



LEGAL REGULATIONS FOR ANTICIPATING ARTIFICIAL INTELLIGENCE-BASED WORKERS THROUGH INSTITUTIONAL TRANSFORMATION OF JOB TRAINING AND THE HUMAN RESOURCES REVOLUTION

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ABSTRACT

KEYWORDS

legal regulations, artificial intelligence, workers, institutional transformation, human resource revolution

The rapid development of artificial intelligence (AI) technology has brought great changes to the lives of mankind. The emergence of AI as part of the rapid evolution of digital technology has led to major changes in the world's lives. This research examines the impact of AI digitalization on Indonesia's workforce and the role of regulation in mitigating negative impacts. It emphasizes the need for holistic evaluation of labor law and modernization of professional job training programs. The research results show that the use of AI in Indonesia is increasing in various sectors, including the employment sector. Moreover, data privacy protection is still inadequate to ensure data protection and privacy of AI technology users. Therefore, it is necessary to update and add regulations that regulate comprehensively, covering data protection, algorithm transparency, occupational safety and health, elimination and specific retraining related to AI, and labor rights relevant to technological developments. It is also necessary to implement new regulations that provide legal protection for the application of AI can minimize the occurrence of cybercrimes on customer data.

INTRODUCTION

The increasing adoption of information and communication technology in Indonesia is a sign of the industrial revolution 4.0. Technology today plays an important role in people's lives and can even change people's attitudes and behavior itself. In addition, the rapid advancement of the internet and technology has become an important part of the integration between humans and machines (Alayida et al., 2023). This certainly draws attention, especially in the employment sector within the field of artificial intelligence (AI), where the difference between "*Das Sollen*" (what ought to be) and "*Das Sein*" (what is) becomes an important issue. On one hand, "*Das Sollen*" refers to the ideal standards, regulations, and ethical guidelines expected to govern the integration of AI into the workforce, including fair labor practices, data protection, and ethical AI usage. On the other hand, "*Das Sein*" reflects the actual state of the employment sector, where the rapid development of AI often outpaces the development and implementation of comprehensive regulatory frameworks (European Commission, 2019). In addition, the rapid advancement of the internet and technology has become an important part of the integration between humans and machines (Autor, 2015).

Earlier, Alvin Toffler created his famous scientific works, "*The Future Shock*" and "*The Third Wave*", which in detail described the evolution of human life. They started with an agrarian (agricultural) society, developed into an industrial society, and finally entered the information age (Benhamou, 2020). Researchers from time to time continue to develop AI by conducting various studies. Until now, AI has evolved to provide many benefits in the field of industry and employment (Cahyaningtyas et al., 2023).

The presence of AI is very relevant in the context of the industrial revolution. 4.0 is characterized by the integration of digital and physical technologies through the Internet of Things (IoT), big data and automation (Longo et al., 2020). In fact, this revolution brought major changes in various sectors, one of which was the employment sector (Fu, 2024). Society believes that industrial progress in artificial intelligence (AI) technology is inevitable. However, it should not be overlooked that AI also simultaneously poses a threat to employment due to increasing layoffs on a large scale, potentially leading to mass unemployment in the future.

The employment sector is one of the important elements in supporting national development and regional development in a region. Likewise, labor plays an important role in economic growth. Because labor is a subject in national development. In Indonesia, it can be seen that the presence of the industrial revolution has begun to affect capital-intensive industries such as petrochemicals and electronics (Hidayat & Najicha, 2023). The concern continues in labor-intensive sectors which are industrial sectors that require a lot of human labor such as manufacturing, textiles and agriculture that will be threatened by automation (Chairani et al., 2022). This results in many manual and repetitive jobs that are at risk of being replaced by AI and causing unemployment for low-skilled workers.

Indonesia currently does not have clear rules in regulating the use of AI, especially in the field of labor, so there is a legal vacuum that results in no legal certainty for the public in the use of AI, especially in anticipating the negative impact of AI on the labor sector. In 2019, President Joko Widodo launched "Making Indonesia 4.0" which is an initiative in accelerating digital transformation and strengthening Indonesia's manufacturing sector that focuses on developing the potential of AI, Internet of Things and Big Data (Chairani et al., 2022). However, at the implementation stage, Indonesia has not been able to realize digital transformation optimally due to limited human resources.

The research examines the impact of AI digitalization on Indonesia's workforce and the role of regulation in mitigating negative impacts. It emphasizes the need for holistic evaluation of labor law and modernization of professional job training. The research examines the impact of AI digitalization on Indonesia's workforce, emphasizing the need for regulatory measures to mitigate negative effects and advocating for the modernization of labor laws and professional job training programs.

RESEARCH METHOD

This research uses normative research methods by examining library materials as basic material to solve the problem being studied (Kurniawan & Aruan, 2021). The approach used is a conceptual and statute approach. The data in this study were obtained through primary, secondary, and tertiary legal materials. The collected data were then analyzed using descriptive-analytical techniques for further conclusions.

RESULTS AND DISCUSSION

Impact of Digitalization of Artificial Intelligence on the Workforce in Indonesia

The digital revolution and technological advances are currently one of the megatrends in the emergence of the potential to change work patterns. The various practices of digital technology vary greatly, such as computerization, robotization, artificial intelligence, automation and so on. This practice relies on technology that allows work practices with new patterns, for example in the use of Artificial Intelligence (AI) to carry out cognitive tasks such as chatbots or automated online support provided by various digital platforms. How it works depends on digital processing as a store of data and communication that is able to recognize external stimuli through oral and written commands (Maddikunta et al., 2022). This new era is

one of the opportunities of the future but at the same time as a challenge that if you cannot manage it will end up as a disaster in the future.

The history of the industrial revolution dates back to the development of the steam engine, which powered factory equipment, railroads, and sailing ships. Furthermore, steam engine power plays a role in various equipment and various jobs that require human and animal power (Manyika et al., 2017). With the development of the industrial revolution, manual work processes began to shift towards digital. For example, when companies need paper as a primary need, such as conducting data analysis and data collection. Before digitalization, companies spent a lot of money on paper, but now it is only accessible through digital. This shift in digitization patterns helps companies produce large amounts of data (Marzuki, 2005). The development of digitalization in the industrial and employment sectors is inevitable.

Indonesia is one of the countries in the world with the fastest infrastructure development in the world, which is estimated to grow the digital economy to reach USD 200 billion by 2025. There is a projection of the development of Indonesia's middle class in 2022, where the per capita income in 2018 is \$ 3,900 and in 2022 it reaches \$ 6,200. The upper and middle class in 2018 is estimated to number 88 million people and by 2022 it is expected to increase to 140 million people. Similarly, the number of people who have savings, which in 2018 amounted to 96 million and in 2022 amounted to 164 million people. The era of digital communication based on computing, information technology and digital communication has become part of the growth of the digital economy in Indonesia (Nugroho, 2017).

Based on BPS data in 2018, farmers in villages have used the internet up to 87% of the total village population and 91% of rural areas in Indonesia have been successfully connected to the internet. Bappenas agrees that information and communication technologies, e-commerce and digital applications can be used to promote entrepreneurship and innovation, support productive activities, and to reach the workforce (Rahargo & Jannah, 2020).

The promotion of employment and productivity for all communities is one of the eighth goals of sustainable development (SDGs). The production of artificial intelligence such as robots, the existence of the internet and extensive data analysis have become a factor in the dynamics of labor supply and demand. In the face of these dynamics, the Chinese state has succeeded in managing artificial intelligence technology into an important existence, considering that China is a developing country with a large population and workforce. Based on panel data from 30 provinces in China from 2006 to 2020, China used a two-way fixed-effects model and a two-stage small squares model to analyze the impact of Artificial Intelligence on employment as well as to assess its heterogeneity. As a result, the installation of artificial intelligent technology represented by industrial robots in Chinese companies has actually increased the number of workers (Rumahorbo & Dewayanto, 2023).

Meanwhile, the United States, the world's largest economy and leading technological power, is making significant advances in artificial intelligence. The existence of artificial intelligence boosts economic productivity while changing the demand and structure of the United States labor market. The increase in unemployment and the decline in the number of people actively participating in the labor force, imply that artificial intelligence has the ability to replace human jobs. So that efforts to focus on individuals to adapt to labor demand become an important thing. To that end, lower levels of education and limited cultural proficiency allow workers to be replaced with artificial intelligence (AI). The potential existence of AI in the United States has helped the development of the labor market, as AI has the capacity to drive innovation and further growth in the United States economy (Saragih, 2019).

The existence of digitalization and artificial intelligence (AI) has been used in various fields, such as manufacturing, medicine, politics, and business decision making. Meanwhile,

inequality in income and education levels will be more vulnerable to being replaced by AI. This shows that there is a correlation between low-educated people and low incomes. Currently various companies demand workers who are skilled in AI-related technologies, of course, people with low education do not have these abilities, which will make it difficult for people to find jobs and will worsen income inequality (Saragih, 2019).

Behind the ease obtained from the existence of AI, there are many ethical difficulties arising from the use of AI, for example not all decision-making processes by AI are clearly visible and not fully humans understand the decisions made by AI. In addition, AI can produce unfair decisions, leading to errors, discrimination and bias. These problems one side indicate that AI cannot replace human resources on a large scale and in the short term (Saragih, 2019). So that in the face of various possibilities from the existence of artificial intelligence, society requires increased control and regulation of human resources involved in the use of AI.

The World Economic Forum estimates that by 2025 there will be around 85 million jobs that will be replaced by AI, but in the same period, AI is also driving the creation of 97 million new jobs. Some jobs that have a high risk of being affected by automation through AI, including retail, services, manufacturing industries, work related to office administration, office supporting activities, and other supporting activities. There are at least four impacts that can be predicted, namely: first, a reduction in working hours, a decrease in income to termination of employment; second, labor mobility both horizontally between types of work and vertically and mobility between regions; third, the reformulation of workforce tasks and jobs, as they will be largely or completely replaced by AI; and fourth, the skills of the workforce must be prepared through intensive training or the like. So efforts are needed to prepare the force (Sari & Jannani, 2024).

The Role of Regulation on the Negative Impact of AI Use in the Labor Sector

Government regulation and control over human resources are key for the country to face the development of artificial intelligence technology. Forty-five percent of businesses rely on funding skills training as an effective intervention available to governments to link talent to jobs to mitigate the negative impact of artificial intelligence in the employment sector. Funding for skills training could be focused on 33% flexibility in hiring and firing practices, 33% tax and other incentives for companies to increase wages, 31% improvements to the school system and 28% changes to immigration laws on foreign talent (Toffler, 1980).

More important government policies than flexibility in hiring and firing practices, taxes and other incentives for companies to increase wages, improvements to the school system, and changes to immigration laws on foreign talent is that funding for reskilling and upskilling ranks first in public policy with the potential to increase talent availability for companies of all sizes. China, Indonesia, Germany and the Philippines are focusing on supporting changes to immigration laws on foreign talent to promote talent availability. Argentina, Brazil and Colombia are focused on seeking flexibility in hiring and firing practices (Toffler, 1980).

The government needs to strive for the formulation of regulations regarding the development of artificial intelligence that is growing rapidly, by linking one field with other fields such as anthropology, psychology, sociology, political science, economics, management, communication, computer science and related fields so as to form a better regulatory picture of the entire system (Shen & Zhang, 2024). This is important to note in the formulation of a regulation, considering that AI changes the behavior of many layers of society from various sectors (Sulistianingsih et al., 2023).

The rapid development of AI and autonomous devices into many aspects of life is transforming basic operations and decision-making in organizations, and showing efficient improvements. At the same time, however, these developments raise important policy,

regulatory, and ethical issues. For example, regarding data access, regarding rules about the security of biased use of data in algorithms, regarding the types of ethical principles introduced through software programming (BBC News Indonesia, 2023).

One way to anticipate the negative impacts that will arise due to the development of AI is that the government needs to increase investment in artificial intelligence (AI). According to Greg Brockman, co-founder of OpenAI, the US federal government still invests very little in AI development, simply because the US invests \$1.1 billion in the allocation of funds for the development of non-secret AI technologies. The value is much lower than the amount spent by China or other leading countries in the field of artificial intelligence research. That shortcoming is noteworthy because the economic payoff of AI is huge. To boost economic development and social innovation, federal officials need to increase investment in artificial intelligence and data analytics. Higher investment is likely to provide many times the benefits in terms of economic and social utilization (BBC News Indonesia, 2023).

In addition, the government needs to maintain mechanisms for human supervision and control. There needs to be a way for humans to supervise and control AI systems. For example, Allen Institute for Artificial Intelligence CEO Oren Etzioni (2017) argues there are rules to govern this system. First, AI must be governed by all laws that have been developed for human behavior, including regulations on "cyberbullying, stock manipulation or terrorist threats," as well as "trapping people into committing crimes." Second, the system must reveal that they are automated systems and not humans. Third, AI systems cannot store or disclose confidential information without the explicit consent of the source of that information" (BBC News Indonesia, 2021). The reason is that these tools store so much data that people should be aware of the privacy risks posed by AI.

Indonesia's preparation in facing the inevitable impacts of the development of artificial intelligence technology is to prioritize the growth of leadership skills to support the team to face change. Given that Indonesia has a productive age population or demographic bonus, what is expected is not to be a demographic burden for the country. This can certainly be achieved if the young workforce can create positive opportunities that can increase gross domestic product (GDP), public welfare, and quality of human life and accelerate national development. Of course with the condition of fulfillment of human quality and high productivity (West & Allen, 2018).

Future leaders have the ability to manage people as workers and business goals. So the current need for Indonesia is that the country must invest in productive age youth as future leaders in order to be able to navigate changes while remaining productive and avoiding mental physical burnout (West & Allen, 2018).

There are four skills that need to be formed, including: First, connecting (connectedness) which emphasizes interpersonal and emotional skills including empathy, compassion, and self-awareness; Second, coaching, as a skill to coach and effective feedback; Third, creating and inclusive culture by maintaining an environment that supports inclusivity; and Fourth, collaborating through technology, which is using technology to connect and collaborate. The need will be even greater and if not done with focus, then by 2030 there will be a talent shortage of more than 85 million people worldwide. The only way to upskill or change skills is to expand the scope of employee development programs to leadership skills and mastery of AI technology (West & Allen, 2018).

The use of artificial intelligence in Indonesia is increasing in various sectors, including the employment sector. However, the regulations available to regulate the negative impact of using artificial intelligence are still very limited. The current regulations are still general in nature and do not specifically regulate the legal responsibility and protection of workers

affected by AI. For example, Indonesia's National Strategy for Artificial Intelligence 2020-2045 published by the Agency for the Assessment and Application of Technology (BPPT) only provides a general policy framework without specific details on implementation and protection (CNBC Indonesia, 2020b).

The role of AI that will replace many jobs in Indonesia such as retail, services, manufacturing and administration will increase the reduction of working hours, decrease in income to the rampant termination of employment by companies. However, until now there are no regulations governing the role of companies in handling the replacement of workers with AI, and existing policies do not comprehensively regulate reskilling for affected workers (CNBC Indonesia, 2020a). Furthermore, regulations related to AI technology in ethical aspects and data privacy protection are still inadequate to ensure data protection and privacy of AI technology users. This is shown from various kinds of problems that occur in Indonesia related to personal data protection.

These cases always occur almost every year, including: First, in 2020 there were cases of data leakage and sales from the Tokopedia platform as much as 91 million data with a selling price of US \$ 5,000 or equivalent to IDR 75 million at Empire Market, a black market on the Dark Web (Etzioni, 2017). Second, the leak and sale of 1.2 million user data from Bhinneka.com. a-bhinneka.com with a price tag of 1,200 US dollars or around Rp 17.8 million (Mahardika & Priancha, 2021). Third, in June 2020, there were 230 thousand Covid-19 patient data in Indonesia leaked and the data was sold on the RapidForums dark web forum. The data of residents sold is fairly complete. Some of this information, including name, citizenship status, date of birth, age, telephone number, home address, Identity Number (NIK), and address of corona test results (Mediana & Yogatama, 2021). Fourth, in 2021 data from the life insurance company BRI Life was hacked and traded on the internet as much as 2 million customer data, and 463,000 documents were sold at a price of 7,000 US dollars or around Rp 101 million (assuming an exchange rate of Rp 14,428 per US dollar) (Pertiwi & Yusuf, 2020). Fifth, in May 2022, there were 297 million data from BPJS participants exposed. The leak consists of the name of the insured, NPWP number, date of birth, mobile phone number and others (Sembiring, 2024). Sixth, in 2023, as many as 204 million voter data for the 2024 election is suspected to have been stolen from the General Elections Commission (KPU) website and the data was sold on the BreachForums website (Sitanggang et al., 2023).

The existence of Law Number 27 of 2022 concerning Personal Data Protection shows that the protection of worker data processed by AI systems has not been fully accommodated, especially related to transparency and data use. Other regulations related to employment in Indonesia have not accommodated the negative impacts arising from AI technology, including Law 13 of 2003 concerning Manpower has not specifically regulated the impact of AI in the context of employment, especially conventional labor without considering rapid technological changes. Furthermore, Law Number 11 of 2020 concerning Job Creation only prioritizes job market flexibility and investment, but does not explicitly cover worker protection from the use of AI. In addition, in its derivative rules in Government Regulation Number 78 of 2015 concerning Wages, it does not at all consider the implications of AI on wages, especially related to wages.

There are several steps that can be taken to improve personal data protection, including: first, an assessment of the protection of personal data must be carried out thoroughly in various laws and regulations in Indonesia and the urgency of regulating each hierarchy of laws and regulations regarding personal data protection in Indonesia; and second, the implementation of new regulations that provide legal protection for the application of AI can minimize the occurrence of cybercrimes on customer data (Sucahyo, 2023). So that in anticipating the negative impacts of the use of AI in the labor sector, it is necessary to update and add

regulations that regulate comprehensively, covering data protection, algorithm transparency, occupational safety and health, elimination and specific retraining related to AI, and labor rights relevant to technological developments.

Transformation of 5.0-Based Job Training Institutions and Human Resource Revolution

The transition of industry 4.0-based technology has signaled a system shift that was originally too focused on digitalization and AI-based technology is now shifting to industry 5.0. Industry 5.0 as a new revolutionary wave emerged as the Age of Augmentation where humans and machines cooperate with each other (Sucahyo, 2023). The transition of industry 4.0-based technology has signaled a system shift that was originally too focused on digitalization and AI-based technology is now shifting to industry 5.0. Industry 5.0 as a new revolutionary wave emerged as the Age of Augmentation where humans and machines cooperate with each other (World Economic Forum, 2023). So that the interaction between machines and humans can be more collaborative, adaptable and questionable in the labor industry sector. The presence of Society 5.0 is a new humanist paradigm. The presence of technology and innovation is used to help and advance society, not to replace the role of humans. Of course, this is a homework for the Indonesian government to prepare regulations to protect workers from the threat of losing their jobs due to the presence of the industrial revolution in the form of AI.

One of the means that can increase the workforce in the use of AI technology is through job training centers. Because the job training center has a central role in the development of human resources to improve their abilities. Through education and training activities, it becomes a solution for a company in overcoming the competency gap that occurs (Rahargo & Jannah, 2020). Indonesia itself already has several regulations in the labor sector, especially in terms of job training center standards regulated in the Minister of Manpower Regulation Number 8 of 2017 concerning Job Training Center Standards. There are even several other regulations to support human resource development such as Government Regulation Number 31 of 2006 concerning the National Job Training System, Regulation of the Minister of Manpower and Transmigration Number 8 of 2014 concerning Guidelines for Organizing Competency-Based Training.

However, some existing regulations need to be evaluated. One of them is the modernization of professional job training centers by providing education and training for the workforce that includes aspects of digital skills such as AI. This is an effort to improve human resources in the technology-capable employment sector.

CONCLUSION

The presence of the industrial revolution has accelerated the pace of technology adoption and shifted the boundary between humans and machines through various sectors, one of which is in the employment sector. The emergence of AI as part of the rapid development of digital technology has brought major changes to the lives of mankind. On the one hand, its presence has a positive impact in helping human work, on the other hand, AI can be a major factor in increasing unemployment in the employment sector. Because of the replacement of human labor by artificial intelligence. In anticipation of this, it is necessary to reformulate the law through the reformulation of labor law principles to accommodate the changes brought by artificial intelligence in the field of labor. The government should also focus on improving the education and job training system through transforming job centers to include AI skills, such as data analysis and machine learning. This can be achieved by incorporating AI courses into the curriculum. In addition, there needs to be collaboration and partnership between the

government and institutions engaged in education and training and private companies to develop and implement AI-related job training programs. Therefore, through this, Indonesia can ensure a smooth transition to the future while still making humans as its main workforce that has adapted to AI.

REFERENCES

- Alayida, N. F., Aisyah, T., Deliana, R., & Diva, K. (2023). PENGARUH DIGITALISASI DI ERA 4.0 TERHADAP PARA TENAGA KERJA DI BIDANG LOGISTIK. *JURNAL ECONOMINA*, 2(1). <https://doi.org/10.55681/economina.v2i1.286>
- Autor, D. H. (2015). Why are there still so many jobs? the history and future of workplace automation. *Journal of Economic Perspectives*, 29(3). <https://doi.org/10.1257/jep.29.3.3>
- BBC News Indonesia. (2021). *BPJS Kesehatan: Data ratusan juta peserta diduga bocor - "Otomatis yang dirugikan masyarakat"*, kata pakar. BBC News Indonesia.
- BBC News Indonesia. (2023). *Ratusan juta data pemilih dari situs KPU diduga diretas, apa akibatnya?* BBC News Indonesia.
- Benhamou, S. (2020). Artificial intelligence and the future of work. *Revue d'économie Industrielle*, 169, 57–88.
- Brynjolfsson, E., & McAfee, A. (2014). *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies*. W.W. Norton & Company.
- Cahyaningtyas, A. S., Aeni, A. N., & Adipura, H. N. (2023). *Pengaruh Perkembangan Teknologi Pada Era Revolusi Industri*. Universitas Padjajaran.
- Chairani, M. A., Pradhana, A. P., & Purnama, T. Y. (2022). The Urgency Of Developing Law As A Legal Basis For The Implementation Of Artificial Intelligence In Indonesia. *Law and Justice*, 7(1). <https://doi.org/10.23917/laj.v7i1.760>
- CNBC Indonesia. (2020a). *230 Ribu Data Pasien Covid-19 di Indonesia Bocor dan Dijual*. CNBC Indonesia.
- CNBC Indonesia. (2020b). *Cerita Lengkap Bocornya 91 Juta Data Akun Tokopedia*. CNBC Indonesia.
- Etzioni, O. (2017). *How to Regulate Artificial Intelligence*. New York Times.
- Fu, R. (2024). Analysis of the Effect of Artificial Intelligence on the Labor Market in the United States. *Advances in Economics, Management and Political Sciences*, 57(1). <https://doi.org/10.54254/2754-1169/57/20230538>
- Hidayat, S., & Najicha, S. H. (2023). *Transformasi Industri Menuju Digitalisasi dan Dampaknya Pada Ketenagakerjaan Serta Dinamika Hubungan Kerja di Indonesia*.
- Kurniawan, F. E., & Aruan, N. L. (2021). DIGITALISASI DAN POLA KERJA BARU: DAMPAK BAGI INDUSTRIALISASI DAN RESPONS KEBIJAKAN KETENAGAKERJAAN. *Jurnal Sosioteknologi*, 20(3). <https://doi.org/10.5614/sostek.itbj.2021.20.3.11>
- Longo, F., Padovano, A., & Umbrello, S. (2020). Value-oriented and ethical technology engineering in industry 5.0: A human-centric perspective for the design of the factory of the future. *Applied Sciences (Switzerland)*, 10(12). <https://doi.org/10.3390/APP10124182>
- Maddikunta, P. K. R., Pham, Q. V., B, P., Deepa, N., Dev, K., Gadekallu, T. R., Ruby, R., & Liyanage, M. (2022). Industry 5.0: A survey on enabling technologies and potential

- applications. *Journal of Industrial Information Integration*, 26. <https://doi.org/10.1016/j.jii.2021.100257>
- Mahardika, Z. P., & Priancha, A. (2021). *Pengaturan Hukum Artificial Intelligence Indonesia Saat Ini*. Hukum Online.
- Manyika, J., Lund, S., Chui, M., Bughin, J., Woetzel, J., Batra, P., Ko, R., & Sanghvi, S. (2017). *Jobs lost, jobs gained: Workforce transitions in a time of automation* (Vol. 150, Issue 1). McKinsey Global Institute.
- Marzuki, P. M. (2005). Penelitian hukum. In *Jakarta: Kencana Prenada Media* (1st ed., Vol. 7). Prenada Media Group.
- Mediana, M., & Yogatama, B. K. (2021). *Data 2 Juta Nasabah Bocor, BRI Life Telusuri Jejak Digital*. Kompas.
- Nugroho, F. E. (2017). *Kemampuan Hukum dalam Mengatasi Perkembangan Teknologi*. FH Unika Atma Jaya.
- Pertiwi, W. K., & Yusuf, O. (2020). *Hacker Klaim Punya Data 1,2 Juta Pengguna Bhinneka.com*. Kompas.
- Rahargo, U. P. T., & Jannah, L. M. (2020). TANTANGAN DALAM PENGEMBANGAN PROGRAM PELATIHAN BALAI DIKLAT INDUSTRI DI ERA REVOLUSI INDUSTRI 4.0. *Kebijakan: Jurnal Ilmu Administrasi*, 11(2). <https://doi.org/10.23969/kebijakan.v11i2.2894>
- Rumahorbo, H. H., & Dewayanto, T. (2023). Pengaruh Transformasi Digital: Kecerdasan Buatan dan Internet of Things Terhadap Peran dan Praktik Audit Internal: Systematic Literature Review. *Diponegoro Journal of Accounting*, 12(4).
- Saragih, L. (2019). IDENTIFIKASI DAMPAK PERKEMBANGAN TEKNOLOGI TERHADAP TENAGA KERJA TOKO RITEL INDONESIA: STUDI KASUS TOKO X. *Jurnal Kependudukan Indonesia*, 14(1). <https://doi.org/10.14203/jki.v14i1.364>
- Sari, L. P., & Jannani, N. (2024). Urgensi Regulasi Artificial Intelligence di Indonesia Perspektif Teori Hukum Responsif dan Sadd Al-Dzariah. *Al-Balad: Journal of Constitutional Law*, 5(3).
- Sembiring, I. R. (2024). *Resolusi Keterampilan Kerja 2024: Kepemimpinan dan AI*. Republika.
- Shen, Y., & Zhang, X. (2024). The impact of artificial intelligence on employment: the role of virtual agglomeration. *Humanities and Social Sciences Communications*, 11(1). <https://doi.org/10.1057/s41599-024-02647-9>
- Sitanggang, R. V., Gracia, E., & Anandhini, N. (2023). *Future of Work for Youth in Indonesia* (RDI White Paper Series).
- Sucahyo, N. (2023). *Memetakan Dampak Kecerdasan Buatan Bagi Sektor Tenaga Kerja*. VOA Indonesia.
- Sulistianingsih, D., Ihwan, M., Setiawan, A., & Prabowo, M. S. (2023). TATA KELOLA PERLINDUNGAN DATA PRIBADI DI ERA METAVERSE (TELAHAH YURIDIS UNDANG-UNDANG PERLINDUNGAN DATA PRIBADI). *Masalah-Masalah Hukum*, 52(1). <https://doi.org/10.14710/mmh.52.1.2023.97-106>
- Toffler, A. (1980). *The Third Wave*. William Morrow.

West, D. M., & Allen, J. R. (2018). *How artificial intelligence is transforming the world*. Brookings.

World Economic Forum. (2023). *The Future of Jobs Report 2023*.

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First publication right:

Devotion - Journal of Research and Community Service



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