

Implementation of Labor Law in the Era of Industrial Revolution 4.0 - Challenges and Solutions

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Informasi Artikel	Abstract
E-ISSN : 3026-6874 Vol: 2 No : 10 October 2024 Page : 29-45	<i>The Industrial Revolution 4.0 has drastically transformed global industries, introducing advanced technologies such as automation, artificial intelligence, and digitalization into the workplace. This rapid technological shift has presented significant challenges for labor laws, which are often designed for traditional work environments. This study explores the implementation of labor law in the context of the Industrial Revolution 4.0, analyzing the challenges faced by both employers and employees in adapting to these new technological advancements. Using a qualitative methodology, this research employs a juridical review of existing labor laws, supported by an in-depth case study examining how these laws are applied in technology-driven industries. The findings indicate that labor laws often lag behind the technological advances, leading to gaps in legal protections for workers and ambiguities in employer obligations. The case study highlights specific instances where current labor regulations fail to address issues related to remote work, job displacement due to automation, and workers' rights in the gig economy. Solutions are proposed to modernize labor laws, ensuring they are adaptable to future technological developments while safeguarding workers' rights. The study concludes that there is an urgent need for legal reforms to balance innovation with fair labor practices in the era of Industry 4.0.</i>
Keywords: labor law, Industrial Revolution 4.0, technology juridical review.	

Abstrak

Revolusi Industri 4.0 telah mengubah industri global secara drastis, dan memperkenalkan teknologi canggih seperti otomatisasi, kecerdasan buatan, dan digitalisasi ke tempat kerja. Pergeseran teknologi yang cepat ini telah menghadirkan tantangan yang signifikan bagi hukum ketenagakerjaan, jadi yang sering kali dirancang untuk lingkungan kerja tradisional. Penelitian ini mengeksplorasi implementasi hukum ketenagakerjaan dalam konteks Revolusi Industri 4.0, menganalisis tantangan yang dihadapi oleh pengusaha dan karyawan dalam beradaptasi dengan kemajuan teknologi baru ini. Dengan menggunakan metodologi kualitatif, penelitian ini menggunakan tinjauan yuridis terhadap undang-undang ketenagakerjaan yang ada, lalu didukung oleh studi kasus mendalam yang meneliti bagaimana undang-undang tersebut diterapkan dalam industri yang digerakkan oleh teknologi. Temuan penelitian menunjukkan bahwa undang-undang ketenagakerjaan seringkali tertinggal dari kemajuan teknologi, yang menyebabkan kesenjangan dalam perlindungan hukum bagi pekerja dan ketidakjelasan dalam kewajiban pemberi kerja. Studi kasus ini menyoroti contoh-contoh spesifik di mana peraturan ketenagakerjaan saat ini gagal mengatasi masalah yang berkaitan dengan pekerjaan jarak jauh, pemindahan pekerjaan karena otomatisasi, dan hak-hak pekerja dalam ekonomi gig. Solusi diusulkan untuk memodernisasi undang-undang ketenagakerjaan, memastikan mereka dapat beradaptasi dengan perkembangan teknologi di masa depan sambil melindungi hak-hak pekerja. Studi ini menyimpulkan bahwa ada kebutuhan mendesak untuk melakukan reformasi hukum untuk menyeimbangkan inovasi dengan praktik ketenagakerjaan yang adil di era Industri 4.0.

Kata Kunci : hukum ketenagakerjaan, Revolusi Industri 4.0, teknologi, tinjauan yuridis.

INTRODUCTION

The Fourth Industrial Revolution (Industry 4.0) has ushered in a transformative era in global industries, characterized by the integration of cyber-physical systems, automation, and advanced data analytics (Petrillo et al., 2018). This technological revolution has led to the development of smart

factories, artificial intelligence, and the Internet of Things (IoT), fundamentally altering traditional work environments and employment practices (Lisdiantini et al., 2024). The evolution of these technologies has introduced new forms of work, such as gig work, remote labor, and automation-driven tasks, which challenge the traditional frameworks of labor law (Ramzan et al., 2020). Existing labor laws, which were primarily designed for physical work environments and industrial contexts, often fail to adequately address the complexities of modern employment relations brought about by these innovations (Lall et al., 2017). As technology outpaces regulation, the need for a critical evaluation of labor laws in this new context becomes apparent.

The implementation of labor laws in the context of Industry 4.0 is not only a legal challenge but also a socio-economic one (Suyanto et al., 2024). The rapid pace of automation and smart manufacturing has raised concerns about job displacement, income inequality, and the protection of workers' rights (Rocha et al., 2020). As AI and autonomous systems transform industries, the risk of technological unemployment increases, particularly for lower-skilled workers who may not possess the necessary competencies for these new roles (Saad et al., 2021). Furthermore, the rise of precarious work arrangements, such as gig economy jobs, has highlighted significant gaps in existing legal protections, exacerbating socio-economic inequalities, especially in regions where labor unions and labor standards are weak (Abdullah, 2023). These challenges underscore the need for a reevaluation of labor law to ensure that it keeps pace with the rapid technological advancements of the Industry 4.0 era.

The primary issue facing labor law implementation in the era of Industry 4.0 is the disconnect between traditional legal frameworks and the evolving nature of work. Most labor laws are outdated and were designed for an industrial age that emphasized stable, long-term employment in physical workspaces (Lohmeyer et al., 2022). However, the rise of automation, artificial intelligence, and the gig economy has significantly altered these dynamics, creating new challenges for ensuring worker protections. These include ambiguous classifications of employment, inadequate legal protections for gig and remote workers, and the failure to address job displacement due to automation. Additionally, legal jurisdiction becomes increasingly complex as remote work crosses national boundaries, challenging the enforcement of labor laws (Rocha et al., 2020).

To address these challenges, a multi-pronged approach is necessary. The general solution involves updating existing labor laws to reflect the realities of digital and gig-based work environments. This includes legal reforms to ensure that worker protections apply regardless of employment status, as well as the introduction of new regulatory frameworks that account for technological disruptions and the increasing prevalence of remote work (Petrillo et al., 2018). Collaborative efforts among governments, industry leaders, and labor organizations will be critical to ensuring that labor laws are not only effective but also adaptable to future technological advancements (Ramzan et al., 2020). By fostering a legal environment that balances technological progress with fair labor practices, the challenges posed by Industry 4.0 can be mitigated.

The Fourth Industrial Revolution (Industry 4.0) has introduced a wide array of technological advancements, such as automation, artificial intelligence (AI), and the Internet of Things (IoT), which have reshaped work environments, employment relationships, and legal frameworks (Petrillo et al., 2018; Ramzan et al., 2020). However, a major theme emerging from the literature is the disconnect between these rapid technological changes and the evolution of labor laws. Traditional labor laws were designed for industrial environments characterized by physical workplaces and long-term employment relationships (Lohmeyer et al., 2022), but these frameworks are increasingly inadequate in addressing emerging employment models, such as gig work and remote labor, which have gained prominence in Industry 4.0.

The challenges posed by these changes are manifold. For example, automation and AI have disrupted traditional job roles, resulting in worker displacement, especially in industries like manufacturing and services (Rocha et al., 2020). This shift raises significant concerns regarding the

adequacy of legal protections for displaced workers, who often lack access to the benefits afforded to full-time employees, such as healthcare, job security, and unemployment benefits (Petrillo et al., 2018; Sirojudin & Wijoyo, 2024). Gig economy workers, typically classified as independent contractors, are particularly vulnerable as they fall outside traditional employment protections (Ramzan et al., 2020). Abdullah (2023) further highlights that in regions with weak labor unions, this vulnerability is exacerbated, leading to cycles of exploitation and inadequate working conditions. These issues underscore the urgency for legal reforms that extend protections to all workers, regardless of employment status, while addressing the instability and precarity faced by gig workers.

In response to these challenges, several solutions from the scientific literature propose pathways for updating labor laws to better align with Industry 4.0's realities. A key approach is reforming legal definitions of employment to recognize and protect workers in gig economies and flexible work arrangements (Petrillo et al., 2018). This reform is critical for ensuring that gig workers receive the same benefits and protections typically reserved for full-time employees, addressing the legal gaps that leave them vulnerable in a rapidly changing workforce. In parallel, another proposed solution focuses on equipping the workforce with the necessary skills to adapt to the evolving demands of Industry 4.0. Saad et al. (2021) emphasize the importance of educational initiatives and reskilling programs aimed at preparing workers for roles shaped by automation. These programs not only provide opportunities for individual advancement but also ensure that industries remain competitive in a landscape driven by technological innovation (Abdullah, 2023).

Despite these proposed solutions, research gaps remain, particularly concerning the enforcement and practical application of updated labor laws in technology-driven industries. Studies by Ramzan et al. (2020) and Rocha et al. (2020) highlight the urgent need for frameworks that address the rights of gig and digital workers but fall short in exploring how such frameworks can be enforced effectively across diverse economic and cultural contexts. Additionally, while automation and AI are recognized as disruptors of traditional labor roles, empirical studies on how these disruptions translate into specific labor law inadequacies in real-world scenarios are limited (Lall et al., 2017). This points to the need for comprehensive case studies examining the application of labor laws in sectors such as autonomous manufacturing and gig-based services. Specifically, issues like employment classification ambiguity, jurisdictional challenges in remote work, and the rights of displaced workers require further investigation.

To address these gaps, the primary objective of this study is to analyze the challenges posed by Industry 4.0 to labor law and propose actionable solutions for updating legal frameworks. This research will conduct an in-depth juridical review and case study analysis to explore the gaps in current labor laws and offer practical recommendations for legal reforms that accommodate the evolving nature of work. The scope of the study will focus on three key areas: the inadequacies of existing labor laws, case studies of industries most affected by Industry 4.0, and proposed legal reforms that strike a balance between fostering technological innovation and ensuring worker protections (Abdullah, 2023).

While the literature provides valuable insights into the impact of Industry 4.0 on labor markets, this study will contribute to the discourse by offering targeted reforms designed to modernize labor law frameworks. By addressing both the theoretical and practical dimensions of labor law in the context of Industry 4.0, this research aims to ensure that labor regulations remain adaptable and effective in a rapidly evolving technological landscape. As such, it emphasizes not only the necessity of reskilling programs and legal protections but also the importance of fostering collaboration between governments, employers, and labor organizations to develop comprehensive labor strategies (Lall et al., 2017; Petrillo et al., 2018). Ultimately, the goal is to create a more equitable labor market that is prepared for the challenges and opportunities of Industry 4.0.

The theoretical foundation for analyzing labor law in the era of Industry 4.0 is grounded in legal pluralism, human capital theory, and labor market segmentation theory.

A. Legal Pluralism:

Legal pluralism, which acknowledges the coexistence of multiple legal systems within a single jurisdiction, offers a valuable framework for understanding the adaptation of labor laws to different employment contexts, such as gig work and remote labor (Griffiths, 1986). In the era of Industry 4.0, where advanced technologies and flexible working arrangements challenge traditional labor regulations, legal pluralism suggests that labor laws should be dynamic and responsive to the various needs posed by these evolving employment models. This includes addressing the complexities of international jurisdictions, especially in cross-border remote work, where national labor regulations may not fully apply.

Legal pluralism in labor law is particularly relevant in contexts where formal state laws coexist with customary laws and informal norms, often creating complexities in enforcement and application (Kötter et al., 2015; McDonnell, 2015). This phenomenon can lead to situations where workers are subject to different standards of protection depending on their legal status or employment context. For example, in many countries, formal labor laws may operate alongside customary practices that govern employment relationships, especially in rural or indigenous communities (Barnabas, 2019; Beegle & Christiaensen, 2019). The hierarchical relationship between state law and customary law can result in the limited recognition of the latter, thereby undermining the rights of workers who rely on these informal systems for protection (McDonnell, 2015). Consequently, workers in such environments may experience varying degrees of legal protection based on whether formal or customary laws govern their employment.

One of the primary challenges of legal pluralism in labor law is the potential for conflicting legal frameworks. In jurisdictions with multiple legal systems, enforcement mechanisms may differ significantly, leading to disparities in how labor laws are applied. Customary law, for instance, may prioritize community consensus and informal dispute resolution, which can conflict with formal legal processes that emphasize individual rights and state intervention (Noortmann & Koning, 2020; Unruh, 2009). This divergence can create a legal grey area where workers may find it challenging to assert their rights effectively, especially if they are unaware of the legal protections available under different systems (Sandberg, 2024). Additionally, the informal nature of customary systems may limit their enforceability in state courts, further complicating workers' ability to seek redress.

Despite these challenges, legal pluralism also offers opportunities to enhance labor rights. The interaction between different legal systems can foster innovative approaches to labor regulation that are more responsive to local contexts. In some regions, for example, customary laws may provide more robust protections for workers than formal state laws, particularly in areas such as dispute resolution and community support (Noortmann & Koning, 2020). Integrating these informal legal systems into formal labor law frameworks can enhance the legitimacy and effectiveness of labor protections, as they resonate more with the lived experiences of workers (Kushidayati, 2022). This highlights the potential for hybrid legal approaches that combine the strengths of both formal and informal systems to create a more inclusive labor law environment.

To navigate the complexities of legal pluralism in labor law, several strategies can be employed. First, policymakers should work towards greater coherence between different legal systems by promoting dialogue and collaboration among stakeholders, including government agencies, labor unions, and community organizations. This can help identify best practices and harmonize legal standards across different systems (Kötter et al., 2015; McDonnell, 2015). Furthermore, legal education and awareness campaigns can empower workers to understand their rights within a plural legal landscape, enabling them to advocate more effectively for themselves (Beegle & Christiaensen, 2019; Sandberg, 2024). Such initiatives would reduce the disparities in legal protections and enforcement that often arise from the coexistence of multiple legal frameworks.

Legal pluralism presents both challenges and opportunities in the realm of labor law. While the coexistence of multiple legal systems can lead to conflicts and enforcement difficulties, it also opens avenues for innovative, context-sensitive approaches to labor regulation. By fostering collaboration and enhancing legal awareness, stakeholders can work toward a more equitable and effective labor law framework that respects the diverse legal traditions present within a society.

B. Human Capital Theory

Human Capital Theory (HCT) posits that individuals' skills, education, and experience constitute forms of capital that enhance their productivity and economic value (Becker, 1993). This theory plays a significant role in shaping labor laws, particularly in the context of Industry 4.0, where automation and artificial intelligence (AI) demand new skill sets for workers. Reskilling and upskilling are essential for maintaining employability in a rapidly transforming labor market (Saad et al., 2021). HCT underscores the need for legal reforms that not only protect workers but also promote continuous investment in skill development, enabling them to adapt to the changing demands of the digital economy.

At its core, HCT asserts that education and training enhance an individual's ability to perform tasks more effectively, thereby increasing their value in the labor market. This foundational idea, articulated by Becker (1993), highlights that individuals make rational decisions to invest in their education based on expected returns, such as higher wages and better job opportunities (Elert et al., 2017). In the context of labor law, this theory emphasizes the importance of policies that ensure equal access to quality education and vocational training programs. Such measures are crucial for reducing inequalities in the labor market, ensuring that all individuals, regardless of their socio-economic background, have the opportunity to build their human capital (Matashu, 2021).

HCT's focus on lifelong learning and continuous skill development becomes especially relevant as industries undergo rapid technological advancements. As jobs evolve due to automation and digital transformation, workers must continuously acquire new skills to remain competitive. Labor laws that support ongoing education and training can facilitate this process, ensuring that the workforce can meet these challenges (Sequeda et al., 2017). Policies encouraging employers to invest in employee training not only enhance individual productivity but also contribute to overall economic growth (Li et al., 2014). Such initiatives are aligned with the goals of workforce development, which is a key aspect of HCT.

However, the application of HCT in labor law is not without challenges. One significant issue is the disparity in access to education and training opportunities, which can exacerbate existing inequalities in the labor market. Marginalized groups often face barriers to accessing quality education, resulting in lower levels of human capital accumulation and poorer labor market outcomes (Gutiérrez et al., 2019). Therefore, labor laws must address these disparities by implementing affirmative measures that promote equal access to educational resources and training programs (Atkinson, 2018). This would ensure that all workers have the opportunity to benefit from investments in human capital.

Moreover, while HCT emphasizes individual investment in education and skills, it is important to recognize that broader structural factors also influence labor market outcomes. While individual efforts to improve skills are crucial, the availability of jobs and the overall economic environment are equally critical in determining employment success. Labor laws that focus solely on individual human capital without considering these structural factors may unintentionally perpetuate existing inequalities (Hornstein et al., 2005). Thus, a more holistic approach that integrates HCT with an understanding of labor market structures is essential for developing effective labor policies.

Human Capital Theory provides a valuable framework for understanding the relationship between education, skills, and labor market outcomes. By emphasizing the importance of investing in human capital, labor laws can promote workforce development, enhance productivity, and contribute to economic growth. However, addressing challenges such as disparities in access to education and

structural labor market dynamics is crucial to ensuring that the benefits of human capital investments are equitably distributed across society.

C. Labor Market Segmentation Theory

Labor Market Segmentation Theory (LMST) divides labor markets into distinct segments or tiers, typically distinguishing between the "primary" labor market, which is characterized by stable, high-wage employment with good working conditions, and the "secondary" labor market, where jobs are often precarious, low-paying, and insecure (Doeringer & Piore, 1972). This theory is especially relevant in the context of Industry 4.0, where the rise of automation and the gig economy has contributed to a growing divide between highly skilled workers who thrive in the primary market and those left vulnerable in the secondary market (Abdullah, 2023). Workers in the secondary market often lack the legal protections and benefits afforded to their counterparts in more traditional employment models, such as health insurance, retirement plans, and job security (Greve, 2019; Kroher, 2024).

A core tenet of LMST is that mobility between these segments is limited. Workers in the secondary labor market, often with lower educational attainment and fewer specialized skills, face significant barriers to transitioning into the more secure, better-paying primary market (Bouassida & Lahga, 2018; Kroher, 2024). This limited mobility perpetuates cycles of inequality, as workers in the secondary market experience high turnover rates, minimal benefits, and poor working conditions, while those in the primary market enjoy stable careers with robust protections (Greve, 2019). Factors such as educational qualifications, skill levels, and social networks play critical roles in determining which segment individuals enter, with marginalized groups, including those of lower socio-economic status, women, and racial minorities, disproportionately represented in the secondary market (Kroher, 2024).

The implications of labor market segmentation extend to labor law, as existing regulations often focus on the primary market, where workers are more likely to benefit from legal protections, union representation, and secure employment contracts (Kuppuswamy et al., 2014). This focus on the primary market neglects the needs of workers in the secondary market, who may lack access to basic labor protections, such as minimum wage regulations, fair dismissal laws, and benefits (Greve, 2019; Kuppuswamy et al., 2014). As Industry 4.0 continues to reshape the labor market, it becomes increasingly important for labor laws to address the growing disparity between these segments and ensure equitable protections for all workers, regardless of their market position (Abdullah, 2023).

LMST also highlights the structural inequalities that exist within labor markets, particularly along lines of race, gender, and socio-economic status. Marginalized groups are often concentrated in the secondary labor market, facing systemic barriers to advancement, lower wages, and fewer opportunities for upward mobility (Kroher, 2024). This dynamic underscores the need for inclusive labor policies that not only protect workers in precarious employment but also address the root causes of segmentation, such as access to education, training, and employment opportunities (Greve, 2019).

To address the challenges posed by labor market segmentation, several strategies can be implemented. First, labor laws must be revised to enhance protections for workers in the secondary market, ensuring access to minimum wage, benefits, and protections against unfair dismissal (Greve, 2019; Kroher, 2024). Furthermore, initiatives aimed at improving access to education and vocational training can help facilitate upward mobility for workers trapped in the secondary market, enabling them to acquire the skills necessary to transition into the primary market (Bouassida & Lahga, 2018; Kroher, 2024). Finally, fostering collaboration between labor organizations, employers, and government agencies can help create a more equitable labor market that recognizes and responds to the diverse needs of all workers (Greve, 2019; Kroher, 2024).

Labor Market Segmentation Theory provides a valuable framework for understanding the complexities of labor law and the disparities that exist within labor markets. By recognizing the distinct characteristics of primary and secondary labor markets, policymakers can develop more inclusive labor

laws that promote equity and protect the rights of all workers, particularly those in precarious employment conditions. This approach is essential for addressing the inequalities perpetuated by segmentation and ensuring a fairer and more resilient labor market in the era of Industry 4.0.

D. Application of Theories to the Study

- Legal pluralism supports the argument for flexible and adaptive labor laws that can respond to the diverse challenges posed by technological advances in Industry 4.0. As this study examines labor laws across different industries, legal pluralism provides a theoretical basis for understanding how labor regulations should evolve in both gig and traditional work environments.
- Human capital theory reinforces the need for labor law reforms that mandate continuous education and training to help workers transition into new roles created by automation and AI. This study's focus on reskilling initiatives aligns with this theory, as it emphasizes the importance of equipping workers with the skills necessary to remain competitive in the labor market.
- Labor market segmentation theory frames the discussion on the gig economy and precarious work, highlighting the growing divide between well-protected and vulnerable workers. The study's exploration of legal gaps in protections for gig workers and those displaced by automation is rooted in this theoretical framework, which underscores the necessity of comprehensive labor law reforms.

This study integrates these three theoretical perspectives to analyze the challenges of labor law in the context of Industry 4.0. Legal pluralism offers a flexible approach to reform, human capital theory emphasizes the importance of skill development, and labor market segmentation theory highlights the inequalities that need to be addressed in labor protections.

METHOD

Research Design

This study employs a qualitative research design to explore the implementation of labor law in the era of Industry 4.0, with a specific focus on the challenges and solutions surrounding automation, artificial intelligence (AI), and digitalization (Lochmiller et al., 2023). The qualitative approach is ideal for capturing the complexities of labor law in this context, as it allows for in-depth analysis of how legal frameworks respond to emerging employment models, such as gig work and remote labor. The study incorporates a juridical review to assess current labor laws, along with an in-depth case study method to analyze real-world applications and gaps in legal protections across technology-driven industries. This design facilitates a comprehensive exploration of the socio-legal dynamics shaping labor law reforms.

Participants

The participants in the study include a group of legal professionals, policy makers, trade union representatives, and industry experts who have direct experience or expertise in labour law and its implementation in the context of Industry 4.0. Opinion gathering from experts through mass media related to the researched case studies will be conducted to gain insights into the practical challenges of labour law enforcement and the impact of technological advancements on workers' rights. Opinion polling was also conducted on these stakeholders from the mass media regarding the case studies, to gather insights on the practical challenges of labour law enforcement and the impact of technological advancements on workers' rights. Participants were selected based on their involvement in industries significantly affected by automation and digitalisation, such as manufacturing, gig economy platforms, and technology-based services. In addition, workers from the gig economy and tech-based industries

were included in the case study analysis to provide a grassroots perspective on how labour laws affect their working conditions.

Research Instruments

The main research instruments for this qualitative study include judicial review and document analysis. The research format of the judicial review allowed for flexibility in exploring the adequacy of labour laws in addressing the challenges posed by Industry 4.0 (Shakti et al., 2023). A case study approach was developed to cover key themes such as the effectiveness of current labour protections, the impact of automation on employment, and potential reforms to modernise labour laws. Document analysis was also conducted, focusing on legal texts, policy papers, and industry reports related to labour law and technological change. The combination of these instruments ensures a comprehensive understanding of the legal and practical dimensions of labour law implementation.

Data Collection

The data was collected through a detailed process. The first stage involved document analysis of existing labour laws, legal precedents, and case studies from industries that are heavily impacted by automation and AI. Relevant documents included legal frameworks governing gig work, remote labour, and job displacement related to automation. The second phase was the collection of case study data from specific industries with labour law gaps, such as gig economy platforms and technology-based services.

Data Analysis

The data was analysed using thematic analysis, which enabled the identification of key themes and patterns across the documents. Thematic analysis involved a process of collecting data to categorise recurring themes, such as gaps in legal protection, challenges in applying existing labour laws to new employment models, and proposed reforms to address these challenges. The analysis is supported by a juridical review, where legal texts and policy documents are scrutinised to assess the alignment (or misalignment) between labour laws and Industry 4.0 realities (Samsudin, 2022). Findings from the case studies are integrated to highlight specific instances where labour laws fail to address critical issues such as remote work, the rights of casual economic workers, and job displacement due to automation. The overall analysis aims to provide actionable recommendations to modernise labour laws in response to technological advancements.

RESULT AND DISCUSSION

Key of Finding

Based on some of the gathered data, several case studies highlight the key challenges faced by remote workers and the use of artificial intelligence. One example is a fraud case involving a woman from Palembang, identified by the initial R, who was deceived by a remote work platform called DOKU, with the perpetrator having the initials FK (13/1/2024). As a result of the scam, R lost Rp. 40 million. The scam operated by offering R a job that involved following social media accounts and downloading several apps. However, after completing the tasks, FK instructed R to transfer money and assigned additional tasks multiple times until R could no longer make transfers. When R requested the return of the money she had sent, FK refused, claiming R needed to complete the tasks first (Detik.com, 2024).

In addition to this case, another form of fraud has emerged via WhatsApp, involving job offers that ultimately result in the victim losing money (31/5/2023). Cybersecurity expert Alfons Tanujaya explained that the scam begins when fraudsters contact the victim's number, offering freelance work with attractive benefits like flexible hours, remote work, and no targets. Each subscriber is said to cost around Rp 10,000. Alfons mentioned that Vaksincom was unaware if the channel owner genuinely paid for subscribers. The victim's income is linked to crypto speculation, promising a 30% cashback on their

deposit, with the money supposedly being returned within 10 minutes. Alfons compared this "like and subscribe" scam to Ponzi robot trading, where victims receive the initial payment but are then enticed to invest more money for greater returns. To build trust, the scammers add victims to a Telegram group where they can observe other members completing tasks and getting paid. When a new task requiring money appears, other members seem eager to participate. According to Alfons, the perpetrators exploit the Fear of Missing Out (FOMO) to lure in victims (CNBCIndonesia, 2023).

The two cases highlighted above clearly demonstrate the significant risk of fraud faced by individuals involved in remote work schemes. Victims are highly susceptible to deception, often suffering substantial financial losses. However, fraud is not the only potential drawback of remote work. Many face difficulties in maintaining a healthy balance between professional responsibilities and personal life, limited communication with supervisors which can hinder career advancement, uncertainty about long-term career prospects, and the challenge of managing an often unstructured, seemingly endless workday. These factors collectively pose serious concerns for remote workers (Mungkasa, 2020).

A significant challenge in ensuring the rights of remote workers is the issue of working hours. The pervasive "always-on" culture associated with remote work creates an expectation for employees to be continuously available. This dynamic has severe repercussions; a 2020 study conducted by IPSOS for the World Economic Forum found that nearly half of adult workers experienced increased anxiety regarding job security (56%), heightened stress due to alterations in work routines and organizational structures (55%), family pressures (45%), and difficulties in achieving a healthy work-life balance (50%) as a consequence of the Covid-19 pandemic. Furthermore, the findings reveal that a majority of workers have seen their working hours expand, with almost 46% reporting diminished productivity and around 44% engaging in work during unconventional hours, such as early morning or late at night. This situation underscores the urgent need to address the negative impacts of remote work culture on employee well-being and productivity (Rifqi Noval, 2022).

In addition to the challenges remote workers face, the rapid integration of artificial intelligence in the digital industrial revolution has introduced its own set of issues. A significant example is the data breach Microsoft experienced on September 10, 2023, involving AI researchers. This breach exposed a wealth of sensitive information, including private keys, passwords, and over 30,000 internal team messages. The breach was initially detected by Wiz, a cloud security firm, which uncovered the severity of the incident. This case underscores the vulnerabilities inherent in AI-driven systems, particularly when it comes to data security and privacy protection (Antaranews, 2023).

Beyond security concerns, the rights of remote workers face several other challenges, including unequal access to digital technology in Indonesia. This disparity leads to inequalities in technology adaptation, which in turn marginalizes workers in remote areas. Finance Minister Sri Mulyani Indrawati has raised concerns about this uneven access to digital technology in Indonesia, emphasizing its crucial role in enhancing the domestic economy. The exclusion of workers from remote regions complicates the fulfillment of their rights and ultimately affects the overall health of the national economy (24/9/2019) (CNNINDONESIA, 2019).

Discussion

Discussion of this study is the significant legal gap in protections for remote workers and gig economy employees, driven by outdated labor laws that fail to address the unique challenges posed by remote work. Current labor laws, such as Law No. 13 of 2003 on Manpower and Law No. 11 of 2020 on Job Creation, treat remote workers the same as traditional employees, without acknowledging the distinct working conditions, such as flexible hours, lack of direct supervision, and blurred lines between personal and professional time (Azzahra et al., 2024). This results in inadequate protection for remote workers, leaving them vulnerable to exploitation, extended working hours, and insufficient access to workplace benefits, such as health and safety protections.

One of the main issues is the failure to regulate working hours for remote workers, a common issue in the "always-on" culture of remote employment. The study highlighted that remote workers frequently experience prolonged and unregulated working hours, often without compensation for overtime. This finding aligns with the 2020 IPSOS study, which reported that 46% of workers globally faced diminished productivity and anxiety due to longer hours, uncertainty about job security, and pressure to be constantly available (Rifqi Noval, 2022).

Additionally, the lack of targeted legal provisions creates barriers for remote workers to access workplace benefits outlined in Article 88 of the Labour Law, which guarantees protections related to occupational safety, moral and ethical treatment, and respect for human dignity. However, these protections are often inaccessible to remote workers due to the absence of tailored guidelines that account for their unique working conditions (Nuriskia & Nugroho, 2022). This legal oversight leaves remote workers in a regulatory grey area, without specific protections related to mental health, data security, or the unique physical risks of working from home.

Furthermore, the gig economy and remote work are characterized by non-traditional work arrangements, where workers are often classified as independent contractors rather than employees. This classification denies them essential benefits, such as unemployment insurance, healthcare, and legal recourse for unfair dismissal (Abdullah, 2023). The vulnerability of remote workers to fraud and financial exploitation, as evidenced by the case of R in Palembang, illustrates the critical need for robust legal frameworks to protect workers in the digital workforce. In this case, R was defrauded of Rp. 40 million by a scam disguised as a remote work opportunity (Detik.com, 2024).

The lack of legal provisions specifically addressing the unique needs of remote workers leaves them unprotected in an increasingly digitalized and flexible workforce. There is an urgent need for labor law reforms that provide remote workers with tailored protections, including clearly defined working hours, access to benefits, and protections against fraud and exploitation. This reform would address the widening gap between the protections afforded to traditional employees and those in non-traditional, technology-driven work environments.

A critical issue identified in this study is the ambiguity surrounding the legal classification of remote workers and gig economy employees. Current labor laws, including Law No. 13 of 2003 on Manpower and Law No. 11 of 2020 on Job Creation, are ill-suited for addressing the realities of non-traditional employment models such as remote work and gig employment (Azzahra et al., 2024). These laws fail to account for the flexibility, isolation, and lack of structured working conditions characteristic of remote jobs, leaving workers in a regulatory grey area. Without appropriate classification, remote workers are denied essential benefits such as healthcare, social security, and job protections typically afforded to full-time employees.

This legal gap is especially concerning for gig workers, whose status as independent contractors often excludes them from the rights and protections granted to employees under labor law. To address this issue, legal reforms must redefine employment categories to include non-traditional work arrangements, ensuring gig and remote workers receive similar benefits and protections. The need for such reform has been highlighted in jurisdictions like California's Assembly Bill 5 (AB5) and the UK's employment reforms, where gig workers have been granted employee-like protections (Saad et al., 2021). This study's findings highlight the urgent need for similar legislative changes to prevent the continued exploitation of remote and gig workers in Indonesia.

With the growth of remote work across borders, enforcing labor rights has become increasingly challenging. Current legal frameworks, designed for traditional, office-based employment, are ineffective in addressing the jurisdictional complexities that arise when remote workers operate in different countries. For instance, remote workers are often unclear about which nation's labor laws apply to them, especially when they are employed by foreign companies (Azzahra et al., 2024). This ambiguity creates

significant gaps in worker protection, leaving many without legal recourse in the event of disputes, fraud, or exploitation.

The study suggests that international cooperation and agreements are essential for resolving these jurisdictional issues and providing adequate protection for remote workers. This would involve harmonizing labor standards across borders and ensuring that remote workers have access to the same protections, regardless of their location. The rise in fraud targeting remote workers, such as the Ponzi-like scams observed in Indonesia, underscores the need for stronger international collaboration to safeguard workers' rights and prevent exploitation (CNBCIndonesia, 2023). Without clear international frameworks, remote workers remain vulnerable to legal uncertainties and inconsistent protections (McDonnell, 2015; Noortmann & Koning, 2020).

The increasing adoption of automation and AI technologies has led to significant displacement of low-skilled workers, particularly in industries such as manufacturing, retail, and services. The case studies in this research revealed that displaced workers often lack the skills needed to transition into new, automation-driven roles, leading to prolonged unemployment and economic insecurity. This is especially critical in Indonesia, where a substantial portion of the workforce remains engaged in labor-intensive sectors (CNNINDONESIA, 2019; Rocha et al., 2020).

Current labor laws fail to address the specific needs of these displaced workers, such as access to reskilling programs, social safety nets, and unemployment benefits. The findings suggest that legal reforms must include provisions for reskilling and workforce retraining, especially for workers at high risk of being displaced by automation. Without these reforms, the socio-economic divide between those who can adapt to new technologies and those who cannot will continue to widen, exacerbating income inequality and social tensions (Saad et al., 2021).

The research underscores the critical importance of reskilling and upskilling initiatives to mitigate the adverse effects of automation and digitalization. However, the study revealed that existing programs, both government-led and industry-driven, are insufficient to meet the scale of disruption caused by Industry 4.0. Workers in low-skill sectors, especially those displaced by automation, face significant barriers to accessing training, including financial constraints and limited availability of relevant programs.

The findings emphasize the need for stronger legal mandates requiring employers to invest in workforce development, particularly for roles at risk of automation. In addition, governments must take a proactive role in providing free or subsidized training programs for vulnerable populations, particularly in underserved regions. This aligns with the Human Capital Theory, which posits that continued investment in education and skills development is crucial for maintaining a competitive workforce in a rapidly changing economy (Becker, 1993; Li et al., 2014).

This study reinforces the Human Capital Theory's assertion that investment in skills and education is directly linked to economic growth. The findings suggest that organizations and governments that prioritize continuous upskilling and reskilling initiatives are better positioned to thrive in the context of Industry 4.0. However, the data also indicates significant disparities in access to these opportunities, particularly for marginalized groups such as low-income workers (CNNINDONESIA, 2019). Legal reforms that promote equitable access to training programs are essential to closing this gap and ensuring that all workers have the opportunity to adapt to the evolving demands of the labor market (Matashu, 2021).

The economic benefits of investing in human capital are well documented, as skilled workers contribute to higher productivity, innovation, and overall economic resilience. This study calls for greater investment in national reskilling programs that are accessible to workers at all levels, ensuring that no one is left behind in the transition to a more automated economy.

The research findings confirm that Labor Market Segmentation Theory is increasingly relevant in the context of Industry 4.0, particularly in relation to remote work and gig economy employment. The gap between workers in the primary and secondary labor markets has widened as automation and digitalization disproportionately benefit highly skilled, full-time employees while pushing low-skill workers into precarious, poorly regulated roles in the gig economy (Doeringer & Piore, 1972; Greve, 2019).

Gig and remote workers are often relegated to the secondary labor market, where they face inconsistent working conditions, job insecurity, and limited access to benefits. The case studies further highlight the legal vulnerabilities of these workers, as current labor laws fail to offer adequate protections for non-traditional employment models (Azzahra et al., 2024). This growing divide emphasizes the need for comprehensive labor policies that address the systemic inequities faced by gig workers and other precarious laborers.

A significant barrier to upward mobility between labor market segments identified in this study is the limited access to education and training opportunities for workers in the secondary labor market. Workers in low-wage, gig-based jobs often lack the resources or qualifications necessary to transition into more secure, higher-paying roles in the primary market. This finding supports previous research showing that barriers such as education, financial limitations, and lack of social capital prevent many workers from advancing beyond precarious employment (Bouassida & Lahga, 2018; Kroher, 2024).

Legal reforms must focus on improving access to vocational training and educational resources for vulnerable populations, ensuring that workers in the secondary labor market are equipped with the skills necessary to compete in an increasingly automated economy. Without such reforms, the divide between primary and secondary labor market workers will continue to grow, exacerbating social and economic inequalities.

The findings highlight the urgent need for inclusive labor policies that reduce inequalities between workers in the primary and secondary labor markets. Remote workers and gig economy employees, who are often disproportionately affected by precarious employment, require stronger protections and access to benefits such as healthcare, unemployment insurance, and legal recourse.

The case studies suggest that countries with robust labor unions and inclusive labor protections offer better support for vulnerable workers, reducing the disparities between different segments of the labor market (Greve, 2019; Kroher, 2024). The study calls for comprehensive legal reforms that extend these protections to all workers, regardless of their employment status, and promote greater social equity in the workforce.

One of the primary challenges identified in the enforcement of labor laws in the era of Industry 4.0 is the rapid pace of technological advancements, which outpaces the ability of legal frameworks to adapt. Existing labor laws—especially those governing remote work and gig economy employment—are often under-enforced due to jurisdictional complexities and the absence of clear regulations that specifically address the conditions of non-traditional work arrangements (Azzahra et al., 2024). Without proper legal guidance, many remote and gig workers find themselves in regulatory loopholes, leaving them vulnerable to exploitation, insecure working conditions, and the denial of essential protections such as overtime compensation, health benefits, and unemployment insurance.

In addition to these challenges, the increased reliance on artificial intelligence (AI) and digital platforms in the modern workplace has introduced new risks related to data security and privacy protection. The integration of AI-driven systems has facilitated greater flexibility and efficiency in remote work, but it has also opened up new avenues for cyberattacks and data breaches, which can compromise both employee privacy and corporate security. A notable example is the Microsoft data breach on September 10, 2023, which exposed sensitive information, including private keys, passwords, and over 30,000 internal messages from AI researchers (Antaranews, 2023). This breach, detected by

Wiz, a cloud security firm, underscores the vulnerabilities inherent in AI-powered systems, which are increasingly becoming central to remote and gig-based work environments.

For remote workers, particularly those using AI-driven platforms, data security concerns are particularly acute. Remote workers often rely on cloud-based services and platforms to communicate and manage their work, making them highly susceptible to cyberattacks. Personal data, intellectual property, and sensitive work-related information are at risk of exposure, which not only threatens individual privacy but also raises broader concerns about corporate espionage and the security of business operations. The lack of specific legal frameworks addressing data security for remote workers exacerbates these risks, as current labor laws do not adequately cover the privacy and security challenges introduced by Industry 4.0 technologies.

The findings of this study suggest that new labor regulations must incorporate robust data security provisions to protect remote and gig workers who are increasingly reliant on digital and AI-driven platforms. This would include mandating stronger cybersecurity measures for companies employing remote workers, ensuring that sensitive data is encrypted, access is restricted, and breaches are swiftly addressed. Such regulations are necessary to safeguard not only the personal information of workers but also the broader integrity of digital work environments.

Moreover, the enforcement mechanisms for data protection in remote work scenarios need to be strengthened. Labor laws must incorporate clear guidelines on data privacy and assign responsibility for data breaches, ensuring that companies take adequate steps to protect the information of their employees. As remote work continues to expand, the combination of legal uncertainty and increased cybersecurity risks poses a significant challenge for both workers and employers. Without explicit regulations, remote workers remain at the mercy of potential data breaches, such as the one experienced by Microsoft, leaving them vulnerable to identity theft, financial loss, and reputational damage.

Thus, the intersection of labor law enforcement and data security in Industry 4.0 presents a multifaceted challenge that requires immediate attention. Policymakers must update labor laws to reflect the realities of a digital, AI-driven workforce, ensuring that workers are protected not only from exploitation and unfair treatment but also from the rising threats of data breaches and cyberattacks. Robust legal frameworks that address both labor rights and data security are crucial to creating a safe and equitable working environment in the digital age.

The concept of legal pluralism offers a valuable framework for addressing the enforcement challenges posed by Industry 4.0. By recognizing the coexistence of multiple legal systems within a single jurisdiction, policymakers can create more flexible and adaptive labor laws that respond to the unique needs of gig and remote workers (Griffiths, 1986).

This study found that incorporating informal legal systems alongside formal state laws can help bridge the regulatory gaps in sectors where traditional enforcement mechanisms are weak. For example, hybrid legal approaches that draw on both state and customary laws could improve labor protections in industries that are heavily reliant on non-traditional work models, such as the gig economy (McDonnell, 2015)

Recommendations for Legal Reform

Based on the study's findings, several key recommendations for legal reform are proposed. First, labor laws must be updated to reflect the realities of remote work and gig employment, ensuring that all workers, regardless of their employment status, have access to essential benefits and protections. Second, international cooperation is necessary to resolve jurisdictional challenges in cross-border remote work, providing clear legal guidelines for remote workers operating in different countries. Finally, there is a need for stronger legal mandates that require continuous investment in reskilling and upskilling programs, particularly for workers at high risk of being displaced by automation.

These reforms are critical to creating a more equitable and resilient labor market that protects the rights of workers in an increasingly digital and automated economy. By addressing the gaps in existing labor laws and adopting a more flexible, adaptive approach to worker protections, policymakers can help ensure that labor regulations remain effective in the face of technological change.

CONCLUSION

The findings of this study highlight the urgent need for comprehensive labor law reforms in the era of Industry 4.0. As automation, artificial intelligence, and digitalization transform global industries, existing labor laws, such as Law No. 13 of 2003 on Manpower and Law No. 11 of 2020 on Job Creation, have proven inadequate in addressing the unique challenges posed by remote work and gig economy employment. These laws fail to provide essential protections for workers in non-traditional employment arrangements, leaving many vulnerable to exploitation, extended working hours, and a lack of access to workplace benefits such as healthcare and job security.

A critical gap identified in the study is the ambiguous classification of remote and gig workers, who are often categorized as independent contractors rather than employees. This exclusion from traditional labor protections leaves them without the legal recourse afforded to full-time employees, contributing to socio-economic disparities. In addition, the jurisdictional complexities associated with cross-border remote work, combined with inadequate data security frameworks, create significant legal and security vulnerabilities for workers.

The rapid integration of AI and digital platforms introduces additional risks, particularly in terms of data security. The study underscores the importance of robust cybersecurity measures and legal frameworks to safeguard workers' personal and professional information, particularly in the wake of high-profile data breaches such as the Microsoft incident in 2023.

The study concludes that to address these multifaceted challenges, comprehensive legal reforms must be implemented. These reforms should include updating employment classifications to cover non-traditional work models, strengthening data protection measures, and promoting international cooperation to manage cross-border employment issues. Additionally, a strong focus on reskilling and upskilling initiatives is essential to help displaced workers transition into new roles created by Industry 4.0, ensuring that they remain competitive in an increasingly automated workforce.

Ultimately, the labor market of the future requires flexible, adaptive legal frameworks that protect workers' rights in a rapidly evolving technological landscape. By modernizing labor laws and promoting collaboration between governments, employers, and labor organizations, policymakers can create a more equitable and resilient labor market, capable of balancing the demands of innovation with the need for worker protection.

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