

Strategic Human Capital Development: Addressing Indonesia's Digital Stagnation Towards Society 5.0

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Abstract – The transition toward the Society 5.0 era necessitates a fundamental paradigm shift in human resource (HR) development, where the optimization of digital technology is intrinsically tied to the quality of human competency. Despite rapid technological evolution, a significant gap remains between innovation and workforce readiness. This research aims to analyze the strategic role of higher education institutions in cultivating the human capital necessary to support Indonesia's national progress. Employing a Systematic Literature Review (SLR) method, this study qualitatively synthesizes 25 core sources from 2019 to 2025 to evaluate digital competency development. The findings indicate that holistic development—encompassing both technical hard skills and adaptive soft skills—is the primary driver for navigating digital disruption. Higher education is identified as a central actor, evolving from a traditional teaching role into a proactive talent and entrepreneurship incubator. Notably, empirical data from the 2025 Indonesian Digital Society Index (IMDI) reveals a multilevel digital divide: while the national average of 44.53 indicates a gradual recovery, Banda Aceh City achieves a superior score of 52.58. However, a critical "Empowerment Gap" persists at 34.32, suggesting that infrastructure readiness has not yet translated into productive economic value. Consequently, this study concludes that producing adaptive HR through Triple Helix synergy is vital for achieving national digital maturity.

Kata Kunci: Human Resources; Society 5.0; Higher Education; Empowerment Gap; IMDI 2025

1. INTRODUCTION

The global landscape of the creative and digital industries is currently undergoing a fundamental paradigm shift driven by the transition toward Society 5.0. This era, which integrates cyber and physical spaces, is no longer determined solely by technological sophistication but is highly dependent on the quality of human resources (HR) capable of optimizing these advancements. In this context, human capital is viewed not merely as an organizational asset but as a vital investment in knowledge and skills that drive national productivity and innovation. The evolution of traditional human capital into "digital human capital" necessitates a balance between technical proficiency (hard skills) and adaptive capacities (soft skills), such as critical thinking, collaboration, and complex problem-solving. According to Aldrickzler et al. (2025), transforming human capital for the digital age requires a profound shift in how we perceive Industry 4.0 and 5.0, where human-centricity becomes the ultimate competitive advantage. However, a significant "adaptation gap" has emerged globally, where the speed of technological evolution far outpaces the capacity of human resources to adapt, creating psychological friction and resistance within the digital ecosystem.

In the Indonesian context, this gap is empirically visible through the longitudinal data of the Indonesian Digital Society Index (Indeks Masyarakat Digital Indonesia—IMDI). While Indonesia experienced a significant surge in digital literacy post-pandemic, current trends indicate a concerning stagnation followed by a very gradual recovery. According to the official report from the Kementerian Komunikasi dan Informatika (2025), the IMDI score rose from 37.80 in 2022 to 43.18 in 2023, plateaued at 43.34 in 2024, and reached a moderate national recovery of 44.53 in 2025. However, a deeper analysis reveals a significant "multilevel digital divide." While the national average remains under 45, regional data shows that the Aceh province lags slightly at 42.64. Interestingly, city-level data highlights a major outperformer: Banda Aceh City achieved a superior score of 52.58, significantly surpassing both provincial and national averages. This stagnation at the national level, coupled with a critical "Empowerment Gap" score of only 34.32, serves as a warning that Indonesia's digital development is trapped at a basic literacy level, failing to reach the innovative utilization required for Society 5.0. Without strategic intervention, technology risks widening social disparities rather than serving as a human-centered solution.

To understand the positioning of this study, it is essential to review recent developments in the field within the last five years. Several studies have explored the intersection of education and digital transformation. First, Aman et al. (2023) analyzed the role of education in Society 5.0, emphasizing the need for creative and innovative HR. However, their research remained theoretical and did not address the specific empirical slowdown and pillar-specific gaps observed in the 2025 national indices. Second, Mamanazarov et al. (2025) argued that innovating human capital through digital transformation requires a synergy between education, law, and economics. While comprehensive, their study focused on a broader central Asian context rather than the specific regional friction points in Indonesia. Third, Evans et al. (2023) conducted a study on university-industry collaboration, identifying it as a primary driver of digital transformation through various types of benefits and enablers. Nevertheless, their analysis lacked the granular multilevel data (City vs. Province) that explains why certain hubs like Banda Aceh outperform their surrounding regions. Fourth, Sujanto (2022) and Astuty et al. (2024) explored the importance of creativepreneurship and sustainable entrepreneurial culture in higher education, finding that business incubation at the university level effectively fosters an entrepreneurial spirit among students.

The primary distinction and state of the art of this research compared to the aforementioned studies lie in its focus on the "Digital Empowerment Paradox" reflected in the IMDI 2025 data. While previous literature focuses on what

competencies are needed, this study rigorously analyzes why digital growth has hit an "Empowerment Ceiling" (34.32) and how the "University Effect" observed in Banda Aceh (52.58) can serve as a strategic jembatan (bridge) to overcome this stagnation. The urgency of this research is underscored by the risk of Indonesia falling into a "commoditization trap" where its workforce remains mere consumers of technology rather than creators of value. According to Voropai and Antoniouk (2025), defining the role of the university within the innovation ecosystem is the key to successfully navigating Industry 5.0. Therefore, this study aims to formulate a strategic framework for higher education to transition from a traditional teaching role into a proactive talent incubator that integrates hard skills, soft skills, and creativepreneurship.

The ultimate contribution of this research is the proposal of a "Triple Helix Synergy Framework," which mandates close collaboration between academia, industry, and government to revitalize national digital maturity. By producing high-quality, adaptive graduates, higher education institutions act as determining variables for the success of Indonesia's national digital transformation toward 2045. This research provides a roadmap for policy interventions that balance infrastructure investment with human-centered capital development, ensuring a sustainable and inclusive digital future by leveraging the success patterns of high-performing digital hubs like Banda Aceh.

2. RESEARCH METHODOLOGY

2.1 Basic Research Framework

This study adopts a qualitative descriptive approach rooted in the interpretivist paradigm to explore the strategic role of human resources within the technological landscape of Society 5.0. Unlike quantitative designs that focus on statistical generalizations, this research seeks to provide a deep understanding of how higher education institutions function as catalysts for digital transformation. The research locus is situated within the Indonesian digital ecosystem, specifically addressing the multilevel national challenges highlighted by the latest Indeks Masyarakat Digital Indonesia (IMDI) 2025. By analyzing data at the national, provincial (Aceh), and city (Banda Aceh) levels, this study identifies the granular "friction points" in digital adoption.

In accordance with social science research standards, the conceptual framework is built upon two primary variable clusters: (1) Independent Variables, represented by Higher Education Interventions and Digital Competency Development, which encompasses both technical hard skills and adaptive soft skills; and (2) the Dependent Variable, which is the National Readiness for Society 5.0 and Technological Optimization. The central research proposition posits that quality human resource development—strategically managed by academic institutions—is the "determining variable" for the success of national digital transformation. This framework illustrates a path where university-led innovations, such as creativepreneurship and adaptive curricula, directly influence the ability of the workforce to overcome the current digital stagnation observed in the empowerment pillar.

2.2 Systematic Literature Review (SLR) Process

To ensure high interpretative rigor and transparency, this study utilizes the Systematic Literature Review (SLR) method as established by Xiao and Watson (2019). This method allows for a comprehensive identification and synthesis of existing research to address the identified research gaps. The SLR process was conducted through three structured phases. In Phase 1 (Identification and Planning), the search for relevant literature was conducted across reputable academic databases, including Google Scholar, Scopus, and Portal Garuda. Strategic keywords used in the search string included "human resources," "Society 5.0," "higher education," "digital competence," and "human capital".

In Phase 2 (Screening and Selection), the timeframe for the selected literature was strictly limited from 2019 to 2025 to capture the rapid acceleration of digital trends in the post-pandemic era. Rigorous inclusion criteria were applied: (1) articles published in peer-reviewed journals or reputable conference proceedings; (2) studies explicitly discussing the intersection of human resources, technology, and education; and (3) official datasets from the Kementerian Komunikasi dan Informatika (2025). Exclusion criteria removed articles focusing solely on purely technical engineering aspects and non-academic opinion pieces. In Phase 3 (Final Synthesis), 25 core sources from the fixed Mendeley database were identified as the primary unit of analysis, providing the empirical foundation needed to evaluate the "adaptation gap" in the Indonesian workforce.

2.3 Data Analysis Techniques

The synthesized data were processed using Reflexive Thematic Analysis. This technique involves a systematic six-phase framework to identify recurring patterns or "themes" within the 25 selected literatures. The analysis began with data familiarization, followed by the generation of initial codes for terms such as "competency shift," "digital stagnation," and "university role". These codes were subsequently collated into three major themes: (1) Transformation of HR Competencies; (2) The Strategic Role of Higher Education; and (3) Challenges in Digital Adoption. To ensure validity and reliability, data triangulation was performed by comparing theoretical claims from global literature against the empirical multilevel data from the IMDI 2025 report. This structured approach ensures that the findings provide a coherent narrative on how high-performing digital hubs, such as Banda Aceh, can serve as models for revitalizing Indonesia's digital maturity.

3. RESULTS AND DISCUSSION

This section delineates the findings derived from a dual-track analysis: a systematic review of 25 primary academic literatures and an empirical evaluation of the Indeks Masyarakat Digital Indonesia (IMDI) 2025 dataset. The results reveal a complex socio-technical landscape where technological infrastructure frequently outpaces human readiness. To provide a comprehensive overview, the synthesized data is categorized into the transformation of human resource (HR) competencies, the strategic role of higher education, and the specific multilevel challenges of digital adoption in Indonesia.

3.1 Findings of the Systematic Literature Review

The systematic synthesis of core literature identifies three major themes that define the current state of digital human capital development. These findings suggest a profound shift in how universities must operate within the Industry 5.0 ecosystem.

Table 1. Synthesis of Key Literature Findings

Key Themes	Description of Findings	Primary Supporting Sources
HR Competency Transformation	Shift from technical proficiency toward holistic and adaptive digital capital, emphasizing ethical frameworks and legal-economic synergy.	(Aldrickzler et al., 2025; Mamanazarov et al., 2025)
Central Role of Higher Education	Evolution of universities into innovation ecosystems and "entrepreneurial universities" that act as driving forces for Society 5.0.	(Carayannis & Morawska-Jancelewicz, 2022; Voropai & Antoniuk, 2025)
Digital Adoption Stagnation	Identification of regional digital divides and the "Empowerment Ceiling" that hinders the conversion of literacy into economic value.	(Hasan et al., 2025; Indonesia, 2025)

The analysis of recent sources, such as Mamanazarov et al. (2025), emphasizes that innovating human capital is no longer just about technical skills but requires a synergy between education, law, and economics within a digital transformation framework. Furthermore, Aldrickzler et al. (2025) argue that the transition to Industry 5.0 necessitates a "Human-Centric" approach where the workforce must possess the resilience to navigate rapid technological disruptions. This literature-based foundation confirms that higher education is the most critical actor in fostering this resilience.

3.2 Empirical Results: Multilevel IMDI 2025 Analysis

To validate the theoretical findings, this study analyzes the IMDI 2025 scores across three levels: National, Provincial (Aceh), and City (Banda Aceh). This multilevel approach reveals significant disparities in digital readiness.

Table 2. Multilevel Comparison of IMDI 2025 Pillars

Region	Total Index	Infrastructure Pillar	Literacy Pillar	Empowerment Pillar	Employment Pillar
National (Indonesia)	44.53	53.06	49.28	34.32	42.91
Provinsi (Aceh)	42.64	49.60	47.69	32.77	42.13
Kota (Banda Aceh)	52.58	66.12	55.58	44.34	43.63

The empirical data indicates that Indonesia is experiencing a gradual recovery post-stagnation, with the national index rising to 44.53 in 2025. However, the most critical finding is the consistently low score in the Pillar of Empowerment (Pilar Pemberdayaan), which sits at only 34.32 nationally and even lower in the Aceh province at 32.77. This "Empowerment Gap" suggests that while people have access to infrastructure and basic literacy, they lack the strategic competency to utilize digital tools for meaningful economic or social value creation.

In contrast, Banda Aceh City exhibits a superior digital maturity with a score of 52.58. This outperformance is particularly evident in the Infrastructure pillar (66.12) and Literacy pillar (55.58), which are significantly higher than both provincial and national averages. This city-level excellence can be theorized as the "University Hub Effect," where the presence of multiple higher education institutions acts as an accelerator for digital culture and literacy.

3.3 Detailed Pillar Performance: Analyzing the Sub-Pillar Disparities

A deeper dive into the sub-pillar data reveals the roots of Indonesia's digital challenges. In the national Literacy Pillar, there is a significant discrepancy between sub-pillars, where one sub-pillar reaches a high score of 94.36 while another lags at 40.43. This indicates an "unbalanced literacy" where the population might be proficient in social media use but remains incompetent in advanced professional digital tools.

The Empowerment Pillar shows an even more concerning sub-pillar score of only 16.23 nationally. This extremely low score reflects a failure in digital business adoption and innovation. In Aceh, the empowerment sub-pillars are similarly low at 12.42. These numbers empirically validate the urgency for universities to shift their focus toward Creativepreneurship and business incubation, as theorized by Suryani et al. (2022) and Mananda and Mahadewi. (2023). Without an intervention that focuses on empowerment, infrastructure investment will yield diminishing returns.

3.4 Discussion: The Strategic Role of Higher Education in Society 5.0

The findings of this study uncover a "Digital Stagnation Paradox": technology is available, but human empowerment is missing. To resolve this, this study integrates the Triple Helix Synergy Framework with the concept of the "Entrepreneurial University." According to Voropai and Antoniouk (2025), the university must define its role not as a mere teaching institution but as an innovation ecosystem that bridges the gap between academic theory and industrial practice.

The success of Banda Aceh (52.58) serves as a regional benchmark. The city's higher score in the Empowerment Pillar (44.34) compared to the national average (34.32) demonstrates that universities can effectively drive empowerment by acting as local "Digital Sandboxes". As argued by Astuty et al. (2024), a sustainable entrepreneurial culture within higher education is vital for promoting the innovation needed to break the "Empowerment Ceiling".

3.5 Theoretical Implications: Re-evaluating Digital Human Capital

This study extends the Human Capital Theory by introducing the dimension of "Holistic Adaptability." In the era of Society 5.0, digital human capital must include the ability to navigate what we call the "Uncanny Valley" of digital literacy—the point where basic skills are no longer enough to manage complex automated systems. The findings of Evans et al. (2023) support this by highlighting that university-industry collaboration is the primary driver of digital transformation.

Furthermore, the "Accountability Vacuum" identified in our thematic analysis suggests that higher education must instill a sense of "Strategic Ownership" in its students. As automation increases, the premium value of human labor shifts toward affective and high-trust interactions. This cross-disciplinary synthesis proves that the "Trust Dimensions" required in client relationships are fundamentally the same as the "Competency Dimensions" required in a national digital workforce.

3.6 Managerial Roadmap: Operationalizing the Triple Helix in Aceh

For the specific context of Aceh, digitalization challenges such as those identified by Hasan et al. (2025) must be addressed through a localized digital roadmap. The Triple Helix Synergy Framework should be operationalized through three distinct tiers:

- a. Curriculum Dynamism (University Layer): Universities must conduct periodic audits to ensure curricula remain synchronized with Industry 5.0 requirements, integrating machine learning and data literacy as proposed by Cahyono et al. (2025).
- b. Applied Innovation (Industry Layer): Partners must move beyond recruiting to co-creating talent through integrated internship programs, such as the Independent Entrepreneurship MBKM program.
- c. Policy Advocacy (Government Layer): The government should incentivize regional digital hubs and bridge the "last mile" of digital literacy to ensure the IMDI growth curve resumes its upward trajectory.

By following this roadmap, Indonesia can transform its workforce from passive technology consumers into mindful innovators who lead the global digital discourse toward 2045.

3.7 Socio-Technical Barriers to Digital Empowerment

The stagnation in Indonesia's digital empowerment, particularly the low score of 34.32 in the national empowerment pillar, can be attributed to deep-seated socio-technical barriers. While infrastructure (53.06) and literacy (49.28) have reached a moderate level of maturity, the transition to "productive utilization" is hindered by what Rusmini et al. (2025) describe as a readiness-based failure. This study argues that the population is currently trapped in a "Passive Adoption Phase," where digital tools are used for social connectivity rather than economic innovation. In the Aceh province, where the empowerment score drops to 32.77, this barrier is even more pronounced. The lack of a digital-first mindset in

traditional sectors creates a "glass ceiling" for digital growth. To break this, universities must go beyond teaching technical skills and begin addressing the psychological readiness of the workforce to take risks in the digital economy.

3.8 The "Accountability Vacuum" in Digital Talent Development

A recurring theme in the 2025 literature is the emergence of an "Accountability Vacuum" as organizations automate their core processes. According to Mamanazarov et al. (2025), the innovation of human capital requires an ethical and legal framework that clearly defines the boundaries of human-machine responsibility. In the Indonesian context, this vacuum manifests as a lack of "strategic ownership" among digital workers. When technology fails or an algorithm errs, there is often a lack of human mediation to resolve the friction. This research posits that higher education must instill a sense of "Strategic Ethics" in its students. Graduates should not only be proficient in using AI tools but must also be capable of acting as the "Final Human Oversight," ensuring that digital transformation remains human-centered and accountable to social values.

3.9 Integrating Creativepreneurship in the Local Ecosystem: The Aceh Context

The specific challenges of digitalization in the West Coast region of Aceh, as identified by Hasan et al. (2025), underscore the importance of localizing the digital roadmap. Our findings suggest that the superior performance of Banda Aceh (52.58) can serve as a mentorship model for other regions in Aceh. The "Creativepreneurship" model proposed by Suryani et al. (2022) should be adapted to incorporate regional cultural elements, thereby creating digital products that are culturally resonant and economically viable. By leveraging regional identity, Aceh can create a unique market niche in the Indonesian creative industry, moving from a consumer of global platforms to a creator of localized digital value.

3.10 Navigating the "Uncanny Valley" of Digital Literacy

As digital literacy scores plateau (49.28 nationally), we observe a phenomenon we call the "Uncanny Valley" of literacy. At this point, the workforce is comfortable with basic digital interfaces but experiences significant cognitive friction when faced with complex, high-stakes automated systems. This study extends the "Trust Threshold" concept from agency-client relationships into the national workforce. When workers do not "trust" the tools they use—due to a perceived lack of transparency or a fear of replacement—their productivity remains stagnant. Higher education must bridge this "Affective Void" by fostering digital trust. This involves teaching students how to collaborate with technology (Human-AI Collaboration) rather than simply operating it, a concept supported by Aldrickzler et al. (2025) regarding the transition to Industry 5.0.

3.11 Human-Machine Collaboration: Escaping Algorithm Aversion

Building on the work of Gunawan (2024), this research identifies that the "Human Touch" is the ultimate premium in a digitally saturated market. As AI handles routine reporting and technical performance (Tasks where AI achieves high cognitive trust), the human role must shift toward high-level strategy and empathetic consultation. Our analysis suggests that the "Empowerment Gap" (34.32) is essentially a "Creativity Gap". Higher education institutions must reposition themselves as "Human Sanctuaries" where students learn to navigate high-stakes interpersonal dynamics that cannot be automated. By producing "Mindful Innovators" who understand when to leverage AI and when to prioritize human intuition, universities ensure their graduates remain indispensable in the era of Society 5.0.

3.12 Strategic Policy Implications for Indonesia Emas 2045

The findings of this study provide a roadmap for policy interventions as Indonesia moves toward its "Indonesia Emas 2045" vision. According to Hadad et al. (2025), accelerating the "Triple Helix of Sharia Economic Talent" and digital capital is the only way to ensure sustainable national growth. The government must move beyond physical infrastructure investment and begin incentivizing "Human Capital Clusters." This involves creating "Digital Sandboxes" in regional cities like Banda Aceh, where the synergy between academia, industry, and local government can be statistically validated and scaled nationally. The goal is to move the national empowerment score from 34.32 to over 50.00 by 2045 by focusing on innovative and productive technological utilization.

3.13 Synthesis: From Passive Adaptation to Mindful Innovation

Ultimately, the goal of higher education in the Society 5.0 era is to transition the workforce from "Mindless Acceptance" of technology to "Mindful Innovation". The current IMDI 2025 stagnation in empowerment is a call to action for all stakeholders to move beyond binary literacy (literate vs. illiterate) and start viewing digital competency as a spectrum of innovative capacity. By operationalizing the Triple Helix Synergy Framework, Indonesia can ensure that its human resources are not only ready to use technology but are capable of leading the global digital discourse toward 2045. This synthesis confirms that the university is the most critical actor in this ecosystem, acting as the "Innovation Engine" that converts technological potential into national reality.

4. CONCLUSION

This research concludes that the successful acceleration of Indonesia's digital transformation toward the Society 5.0 era is fundamentally determined by the quality of its human capital, specifically their capacity to move beyond basic literacy toward productive empowerment. The empirical analysis of the Indeks Masyarakat Digital Indonesia (IMDI) 2025 dataset reveals a critical "Empowerment Gap," where the national score for innovative utilization remains low at 34.32, despite moderate growth in infrastructure and literacy. This finding confirms that the primary challenge is no longer technological access, but the strategic competency of human resources to create economic and social value. This study identifies that higher education institutions serve as the "Innovation Engine" in this ecosystem, as evidenced by the superior performance of Banda Aceh City (52.58), which functions as a regional digital hub due to its high concentration of academic institutions. By implementing the proposed Triple Helix Synergy Framework, which mandates a cohesive and dynamic collaboration between academia, industry, and government, Indonesia can systematically overcome the current growth bottleneck and break through the "Empowerment Ceiling". However, this study acknowledges its limitations, primarily its reliance on qualitative secondary data and literature synthesis which may not fully capture the real-time psychological resistance or cultural friction in different regional contexts. Therefore, future research should employ mixed-methods or longitudinal designs to statistically validate the impact of university-led incubators on local economic growth across diverse provinces. Ultimately, achieving the "Indonesia Gold 2045" vision requires a paradigmatic shift from being technology consumers to becoming mindful innovators, with higher education acting as the strategic catalyst for this national digital maturity.

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