

Literature Review and Talent Criteria Analysis: A Framework for Developing Indonesia's Digital Workforce to Achieve Export Excellence

Anggara Trisna Nugraha

Department of Bio-industrial Mechatronic Engineering
National Chung Hsing University, Taichung, Taiwan
Marine Electrical Engineering Department
Shipbuilding Institute of Polytechnic Surabaya
Surabaya, Indonesia

Anda Iviana Juniani, Zaki Wicaksono and Dhadys Ayu Juli Anjhani

Marine Mechanical Engineering Department
Shipbuilding Institute of Polytechnic Surabaya
Surabaya, Indonesia

Putri Amelia

Information Systems Department
Semen Indonesia International University, Indonesia

Khoirul Amin

Green Smart Manufacturing Study Program
Department of Industrial Management
National Formosa University, Taiwan
andaiviana@ppns.ac.id

Abstract

Indonesia's digital service industry has much potential to make the country's economy more competitive, especially by growing businesses focused on exports. However, the industry cannot grow and stay strong since there are not enough competent workers, people do not know enough about digital technology, and intellectual capital is not significantly developed. This study seeks to investigate the strategic significance of digital talent and knowledge based assets in expediting the advancement of the digital service sector. A thorough literature analysis is undertaken to analyze the growth progression within the digital service industry and the changing significance of intellectual capital in recent years. The research aims to delineate essential skills and traits for digital talent to facilitate value creation and enhance Indonesia's global competitiveness. Bibliometric approaches examine relevant academic publications in the Scopus database from the last five years. This study helps to find research trends and gaps in knowledge. We look at how Indonesia's lack of talent and investment in acquiring digital skills affects its position in the global digital services market from both theoretical and practical points of view. The results will guide governmental initiatives on digital upskilling, education industry partnership, and human capital development to cultivate a robust and export driven digital ecosystem.

Keywords

Digital Service Industry, Human Capital, Intellectual Capital, Talent Development, Export, Indonesia.

1. Introduction

Over the past decade, the global digital economy has transformed the foundations of trade, innovation, and employment. Digital services ranging from software development and cloud-based business solutions to creative and financial technologies have become central to the competitiveness of nations in the Fourth Industrial Revolution. Reports from UNCTAD (2023) and the OECD (2024) indicate that digitally deliverable services (DDS) accounted for nearly 65% of global service exports in 2023, a figure that continues to grow as industries increasingly adopt artificial intelligence (AI), data analytics, and automation. Within this transformation, digital talent defined as the combination of technical expertise, analytical intelligence, and adaptive mindset emerges as a critical resource determining national advantage in digital trade.

Indonesia's digital service sector has demonstrated robust domestic growth, contributing substantially to GDP and employment, yet its export performance remains suboptimal compared to regional peers. While Southeast Asia's digital economies particularly Singapore and Malaysia have successfully positioned themselves as global digital service hubs, Indonesia still faces constraints in scaling its digital export ecosystem. Persistent shortages of skilled digital talent, underdeveloped intellectual capital, and fragmented regulatory frameworks limit the country's ability to capitalize on global DDS opportunities. The mismatch between digital market expansion and talent supply has created what Buvat et al. (2017) describe as the digital talent gap a systemic bottleneck that constrains innovation and export competitiveness.

The motivation for this research arises from three interrelated challenges that define Indonesia's digital development trajectory. First, Indonesia ranks in the lower quartile of the World Economic Forum's Networked Readiness Index, reflecting gaps in digital infrastructure, workforce adaptability, and innovation capability. Second, bibliometric analyses of Scopus indexed studies reveal that scholarly attention has disproportionately focused on technological enablers such as broadband connectivity, fintech growth, and digital platforms while limited research has examined human capital dynamics and the relationship between talent criteria and digital export performance. Third, although regulatory initiatives like digital protection laws and fintech sandboxes signify macro level progress, their efficacy in cultivating specialized digital competencies and knowledge-based assets remain underexplored. Collectively, these issues underscore the misalignment between Indonesia's digital aspirations and its current human capital capacity.

This study aims to develop a comprehensive framework that aligns Indonesia's digital talent criteria and intellectual capital dimensions with strategies for export driven growth in the digital services sector. The specific objectives are to synthesize existing Scopus indexed literature on digital connectivity, fintech innovation, regulatory enablers, and human capital development, in order to map current research trends and identify critical knowledge gaps relevant to Indonesia's digital workforce and to delineate and classify the core technical and non-technical competencies such as data analytics, cybersecurity, creative problem solving, and cross cultural collaboration that most significantly influence the ability of Indonesian professionals to deliver high value digital services for export markets.

2. Literature Review

The global digital economy has rendered talent the paramount factor in innovation and competitiveness. Digital talent, defined by a combination of technical expertise, analytical skills, and adaptability, is the crucial human capital that enables nations to thrive in the Fourth Industrial Revolution. The OECD Skills Outlook (2024) and the UNCTAD Digital Trade Report (2023) indicate that digitally deliverable services constitute over 60% of global trade. The robustness of a nation's digital human capital directly influences its capacity to engage in this ecosystem. Early literature characterized digital talent primarily as technical literacy, but current research (Buvat et al., 2017; WEF, 2022) expands this concept to encompass digital intelligence, defined as the capacity to adapt, collaborate, and innovate within data driven environments. This transformation entails transitioning from possessing talents to synthesizing them into a cohesive whole, wherein readiness for digital employment is contingent upon one's conduct, cognition, and technological utilization. Digital talent frameworks currently emphasize six interrelated domains: attitude, knowledge, technical competencies, software and hardware proficiency, and data driven decision making. This establishes a multidimensional framework that integrates human and systemic competencies within digital businesses.

Despite the rapid growth of Indonesia's digital economy, a fundamental talent gap persists. The World Bank (2021) indicates that by 2030, there will be a deficit of about 9 million competent digital professionals, particularly in data analytics, cybersecurity, and cloud engineering. Government initiatives such as the Digital Talent Scholarship (Kominfo) and MBKM have enhanced fundamental literacy, nonetheless they remain insufficient in fostering the specific skills required for global digital services. Moreover, fragmented collaboration among educational, industrial, and policy institutions hinders the establishment of a unified competency framework, leading to graduates who possess basic ICT skills but lack applied digital problem solving and innovation abilities necessary for export-oriented services.

Three essential conditions must be met for the advancement of digital talent, educational systems must transition to project based and competency oriented learning (Hendarman et al., 2020), industrial learning environments must promote ongoing upskilling and digital experimentation (Mubarik et al., 2017), and policy coherence is required to synchronize education, certification, and labor market incentives (LPKIA, 2023). Countries like as Singapore and Korea, which have implemented digital talent policies like Singapore's Skills Future and Korea's Digital New Deal, demonstrate that their workforces can adapt more swiftly and their exports can expand more readily. This illustrates the significance of system interoperability. Recent studies delineate four primary talent deficiencies insufficient technical expertise in emerging technologies, inadequate analytical and problem-solving capabilities, limited adaptability and innovative thinking, and weak integration of managerial and operational digital skills (Hendarman et al., 2020; Buvat et al., 2017). These deficits signify that Indonesia's dilemma transcends a simple labor shortage, it involves a qualitative gap between the talents available and the capabilities demanded in the global market.

3. Methods

This literature review aims to explore and analyze various publications that discuss the relationship between digital talent, human capital, the digital service industry, and intellectual capital. The approach used includes Systematic Literature Review (SLR) and Bibliometric Analysis (BA) to group and present data in a more structured format that is easier for readers to understand. SLR specifically provides relevant information to be processed into meaningful knowledge. This method has been widely applied in various disciplines and represents the breadth of scientific studies in the field (Benabdellah et al., 2019; Juniani et al., 2021; Paganin & Borsato, 2017). A method for selection and analysis of the articles is shown in Figure 1.

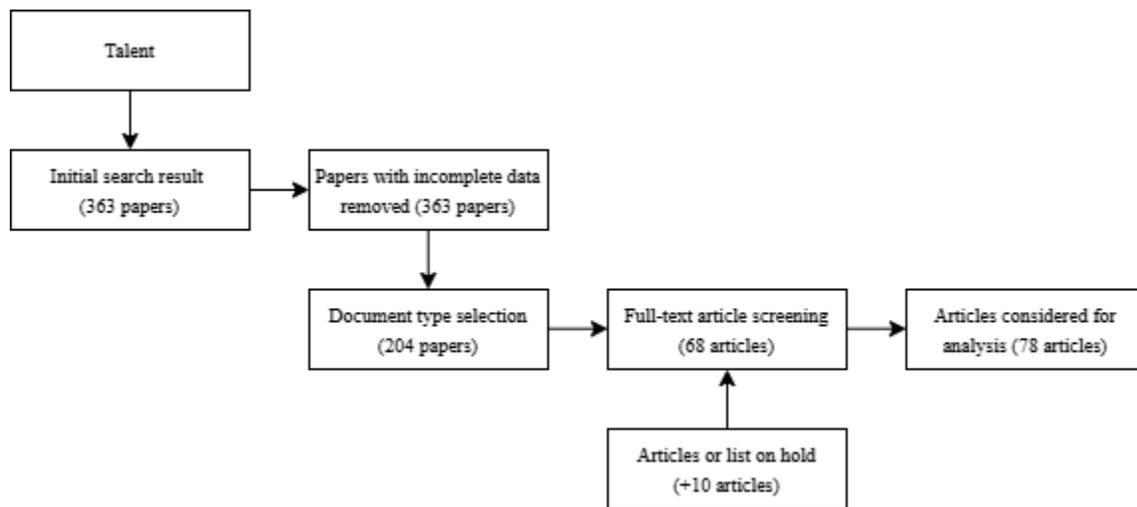


Figure 1. The screening process to select the article sample

To achieve the research objectives, data was collected from the Scopus database using the keywords “digital talent,” “human capital,” “digital service industry,” and “intellectual capital.” The article selection and analysis process is described in more detail in Figure 1. Next, a literature search was conducted on the Scopus database using the following search format: ((TITLE-ABS-KEY (digital service industry, digital talent, and human capital)) AND (LIMIT-TO (LANGUAGE, “English”))).

The literature search process was then carried out through the Scopus database using the query format: ((TITLE-ABS-KEY(“digital talent” AND “digital service industry”) OR TITLE-ABS-KEY(“intellectual capital” AND “venture capital”) OR TITLE-ABS-KEY(“human capital”)) AND (LIMIT-TO (LANGUAGE, “English”))). The initial search results yielded a total of 364 final publications and one article still in the process of publication for the period 2025-2026. These documents consisted of 362 conference papers published between 1992 and 2025, including 50 journal articles, 18 review articles, and several book chapters and lecture notes.

The results were then filtered again, leaving 362 publications published between 2020 and 2025. Based on the research objectives, only 204 articles and reviews were considered for further analysis. Each article was reviewed to ensure its suitability for the focus and objectives of the study. From this selection process, 78 publications were found to meet the criteria for in depth evaluation.

The abstract reading stage was carried out to identify the main conclusions, application objectives, and methodologies used in each article, so that the literature most relevant to the research topic could be found. After the further screening process, 10 articles were selected for the main analysis, while the other publications were saved for additional evaluation. Finally, a total of 68 articles were confirmed to be feasible and used in the final analysis of this study. The bibliometric visualization generated using VOSviewer identifies four major thematic clusters representing the research structure on digital talent and intellectual capital Human Capital (green cluster), Digital Transformation (red cluster), Human (blue cluster), and Digital Technology (yellow cluster). As illustrated in Figure 2 below:

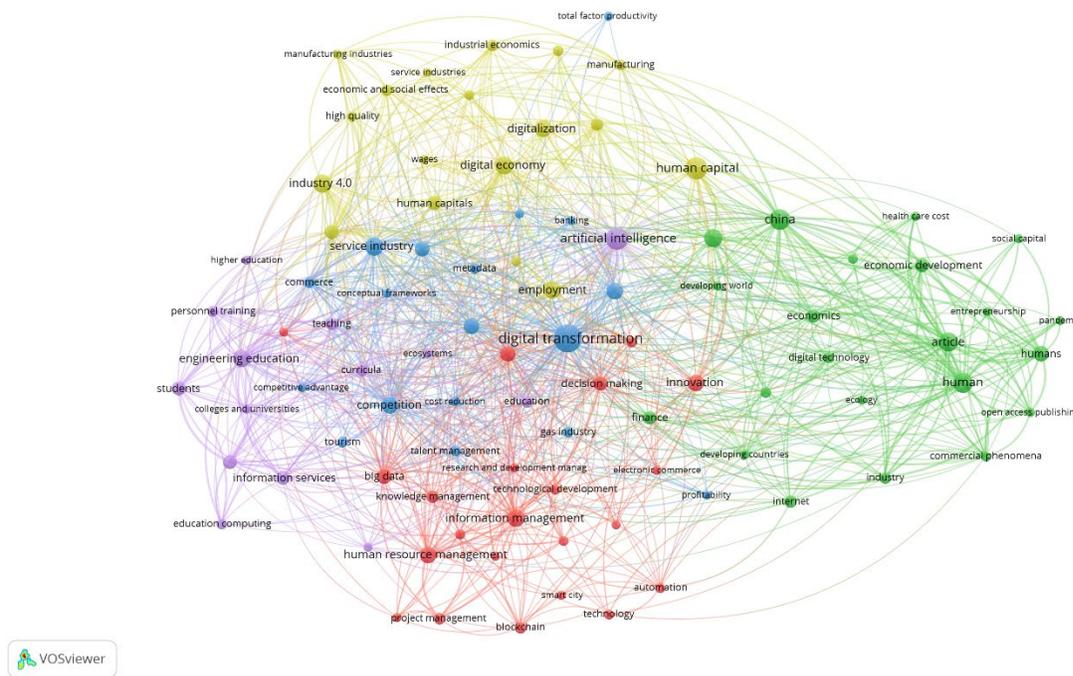


Figure 2. VOS Network Visualization for Bibliometric

This study utilizes VOSviewer software version 1.6.13 to present graphical visualizations of bibliographic information as a complement to the main analysis. The software was used to construct visual representations in the form of networks and document clusters. The type of analysis applied was co-occurrence analysis with keywords as the unit of analysis. In this analysis, the full counting method was used, which means that each relationship between items was given the same weight.

Bibliometric analysis serves to identify and map the structure of research networks, answer questions related to major themes in a field of science, the relationship between themes, and the development of topics over time (Amin, Khan, & Zuo, 2019). The bibliometric approach is also considered more objective and comprehensive because it is able to process large amounts of data efficiently and systematically. In the visualization produced by the VOS algorithm (as

in Figure 2), the closer the position of two items, the more references they have in common, which indicates similarities in theoretical foundations or research approaches (Marzi et al., 2020). The network visualization results from VOSViewer display several well identified clusters. Each cluster represents a group of articles with strong thematic links, illustrating the potential for interrelated fields of study. The main themes that emerged from the clustering results consisted of four clusters, namely:

- 1) Green Cluster: Human Capital
- 2) Red Cluster: Digital Transformation
- 3) Blue Cluster: Human
- 4) Yellow Cluster: Digital Technology

As emphasized by Benabdellah (2019) and Juniani (2021), visualization techniques play an important role in simplifying the research mapping process. This approach is one of the most reliable methods in bibliometric network analysis, especially for mapping and classifying relationships between journals, author collaborations, researchers, and keyword occurrences. The concept of bibliographic coupling refers to the condition when two articles cite the same reference in their bibliographies. Meanwhile, the level of collaboration between productive authors is measured through co authorship analysis, and citation relationships between variables are analyzed through citation analysis. In addition, co occurrence analysis is used to display the keywords most frequently used in various publications, including terms that usually appear in the abstract section. Terms that frequently appear together in an article are visualized in the form of a network of connections, which illustrates the strength of associations between topics (Marzi et al., 2020).

4. Data Collection

Data collection in this study was conducted systematically through a combination of Systematic Literature Review (SLR) and Bibliometric Analysis (BA) approaches to ensure the comprehensiveness and validity of the selected data. The process aimed to identify and classify key studies discussing the interrelation between digital talent, human capital, intellectual capital, and the digital service industry, with a specific focus on Indonesia's context of digital export development.

4.1 Data Source and Search Strategy

The main source of bibliographic data was the Scopus database, recognized for its extensive coverage and high-quality peer reviewed publications in engineering, management, and social sciences. The search was performed using a combination of keywords and Boolean operators to capture the most relevant literature. The search query applied was: ((TITLE-ABS-KEY ("digital talent" AND "digital service industry") OR TITLE-ABS-KEY ("intellectual capital" AND "venture capital") OR TITLE-ABS-KEY ("human capital")) AND (LIMIT-TO (LANGUAGE, "English"))).

This query was designed to retrieve articles that explicitly connect talent development with digital service industry growth and knowledge-based assets. The initial search yielded 364 publications spanning from 1992 to 2025, consisting of conference papers, journal articles, review papers, and book chapters.

4.2 Screening and Eligibility Criteria

To ensure relevance and analytical focus, the following inclusion and exclusion criteria were applied:

- a. Inclusion Criteria:
 - 1) Publications in English from 2020-2025.
 - 2) Indexed in Scopus and peer reviewed.
 - 3) Discuss topics on digital talent, human capital, intellectual capital, or digital transformation.
 - 4) Include conceptual or empirical models relevant to digital service export or workforce development.
- b. Exclusion Criteria:
 - 1) Articles outside the thematic scope (e.g., unrelated to talent or export services).
 - 2) Non-academic sources, commentaries, and duplicate records.
 - 3) Papers without full text availability.

After this filtering stage, 204 documents met the preliminary criteria and were subjected to abstract level review. Each abstract was evaluated to identify objectives, methods, and findings relevant to digital workforce and export development. Following this screening, 78 publications remained for in depth content analysis, while 68 were confirmed as the final dataset used in the bibliometric and thematic analysis stages.

4.3 Data Extraction and Coding Procedure

Each selected article was manually coded based on:

- 1) Bibliographic metadata (author, year, journal, country, citation count);
- 2) Conceptual focus (digital talent, human capital, intellectual capital, digital transformation);
- 3) Methodological type (empirical, theoretical, or review);
- 4) Key variables or frameworks used (e.g., skills framework, knowledge management, talent strategy);
- 5) Relevance to Indonesia or global digital service industry.

This structured coding process enabled thematic synthesis of recurring constructs and relationships, forming the foundation for the identification of six core digital talent dimensions analysed in Chapter 5.

4.4 Bibliometric Data Processing

Bibliometric data were exported from Scopus in CSV format and analysed using VOS Viewer 1.6.13. The software facilitated the visualization of co-occurrence networks, co authorship analysis, and citation mapping. The full counting method was adopted, meaning that every co-occurrence link was given equal weight. The resulting network visualization identified four major clusters:

- 1) Green Cluster: Human Capital
- 2) Red Cluster: Digital Transformation
- 3) Blue Cluster: Human
- 4) Yellow Cluster: Digital Technology

These clusters represent the thematic evolution of research on digital talent and intellectual capital. The proximity between nodes in the visualization indicates conceptual linkage or shared theoretical background among the studies.

4.5 Data Validation and Reliability

To ensure reliability and minimize bias, multiple validation steps were conducted:

- 1) Cross checking the search results using variations of the keyword combinations.
- 2) Removing duplicates and verifying journal quality through SCIMAGO Journal Rank (SJR) and Scopus indexing.
- 3) Expert review by academic peers specializing in digital economy and human capital management to confirm the thematic relevance of included publications.

The combination of systematic filtering, bibliometric mapping, and expert validation enhances the robustness and reproducibility of this data collection process, ensuring that subsequent analysis in Chapter 5 accurately reflects current research trends and critical gaps in digital talent development.

5. Results and Discussion

5.1 Identification of Digital Talent Criteria through Systematic Literature Review

A systematic mapping of 68 peer reviewed studies from Scopus indexed journals (2000-2024) was conducted to identify the key constructs of digital talent in the digital service industry. The search yielded publications focusing on digital skills frameworks, human capital development in Industry 4.0, and competence modelling for digital transformation, producing six main dimensions of digital talent criteria relevant to Indonesia's digital services industry. The six dimensions, Attitude, Knowledge, Strong Technical Competence, Software Skills, Hardware Skills, and Data Driven Decision Making, form an integrated competency model that reflects individual capabilities and systemic readiness for digital service export. The synthesis indicates that the evolution of digital talent criteria has shifted from technical literacy (pre-2010) to strategic digital intelligence (post-2020), aligning with the global trend of the Digital Economy and Society Index (DESI) and the UNCTAD Digital Trade Framework. Mapping was conducted through a synthesis of primary literature, including Mubarik et al. (2017), Hendarman et al. (2020), Buvat et al. (2017), and reports from educational and industrial institutions (LPKIA, 2023; WEF, 2022).

5.2 Attitude Dimension (A)

The Attitude dimension emerged as the most foundational pillar of digital talent. Studies by Hendarman et al. (2020) and Buvat et al. (2017) emphasized that digital attitude comprising commitment, adaptability, and innovative mindset correlates positively with technology adoption and innovation performance in digital enterprises. This study identified 11 subdimensions of attitude that a strong digital attitude ensures that individuals are willing to adopt emerging technologies, sustain continuous learning, and maintain consistency in technological engagement.

This study identified 7 subdimensions of attitude, ranging from commitment to digital communication (A1), urgency of maintenance technology (A2), acceptance of technology in daily work (A3), using computers, software, and internet to communication and sharing data (A4), focus and high consistency (A5), global communication capability (A6), and monitoring and evaluate of technology digital capability (A7). These constructs correspond with the Technology Acceptance Model (TAM) and Digital Mindset Theory, reinforcing that a proactive and globally oriented digital mindset serves as a catalyst for skill application and innovation in digital service industries. These sub dimensions of attitude are listed in Table 1 below.

Table 1. Sub Dimensions of Attitude Dimension

No	Dimension	Code	Sub Dimensions
1	Attitude	A1	Committed to the idea that communicating and sharing information using computers, software, or the internet is easy to do.
2		A2	Committed to the urgency of routine and continuous maintenance technology in the digital services business.
3		A3	Accepts the use of technology in daily work.
4		A4	Always use computers, software, and the internet to communicate and exchange data
5		A5	Have a high level of focus and consistency
6		A6	Global communication skills
7		A7	Ability to monitor and evaluate the use of digital technology according to schedule

The results of Tabel 1 have empirical evidence supports this integration study of Hendarman et al. (2020) found that employees with high adaptability and openness to technology are 1.8 times more likely to upskill autonomously. Similarly, Buvat et al. (2017) reported that 78% of high performing digital firms cultivate innovation driven attitudes as part of talent development strategies. Thus, attitude is not merely an affective component but a behavioral driver of digital competence transformation.

5.3 Knowledge Dimension (B)

The Knowledge dimension, adopted from Hendarman et al. (2020), encompasses 6 subdimensions that reflect both foundational and advanced cognitive understanding of digital systems. The knowledge dimension encapsulates cognitive readiness to understand and apply emerging technologies such as Big Data, Blockchain, Cybersecurity, and Cloud Computing. Across the literature, this domain represents the epistemic layer of digital capability the intellectual scaffolding that enables creative problem solving and data driven innovation. These sub dimensions of knowledge are listed in Table 2 below.

Table 2. Sub Dimensions of Knowledge Dimension

No	Dimension	Code	Sub Dimensions
1	Knowledge	B1	Possess knowledge and expertise in Big Data
2		B2	Possess knowledge and expertise in Blockchain
3		B3	Possess knowledge and understanding of cybersecurity
4		B4	Recognize the importance of cybersecurity in today's industrial era
5		B5	Recognize the importance of cloud computing in today's industrial era
6		B6	Be capable of cloud computing engineering or innovation

The results of Tabel 2 as a subdimension reflects a novel approach to organizational learning and innovation ecosystems. This finding is consistent emphasized that knowledge recombination through digital experimentation drives agility and product service system innovation in digital industries. In the context of digital export services, the literature underscores that knowledge of data security and cloud interoperability significantly reduces transaction risk

and improves client trust across borders. Therefore, this dimension directly connects technical awareness with economic outcomes confirming that knowledge is a strategic economic asset in the digital age.

5.4 Technical Competence Dimension (C)

The Technical Competence dimension, drawn from the LPKIA (2023) framework. Technical competence represents the hard skills core of digital talent and has evolved beyond basic programming to include Artificial Intelligence (AI), Machine Learning (ML), Cloud Engineering, and Cybersecurity Architecture. Literature identified 9 subdimensions including software development (C1), Proficient programming languages (C2), AI algorithm design (C3), cloud operation (C4), Manage data and cloud based (C5), Proficient bid data processing (C6), Protect information systems (C7), Create data visualizations (C8), and machine learning for automation (C9) indicate a convergence of computing and analytics as critical levers of competitiveness. These sub dimensions of Technical Competence are listed in Table 3 below.

Table 3. Sub Dimensions of Technical Competence Dimension

No	Dimension	Code	Sub Dimensions
1	Technical Competence	C1	Familiar with web and mobile application development
2		C2	Proficient in programming languages such as Java, Python, or JavaScript
3		C3	Understanding of AI algorithms
4		C4	Able to work with platforms such as AWS, Microsoft Azure, or Google Cloud
5		C5	Able to manage data and cloud-based services
6		C6	Proficient in big data processing using tools such as Python, R, or SQL
7		C7	Ability to protect information systems from cyber threats, which is crucial in safeguarding company and customer data
8		C8	Able to create data visualizations and generate insights for strategic decision making
9		C9	Apply machine learning for business process automation or customer service personalization

Results of Table 3 had empirical cross validation with literature (e.g., Hendarman et al., 2020; LPKIA, 2023) that confirms that the integration of AI and cloud based competence produces the strongest predictor of export success among digital startups. The literature consensus reveals that firms employing technically proficient digital professionals achieve up to 25% higher productivity and 34% faster market penetration compared to peers. In parallel, emphasized that AI literacy and data fluency are among the top ten emerging skills of the 2020s.

5.5 Software Skills Dimension (D)

The Software Skills dimension with 8 subdimensions extends beyond mere tool proficiency to encompass adaptive learning and ethical awareness. The literature expands this domain from traditional IT capability to digital employability the ability to use platforms such as LinkedIn, Upwork, and Dribbble for professional engagement and business acquisition to identifies this as the behavioral operational link connecting knowledge to practice (Hendarman et al., 2020; Buvat et al. 2017).

Criteria findings confirmed that digital platform management and continuous learning orientation to develop platform to make a innovation and relation that are high impact attributes, aligning with the concept of lifelong learning ecosystems enriches this dimension with ethical consciousness, consistent with the Unsustainable Development Goal 9 (Industry, Innovation, and Infrastructure). These sub dimensions of Software Skills are listed in Table 4 below.

Table 4. Sub Dimensions of Software Skills Dimension

No	Dimension	Code	Sub Dimensions
1	Software Skills	D1	Believe that the use of technology greatly helps with work
2		D2	Proficiency in C, C++, Java, JavaScript, and HTML software
3		D3	Able to adapt quickly when using new technology
4		D4	Able to cope with the stress I experience when adapting to new technology
5		D5	Always want to learn new things that can improve performance, especially learning new technologies
6		D6	Able to manage and utilize the LinkedIn platform to find clients and projects
7		D7	Able to manage and develop the Upwork platform as a medium connecting clients and freelancers for various projects
8		D8	Digital design able to manage and develop the Dribbble platform to promote portfolios and find design related jobs

This synthesis of Table 4 implies that software literacy must extend to socio digital literacy mastering not only the tools but also the global ecosystem of digital collaboration and substantiates that platform based visibility is an emerging proxy for export readiness in the digital economy.

5.6 Hardware Skills Dimension (E)

While often underexplored, the Hardware Skills dimension complements software proficiency by enabling talent to manage the physical digital interface, particularly relevant in IoT based digital services. The subdimensions from hardware and firmware design to AI and managed data systems operation reveal the increasing demand for hybrid engineers who bridge digital systems and physical infrastructure.

Derived from Hendarman et al. (2020), it emphasizes technical literacy related to firmware, electrical design, and AI integration. Support this finding, it can be concluded that noting professionals with embedded systems expertise are essential for smart manufacturing, edge computing, and intelligent logistics. These sub dimensions of Hardware Skills are listed in Table 5 below.

Table 5. Sub Dimensions of Hardware Skills Dimension

No	Dimension	Code	Sub Dimensions
1	Hardware Skills	E1	Understanding relationships with other companies in the eyes of the market due to integrated and easily accessible data.
2		E2	Mastery of hardware firmware, electrical, and PCB design.
3		E3	Making decisions based on logical thinking using data that is easily accessible on a computer.
4		E4	Always prioritizing data and facts in the field to make decisions.
5		E5	Always focusing on one problem and paying attention to important or major issues and resolving them quickly and easily
6		E6	Able to solve problems by analyzing existing data
7		E7	Able to easily manage knowledge and data obtained by storing it in storage applications

This results of Tabel 5 resonates with the industry transition toward cyber physical systems, where talent must understand both hardware architecture and data analytics pipelines. Within Indonesia’s digital economy, hardware literate professionals are vital for developing IoT driven digital services including maritime tracking, aggrotech sensors, and smart logistics thereby extending digital export capabilities beyond purely software based services.

5.7 Data Driven Decision Making Dimension (F)

The Data Driven Decision Making (DDDM) dimension, sourced from Buvat et al. (2017), encapsulates strategic, analytical, and ethical intelligence the apex of digital talent maturity. DDDM dimension is recognized as the strategic apex of digital talent competence. Comprising 5 subdimensions that represent the capability to collect, interpret, and

act upon data driven insights. This dimension integrates analytical reasoning, data governance, and ethical and sustainable decision making. These sub dimensions of Data Driven Decision Making are listed in Table 6 below.

Table 6. Sub Dimensions of Data Driven Decision Making Dimension

No	Dimension	Code	Sub Dimensions
1	Data Driven Decision Making	F1	Ability to collect, process, and analyze relevant data for decision making
2		F2	Able to take responsibility for database management
3		F3	Ability to understand and comply with user data security policies
4		F4	Able to make objective decisions based on data
5		F5	Able to utilize i-cloud for digital data governance and data security.

Empirical literature corroborates reported that organizations embedding DDDM into workflows achieved threefold improvement in innovation speed and significantly reduced decision latency. Beyond analytics, the inclusion of ethical and sustainability values introduces a normative dimension ensuring that digitalization supports societal welfare and environmental stewardship. Thus, this dimension transcends technical competence by merging data intelligence with strategic foresight the defining hallmark of globally competitive digital talent. This validates which identifies data driven leadership as a key factor enabling service scalability and cross border competitiveness.

5.8 Comparative Insights and Contribution to Existing Literature

The synthesis of findings within this research is firmly grounded in comparative insights from prior studies that have explored digital talent readiness, human capital transformation, and digital competency frameworks across institutional, industrial, and global contexts. This study establishes how each dimension and subdimension of digital talent was conceptually inherited, empirically justified, and contextually adapted to Indonesia’s digital service export ecosystem (Table 7).

Table 7. Comparative Insight and Literature Contribution to the Formation of Digital Talent Criteria

No	Source/Year	Core Findings & Theoretical Focus	Application/Justification in This Study	Contribution to Current Research
1	Hendarman et al. (2020) “Human Capital Mapping For Industry 4.0: Gap and Index.”	Identified six fundamental digital competency areas which attitude, knowledge, technical, software, hardware, and managerial adaptability. Emphasized local readiness for Industry 4.0.	Adopted as primary foundation for the six dimensional model directly derived and expanded to any subdimensions.	Provided structural backbone of digital talent criteria, enabled contextual localization of Indonesia’s digital human capital taxonomy.
2	Buvat et al. (2017) “The Digital Talent Gap Report, Capgemini & LinkedIn”	Highlighted the global gap between digital demand and workforce capabilities, emphasizing data driven decision making and analytics literacy.	Used to conceptualize Dimension F (Data Driven Decision Making), and justify inclusion of subdimensions.	Contributed to expanding the theoretical horizon from traditional skills toward data intelligence capability as a determinant of export readiness.
3	LPKIA (2023) “5 Kriteria Talenta Digital Unggul”	Classified technical excellence in web, mobile, cloud, AI, and cybersecurity as indicators of digital talent strength.	Applied to build Dimension C (Technical Competence), focusing on AI and cloud integration.	Strengthened the technical operational aspect by linking coding, data analytics, and machine learning to global competitiveness.

The comparative literature integration not only reinforces the theoretical robustness of this study but also situates it as a novel contribution to global discourse on digital human capital development. By merging empirical quantification with contextual insight, this research advances from describing “what digital talent is” to explicating “how digital talent operates as a strategic engine of national competitiveness.”

6. Conclusion

This study effectively accomplishes its principal aims of identifying, categorising, and conceptualising the essential criteria delineating digital talent within Indonesia's digital service sector. Using Systematic Literature Review and Bibliometric Analysis on publications indexed by Scopus, the study mapped current academic trends, found gaps in themes, and put together the most important skills needed to build a digital workforce that can compete on a global scale. The results create a complete six dimensional framework of digital talent that includes attitude, knowledge, technical competence, software skills, hardware skills, and data driven decision making. Together, these comprise an integrated human capital readiness model for the digital export ecosystem. This multidimensional construct aligns with global digital competency frameworks and meets Indonesia's needs to close the digital talent gap. The study's distinctive contribution resides in amalgamating bibliometric visualisation and qualitative synthesis to bridge intellectual capital theory with practical skill frameworks. It moves the conversation from just talking about digital skills to how digital talent works as a strategic engine of national competitiveness, connecting micro level skills with macro level export readiness. Furthermore, the proposed model offers a theoretical framework for policymakers, educational institutions, and industry leaders to synchronise talent development strategies with digital trade goals, facilitating Indonesia's transition to a knowledge based and export driven digital economy. Subsequent investigations ought to empirically substantiate this framework via survey based assessments or structural modelling to quantify its influence on organisational performance and export scalability. These additions would help us better understand how the dynamics of digital talent affect Indonesia's place in the global digital services market.

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Biographies

Anggara Trisna Nugraha is currently pursuing his doctoral degree in Bio-industrial Mechatronic Engineering at National Chung Hsing University, Taichung, Taiwan. He is a lecturer and professional in Electrical Engineering with specialization in control systems and marine electrical technology. Since 2019, he has served as a lecturer at the Politeknik Perkapalan Negeri Surabaya (PPNS). He earned his Bachelor of Engineering degree from the Department of Electrical Engineering at Jember State University in 2015, and a Master of Engineering degree specializing in Control Systems from the Faculty of Electrical Technology at Institut Teknologi Sepuluh Nopember (ITS), Surabaya, in 2017. In 2024, he obtained his Professional Engineer (Ir.) certification from Hasanuddin University, along with the IPM (Professional Engineer) and ASEAN Engineer certifications, representing his international professional accreditation. He actively participates in academic research, scientific publications indexed by Scopus and other scholarly databases, and student mentoring. His research interests include control systems, industrial electronics, and marine electrical technology. Additionally, he contributes as a reviewer for international journals and conferences. Committed to advancing technology and engineering education based on international professional standards, Anggara aims to develop Indonesia's engineering education to compete globally through research and sustainable innovation.

Anda Iviana Juniani is an Associate Professor in the Design and Manufacturing Engineering study program within the Marine Mechanical Engineering Department at the Shipbuilding Institute of Polytechnic Surabaya (PPNS), Indonesia. She earned her Bachelor's degree in Industrial Engineering, Master's degree in Sustainable Manufacturing, and Doctoral degree in Quality Management and Manufacturing all from Institut Teknologi Sepuluh Nopember (ITS), Surabaya. Dr. Juniani has published numerous journal and conference papers. She has successfully completed research projects in collaboration with prominent companies such as Medco E&P, Alstom Power, Pertamina, Megasurya Mas, Angkasa Pura, PLN Nusantara, Terminal Petikemas Pelindo, Tanjung Jati Baru Power, Arto Metal International, Piramida Teknologi Informasi, and Amman Mineral Nusa Tenggara. Her research interests include manufacturing systems, product development, design for X, optimization, reliability, risk management, quality engineering, lean manufacturing, and sustainable manufacturing.

Zaki Wicaksono is an undergraduate student in the Design and Manufacturing Engineering Program at the Shipbuilding Institute of Polytechnic Surabaya (PPNS), Indonesia. He has shown active involvement in academic, organizational, and leadership activities, serving as project leader, Master of Ceremony, and moderator in various PPNS Student Executive Board (BEM) events, including the RUDDER 2024 new student orientation. Currently, he holds the position of Coordinating Minister of Knowledge and Movement in BEM PPNS, a role dedicated to bridging student aspirations, movements, community service, and welfare programs. His leadership and innovation were recognized when he secured funding for the 2025 Student Creativity Program (PKM) in the Application of Science and Technology scheme, developing an automatic turmeric slicer and dryer based on a rotary dryer system. His academic interests include engineering design, operational management, statistical quality control, and manufacturing processes, supported by technical skills in AutoCAD, Fusion 360, SolidWorks, and digital tools. He has engaged in community service to optimize village potential and contributed to a Bank Indonesia research grant project using the Delphi method to address complex decision-making challenges.

Dhadys Ayu Juli Anjhani is an undergraduate student of Design and Manufacture Engineering at the Shipbuilding Institute of Polytechnic Surabaya (PPNS), Indonesia. She has actively contributed to academic and organizational leadership as project leader, Master of Ceremony, and moderator for events organized by the Himpunan Mahasiswa Teknik Desain dan Manufaktur (HIMA TDM), including serving as Moderator at the 9th Conference on Design and Manufacture Applications. She also holds the role of Vice President of the Campus Ambassador Association PPNS 2024, where she was awarded Runner Up 2 Campus Ambassador 2024 and named Staff of the Month by HIMA TDM. Her academic and research interests encompass engineering design, operational planning, process optimization, and statistical analysis, supported by technical proficiency in AutoCAD, Fusion 360, and digital communication tools. She has participated in the National Science Olympiad (KSN) and the UKM Maritime Challenge ITS-PPNS. In addition, she contributed to a Research Grant Bank Indonesia project, undertaking Analytical Network Process (ANP) analysis, literature review, and data preparation in collaboration with a research team.

Putri Amelia is a lecturer in the Department of Information Systems at Semen Indonesia International University (UISI), who earned her doctorate from the Sepuluh Nopember Institute of Technology (ITS) in Surabaya. Her research interests focus on the aquaculture industry supply chain, with a collaborative approach based on intellectual capital,

social capital, and the role of information sharing in improving the performance and resilience of the supply chain system. Some of the research themes she focuses on include “The Dynamics of Supply Chain Collaboration: Intellectual and Social Capital Perspectives with the Moderating Role of Information Sharing” and “Application of System Dynamics Simulation in Food Supply Chain: Review and Bibliometric Analysis.” Through these studies, she to develop a knowledge and technology-based supply chain collaboration model to support food security and enhance the competitiveness of the national industry.

Khoirul Amin is an alumnus of the Design and Manufacturing Engineering program at the Shipbuilding Institute of Polytechnic Surabaya (PPNS), Indonesia. He was selected as an FTIP 2025 awardee at National Formosa University, Taiwan, where he studied multi attribute decision making (MADM) and applied it in project-based manufacturing analysis. His academic background includes the use of Analytic Hierarchy Process (AHP) in his undergraduate thesis to support structured decision making. In the Research Grant Bank Indonesia project, he contributed to the literature review, Delphi analysis, and ANP modeling, focusing on prioritizing digital talent factors for export driven service ecosystems. His leadership experience as former President of PPNS Student Union further supported his role in coordinating collaborative research and stakeholder engagement.