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LABOR MARKET TRANSFORMATION: IMPLICATIONS OF TECHNOLOGICAL CHANGE IN SOCIETY 5.0

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ABSTRACT

Society 5.0 is resulting in transformation across a wide range of sectors, including manufacturing, education, healthcare, and services. Through the adoption of artificial intelligence, machines can carry out tasks that previously could only be performed by humans, resulting in significant changes in the types of jobs and skills available in the labor market. This research aims to detail and identify how technological changes affect the labor market, as well as explore solutions and strategies to capitalize on opportunities and deal with challenges that arise from these changes for society's overall well-being. This research uses a literature study method with a predictive approach. The results showed that in the era of Society 5.0, people must improve their skills through education and training to adapt to the changes. Cross-sectoral cooperation between the government, the private sector, and the community is crucial. Joint efforts to formulate supportive policies and innovation in creating new sustainable jobs are vital to mitigating the negative impacts and harnessing the positive potential of technological change in the labor market. This research is expected to have a significant impact, ranging from policy development to improving social welfare, by comprehensively understanding how technology affects life and work in modern society.

Keywords: *Labor Market, Demand and Supply of Labor, Human Development, Technological Change, Society 5.0*

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ABSTRAK

Society 5.0 menghasilkan transformasi di berbagai sektor, seperti manufaktur, pendidikan, kesehatan, dan layanan. Melalui adopsi kecerdasan buatan, mesin dapat melakukan tugas-tugas yang sebelumnya hanya dapat dilakukan oleh manusia, yang mengakibatkan perubahan signifikan dalam jenis pekerjaan dan keterampilan yang tersedia di pasar tenaga kerja. Penelitian ini bertujuan untuk merinci dan mengidentifikasi bagaimana perubahan teknologi mempengaruhi pasar tenaga kerja, serta mengeksplorasi solusi dan strategi untuk memanfaatkan peluang dan menghadapi tantangan yang muncul sebagai akibat dari perubahan tersebut, demi kesejahteraan masyarakat secara keseluruhan. Penelitian ini menggunakan metode studi literatur dengan pendekatan prediktif. Hasil penelitian menunjukkan bahwa di era Society 5.0, masyarakat dituntut untuk meningkatkan keterampilan mereka melalui pendidikan dan pelatihan agar dapat beradaptasi dengan perubahan. Kerja sama lintas sektoral antara pemerintah, sektor swasta dan masyarakat menjadi sangat penting. Upaya bersama untuk merumuskan kebijakan yang mendukung

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dan inovasi dalam menciptakan lapangan kerja baru yang berkelanjutan merupakan kunci untuk mengurangi dampak negatif dan memanfaatkan potensi positif dari perubahan teknologi di pasar tenaga kerja. Penelitian ini diharapkan dapat memberikan dampak yang signifikan, mulai dari pengembangan kebijakan hingga peningkatan kesejahteraan sosial, dengan memberikan pemahaman yang komprehensif mengenai bagaimana teknologi mempengaruhi kehidupan dan pekerjaan di masyarakat modern.

Kata Kunci: *Pasar Tenaga Kerja, Permintaan dan Penawaran Tenaga Kerja, Pembangunan Manusia, Perubahan Teknologi, Masyarakat 5.0*

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Introduction

Society 5.0 is a transformation plan from the Industrial Revolution 4.0 developed in Japan (Arsovski, 2019; Darwin, 2021). Society 5.0 is not limited to the manufacturing sector but also extends to various aspects of life, such as education, public services, security, and the environment, with the help of the integration of physical and virtual spaces (Mourtzis et al., 2023b; Skobelev & Borovik, 2017). Integrating physical space with the virtual world enables the timely and accurate utilization of information to improve efficiency (Di Marino et al., 2022), productivity, and the overall quality of life in society. Society 5.0 is expected to significantly change how we work, interact, and live our daily lives, building a more inclusive, intelligent, and sustainable society (Ghobakhloo et al., 2022).

These technological advancements have enabled broader automation (Weidemann et al., 2023) in production (Xu et al., 2020), administration, and service processes (Demir et al., 2019). With the adoption of artificial intelligence, machines can perform tasks that were once only possible for humans, causing significant changes in the types of jobs and skills available in the labor market (Pilipczuk, 2020, 2021). Technology has changed the types of jobs (Szabó-Szentgróti et al., 2021). Jobs that require high technical skills or human interaction skills are favored (Poláková et al., 2023; Schislyaeva & Saychenko, 2022; Zhironkin & Ezdina, 2023), while jobs that can be automated are likely to be threatened (Di Marino et al., 2022; Szabó-Szentgróti et al., 2021). Therefore, there are significant changes in the demand for specific skills in the labor market (Sarabdeen & Alofaysan, 2023).

These changes give rise to a skills gap in society (Alhloul & Kiss, 2022). People with skills that match the new needs have more opportunities (Khan et al., 2023), while others may face difficulties adjusting to these changes (Bińczycki et al., 2023). It could lead to greater economic and social inequality if not addressed appropriately (Barata & Kayser, 2023). While there are significant challenges, such as potential job losses caused by automation, there are also new opportunities in creating jobs relevant to new technologies and developing the skills required in Society 5.0 (Aslam et al., 2020).

The rapid and profound technological changes in the Society 5.0 era are affecting the labor market's structure and creating unprecedented new challenges. With widespread automation and the adoption of artificial intelligence, these changes alter the types of jobs available and affect how humans interact with technology in the work environment. As such, research on labor market transformation in Society 5.0 is becoming increasingly urgent as we are on the verge of revolutionary changes in how we work and live our daily lives.

This research on labor market transformation in Society 5.0 aims to detail and identify how technological change is affecting the labor market. It also explores solutions and strategies to maximize opportunities and overcome challenges arising from these changes for the overall well-being of society. The research is expected to have far-reaching impacts, from policy planning to social welfare, by providing a comprehensive view of how technology impacts life and work in modern society.

Literature Review

Labor Market

The labor market refers to the interaction between supply (workers) and demand (employers) for individuals' labor or skills. It is an essential component of the economy as it affects economic growth, unemployment rates, public welfare, sustainability, and innovation within a country (Melnyk et al., 2019). Changes in the labor market are often the subject of research to understand trends, predict future needs, and develop policies that support sustainable economic growth (Ghobakhlo et al., 2023).

Some essential concepts related to the labor market include:

1) Labor Supply. It includes individuals who are ready to work in various industry sectors. Factors that affect labor supply include population size, education level, skills, and economic needs.
2) Labor Demand. It refers to the need of companies and organizations for labor to fulfill their operations. This demand is influenced by economic growth, technological innovation, government policies, and changing market needs.
3) Wages and Compensation. Wages and compensation are essential factors in the labor market that reflect the value of a particular skill or job. It is influenced by labor demand and supply and external factors such as government regulations (Dai et al., 2022).
4) Labor Mobility. Labor mobility refers to the ability and propensity of individuals to move between geographical locations or industries in search of jobs that match their skills (Adel, 2022).
5) Skills Gap. A skills gap occurs when the skills possessed by the workforce are outside market demand. Companies need help finding employees that fit their needs or jobs suitable for individuals seeking employment.
6) Labor Market Dynamics. The labor market constantly changes over time due to technological, economic, and demographic changes. These changes can affect unemployment rates, employment patterns, and the skills sought by the market (Novakova, 2020).

Society 5.0

As stated earlier, the Society 5.0 era is a transformation concept from the industrial Era 4.0 originating from Japan; this concept integrates humans with machines that can make work or activities more accessible, efficient, and sustainable (Psarommatis et al., 2023). Society 5.0 is currently built by several pillars, including:

1) Cyber-Physical System (CPS) is a platform that involves mechanical systems governed by computer algorithms. This platform is integrated with the Internet and involves user participation in the network (Saadati & Barenji, 2023);
2) Artificial Intelligence (AI) is a representation of human intelligence implemented on computer systems or other machine devices, enabling such devices to process information and make decisions as humans do (Özdemir & Hekim, 2018);

3) The Internet of Things (IoT) is a system that allows an object to transmit data over a network without human-to-human or human-to-computer interaction (Aslam et al., 2020) and
4) Extended Reality (XR) is a technological concept that brings together various forms of reality, such as virtual reality (VR), augmented reality (AR), and mixed reality (MR). Through this technology, users can interact with digital environments that show elements of the real and virtual worlds (Mourtzis et al., 2022).

Society 5.0 opens up various opportunities for society, including: 1) service improvement: Society 5.0 can facilitate the development of service solutions by utilizing AI and IoT to simplify and make societal services more efficient (Narvaez Rojas et al., 2021); 2) sustainable living: society 5.0 can help reduce the environmental impact of human activities through the development of smart cities, green energy, and sustainable transportation systems (Alimohammadlou & Khoshsepehr, 2023); 3) digital transformation: society 5.0 can help businesses and organizations become more efficient and productive using advanced technologies such as robotics and automation (Martynov et al., 2019); and 4) economic growth: society 5.0 can create new industries and jobs, driving economic growth and development (Fukuda, 2020).

In addition to opportunities, society faces challenges. 5.0: 1) privacy and security: The increasing use of advanced technologies has raised concerns about data privacy and security. It is essential to establish regulations and protocols to protect sensitive data and prevent misuse of technology (Mourtzis et al., 2023a); 2) term gap: the gap between those who have access to technology and those who do not. It is essential to ensure that everyone has access to technology to prevent exclusion and promote equality (Sá et al., 2021); and 3) inequality: the integration of technology into society has the potential to exacerbate existing social inequalities, such as access to healthcare, education, and employment opportunities. It is essential to ensure that these technologies are accessible to everyone, regardless of socioeconomic status (Ayhan & Akar, 2022).

Data and Research Methods

This research uses a systematic literature review method (Yin, 2016) with a predictive approach (Sarma, 2017). This method was used to gain a structured and comprehensive understanding of the implications of technological change in Society 5.0 on the labor market. The first step in the systematic literature review is to determine explicit inclusion and exclusion criteria for literature selection. It will help ensure that the literature selected is relevant to the research focus and of sufficient quality.

Once the inclusion and exclusion criteria have been established, a systematic literature search will be conducted using scientific journal databases, online repositories, and other relevant sources. Keywords corresponding to the research topic will be used to obtain the most relevant literature. Next, the literature will be critically evaluated to determine its quality, relevance, and contribution to understanding labor market transformation in Society 5.0. This evaluation will be conducted using evaluation tools or frameworks that have proven their validity in previous studies. Once the relevant literature has been selected, data synthesis will be conducted to identify patterns, trends, and key findings that emerge from the literature. It will help develop a comprehensive understanding of the implications of technological change in Society 5.0 on the labor market (Kolade & Owoseni, 2022).

In addition to the systematic literature review approach, this research will adopt a predictive approach. The predictive approach will utilize information from the selected literature review and historical data on the labor market, technological developments, economic trends, and more. This historical data will be used to build a predictive model that can forecast future changes in the labor market due to Society 5.0.

Integrating these two methods will allow researchers to draw on a deep understanding of existing literature while using historical data to make predictions or projections about how the labor market might change due to Society 5.0. As such, this research is expected to provide a more structured and in-depth understanding of the impact of Society 5.0 on the labor market and a solid basis for formulating appropriate solutions and strategies in the face of these changes (Bryda & Costa, 2023).

Finding and Discussion

The findings of this study will provide deeper insights into the impact of technological evolution on the structure and dynamics of the labor market. These results are expected to provide an in-depth understanding of the skills shifts required, changes in the types of jobs available, and the ways of adaptation required by individuals, organizations, and public policies to deal with these changes. This session will discuss key findings, trend analysis, and practical implications that can be the foundation for more informed decision-making in the face of the ongoing transformation in the world of work influenced by Society 5.0.

Job Change Analysis

Technological developments such as artificial intelligence (AI), robotics, and process automation have changed how work is done. Intelligent machines or devices replace routine and automatable work. It resulted in a shift in the types of jobs available. Although some jobs are not fully automated, the tasks within the job have changed. Some routine and repetitive tasks can be automated to transform the task composition. Some sectors are experiencing rapid growth, while others face declines due to these changes. A sector that may experience growth as a result of Society 5.0 is information and communication technology (ICT) (Martynov et al., 2019). This sector is one of the sectors that has experienced the most noticeable growth in Society 5.0. The demand for IT services, software development, cybersecurity, and data management is increasing due to the deeper integration of technology in various aspects of life (Zhironkin & Ezdina, 2023).

Then, the health and medical sector. There has been a significant increase in the use of advanced medical technologies such as health information systems, connected medical devices, telemedicine, and the use of AI in disease diagnosis and management. It creates new jobs in digital health. The last one that experienced growth due to Society 5.0 was the education sector. Adopting technology in online learning, e-learning platforms, and digital educational content development has created a demand for jobs in digital curriculum development, instructional design, and e-learning management.

In addition to sectors that experienced growth due to Society 5.0, several sectors experienced a decline due to Society 5.0, namely routine and repetitive work. Work that tends to be routine and can be automated is more likely to decline due to the adoption of technology that replaces these tasks. For example, simple administrative work can be done by AI or robots. Furthermore, the conventional industrial sector, without innovation, industries that do not adapt to technological changes and remain dependent on conventional processes, tend to stagnate or decline. For example, some traditional manufacturing sectors still need automation or digitalization.

The last sector to experience a decline due to Society 5.0 is jobs that need to keep up with new skills; people who need to develop new skills relevant to technological change tend to need help adjusting to the evolving labor market. It is important to remember that these changes are flexible and may differ depending on the regional context, company type, and other factors. However, understanding these trends is essential in adjusting to changes in the labor market influenced by Society 5.0.

New Skills Development

Society 5.0, which combines information technology with people's daily lives, significantly impacts the type of work and skill demands in the labor market (Alhloul & Kiss, 2022). Learning independently and quickly adapting to new technological developments is an important skill. It includes searching for resources, keeping up with the latest developments, and learning continuously. A solid understanding of emerging technologies, such as artificial intelligence (AI), data analytics, software development, and IoT, is required. Developing these skills can help individuals to stay relevant and adapt to technological changes.

Alongside technical skills, soft skills such as practical communication skills, leadership, creativity, critical thinking (Dumitru & Halpern, 2023), and the ability to adapt to new changes and challenges are rapidly becoming increasingly important. These skills enable individuals to work effectively in changing work environments. In Society 5.0, skills development is critical to ensuring individuals remain relevant and contribute effectively in an ever-changing labor market (Khoerulloh & Janwari, 2021). Adopting a lifelong learning approach and the willingness to continue to evolve are essential prerequisites for dealing with the challenges of rapid technological development.

Policy and Regulatory Strategy

The policies and regulations needed to cope with labor market changes due to Society 5.0 must consider various aspects that allow effective adaptation (Yakovenko et al., 2022). Some relevant policy and regulatory strategies include:

1) Continuing Education and Training
   Education policies that support lifelong learning approaches are essential. Initiatives to provide easy access to training and courses for new skills and skills development required by the labor market should be given special attention (Kara & Zaim, 2012).
2) Industry-Education Collaboration
   Policies that encourage cooperation between educational institutions and industry to develop curricula appropriate to industry needs are critical. It helps bridge existing skills gaps and increases the relevance of the skills taught to market needs (Mingaleva & Vukovic, 2020).
3) Labor Protection
   Regulations that protect the workforce from negative impacts, such as job reductions due to automation or AI, should be considered. It could be through career relocation or transfer programs, skills retraining, or social security guarantees for affected workers (Inanc & Kalleberg, 2022).
4) Strengthening Digital Skills
   Policies that encourage the early mastery of digital skills and expand access to information technology will help prepare the workforce for the demands of increasingly technical jobs (Martynov et al., 2019).

5) Facilitation of Innovation and Entrepreneurship
   Policies encouraging innovation and entrepreneurship in society will help create new jobs, facilitate economic transformation, and improve the quality of life produced by Society 5.0 (Narvaez Rojas et al., 2021).
6) Regulatory Policy on Data Privacy and Security
   Data privacy protection and information security are essential when adopting increasingly advanced technologies. Policies governing personal data protection and cybersecurity are necessary to ensure trust and security in the digital ecosystem.
7) Development of Work Flexibility Policy
   Policies that support work flexibility, such as remote working or flexible hours, will help adapt to the changing work dynamics produced by Society 5.0 (Fraile et al., 2023).

Appropriate policies and regulations will play a key role in shaping an environment that supports a smooth transition toward a more advanced technology-driven society. It involves social interaction between the government, the private sector, educational institutions, and communities in formulating and implementing relevant and adaptive policies to labor market changes.

Ethics and Social Impact

Ethical decisions in replacing human jobs with technology need to be considered. Ethical questions arise about the impact of job replacement by machines or AI on the lives of individuals, families, and communities. The ethical aspect of using technology in the labor market, especially in replacing jobs with machines or artificial intelligence (AI), has become crucial because of its impact on social and economic life. Using technology that replaces human jobs can lead to widespread job losses in specific sectors. It can trigger structural unemployment, which long-term impacts social and economic stability (Coelho et al., 2023).

If not appropriately managed, technology's replacement of jobs can widen social and economic inequalities. People with less relevant skills or limited access to training can stay caught up, increasing gaps in opportunity and income. In addition, the issue of privacy and data use becomes crucial in developing technologies such as AI. Extensive data collection to train AI systems may raise concerns about the ethical use of personal data.

Because of the significant social and ethical implications of using technology in the labor market, its long-term impact must be considered. Good policies and regulations, active involvement in education and training, and open dialogue between governments, the private sector, and communities are essential to managing technological evolution's social and ethical impacts on the labor market (Sarabdeen & Alofaysan, 2023).

Conclusion

The rapid technological changes of society 5.0 play a key role in transforming the labor market. The evolution of technology affects the structure, types of jobs, and skills needed in the labor market. Workable solutions and strategies to maximize the opportunities generated by this technological change while also addressing the associated challenges require cross-sector collaboration from governments, the private sector, and the general public. Concerted efforts to develop relevant education programs, skills training, supportive policies, and innovations in creating new and sustainable jobs are vital in mitigating negative impacts and harnessing the positive potential of technological change in the labor market.

Research limitations need more in-depth analysis of specialized sectors, such as health, manufacturing, finance, and education. For this reason, in future research, researchers hope to focus on a more in-depth analysis of labor market transformation in particular sectors that have a significant impact due to Society 5.0, such as the health, manufacturing, finance, or education sectors. It can provide more specific insights into the implications of technological change within each sector.

Authors' Contribution

AKK conceptualized the study, created the methodology, and wrote the original draft. HAA reviewed and edited the manuscript.

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