaining machines. However, increased work efficiency does not necessarily translate to a decrease in working hours. On one hand, remote work blurs the boundaries between work and leisure, making it challenging to safeguard more leisure time for workers in flexible work arrangements. On the other hand, further developments in artificial intelligence may lead to widespread unemployment and changes in economic structures. Therefore, policies and laws need to be redefined to address emerging social issues within the new technological landscape and to coordinate economic structures. The formulation of policies and laws should consider various social factors, including wage systems, the coordination of work structures, and the psychological well-being of workers. Regardless, the formulation of policies and laws must prioritize the well-being of the ordinary people and social equity. Policymakers need foresight to address the societal transformations resulting from technological developments. In conclusion, proactive and comprehensive policies are essential to navigate the evolving socio-economic landscape and uphold the welfare of the population in the face of technological advancements.

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