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Human Resource Upskilling and Reskilling Strategies in the Financial Services Industry in the Digital Era

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Abstract: The digital transformation of the financial services industry has fundamentally shifted task structures, competency architectures, and human capital configurations. Process automation, artificial intelligence (AI), big data analytics, cloud computing, and distributed ledger technologies are shifting the focus of work from routine transactional activities to analytical, advisory, and professional judgment-based activities. This shift has created a structural skills gap and demands organizational responses in the form of upskilling and reskilling strategies. This study conducted a Systematic Literature Review (SLR) following the PRISMA 2020 protocol and Tranfield et al.'s (2003) three-stage procedure to map the conceptual definitions, theoretical roots, variable structures, and measurement instruments used in upskilling and reskilling research on human resources in financial services. The synthesis results indicate that: (1) Human Capital Theory (Schultz, 1961; Becker, 1964) serves as a grand theory reinforced by the Resource-Based View (Barney, 1991); (2) Dynamic Capabilities Theory, Knowledge-Based View, Social Cognitive Theory, and the technology adoption model (TAM/UTAUT/DOI) act as middle-range theories ; (3) the dominant antecedents are multilevel, encompassing technological, individual, and organizational determinants; (4) the main consequences range from individual performance to digital transformation success and workforce productivity; and (5) organizational support and digital leadership serve as moderating variables, while behavioral intention and digital knowledge management serve as mediating variables. This study offers an integrative conceptual model and a further research agenda for the Indonesian financial services context.

Keyword: Upskilling, Reskilling, Digital Human Capital, Financial Services Industry, Digital Transformation, Systematic Literature Review.

INTRODUCTION

Labor economics literature has long predicted that technological change is task-biased: technology substitutes for routine tasks and complements non-routine tasks that require abstract reasoning and social interaction (Autor, 2015; Acemoglu & Restrepo, 2019). Frey

and Osborne (2017) estimate that a significant proportion of financial administrative jobs are at high risk of automation, while Brynjolfsson and McAfee (2014) emphasize that labor's value-added is shifting toward the ability to collaborate with machines. Within this framework, upskilling and reskilling are no longer peripheral training programs but rather instruments of structural adjustment in the labor market.

Recent empirical evidence reinforces this urgency. Pothisarn and Thongmak (2026) report that the accounting profession, the backbone of the reporting and assurance functions in financial services institutions faces a wide digital skills gap, with approximately 69% of new accountants reporting they lack advanced technology competencies and lag in data mining and business intelligence. In a study of 658 professional accountants, they found that the skill areas most desired for continuous development were data and database management (221 respondents), cybersecurity (207 respondents), and data analytics (206 respondents). These findings indicate that reskilling demand is specific, measurable, and oriented toward core FinTech technologies.

At the macro level, Rabadán-Pérez and Muñoz-Céspedes (2026) show, using Eurostat harmonized data for 26 EU member states and ten NACE sectors, that digital transformation is positively associated with digital human capital (DHC), with a standardized path coefficient of 0.42 (95% bootstrap CI: 0.13–0.74), and that digital skills are positively correlated with labor productivity. However, they also find that the mediating role of DHC in the digitalization–productivity relationship is limited to the observation period, indicating an implementation lag between technology investments and the realization of their economic benefits. This finding aligns with the classic argument that technological benefits are only realized when accompanied by complementary assets such as skills, organizational practices, and managerial capabilities.

On the organizational side, Sonar et al. (2025) identified, through a hybrid fuzzy Delphi–DEMATEL–ISM method, that the most fundamental barriers to digitalizing operations are human and cultural, not solely technological. Fear of job losses ranked first as a causal factor with a D–R value of 4.3023, followed by unclear benefits for workers and a scarcity of advanced information technology skills. In other words, resistance to change and competency deficits are the causal roots that must be addressed before technology investments can generate value.

In the Indonesian context, this urgency has a regulatory basis. The Financial Services Authority (2021a), through its Blueprint for Digital Banking Transformation, places strengthening human resources and digital culture as a key pillar, while the Indonesian Banking Development Roadmap 2020–2025 (Financial Services Authority, 2021b) emphasizes the need to accelerate the digital capabilities of industry players. Law Number 4 of 2023 concerning the Development and Strengthening of the Financial Sector also expands the mandate for literacy and capacity building of financial sector players. This regulatory framework creates institutional pressures (both coercive and normative) that strengthen the incentives for financial services institutions to institute upskilling and reskilling programs.

METHOD

Systematic Literature Review Design

This study uses a Systematic Literature Review (SLR) approach, a literature review method that follows an explicit, transparent, and replicable protocol to identify, assess, and synthesize scientific evidence relevant to a specific research question (Tranfield et al., 2003). Unlike narrative reviews , which are susceptible to researcher selection bias, SLR minimizes bias through pre-established eligibility criteria, a documented search strategy, and a multi-layered screening procedure.

The review protocol adopted Tranfield et al.'s (2003) three-stage process: (1) review planning , including formulating research questions, developing a search strategy, and establishing eligibility criteria; (2) review implementation , including identifying, screening, and selecting studies; and (3) reporting and synthesis , including data extraction, thematic analysis, and developing a narrative and conceptual synthesis. Reporting of the selection process follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 (Page et al., 2021), consistent with the practices implemented by Satjawisate et al. (2025) in their study of the digital competency of the accounting profession.

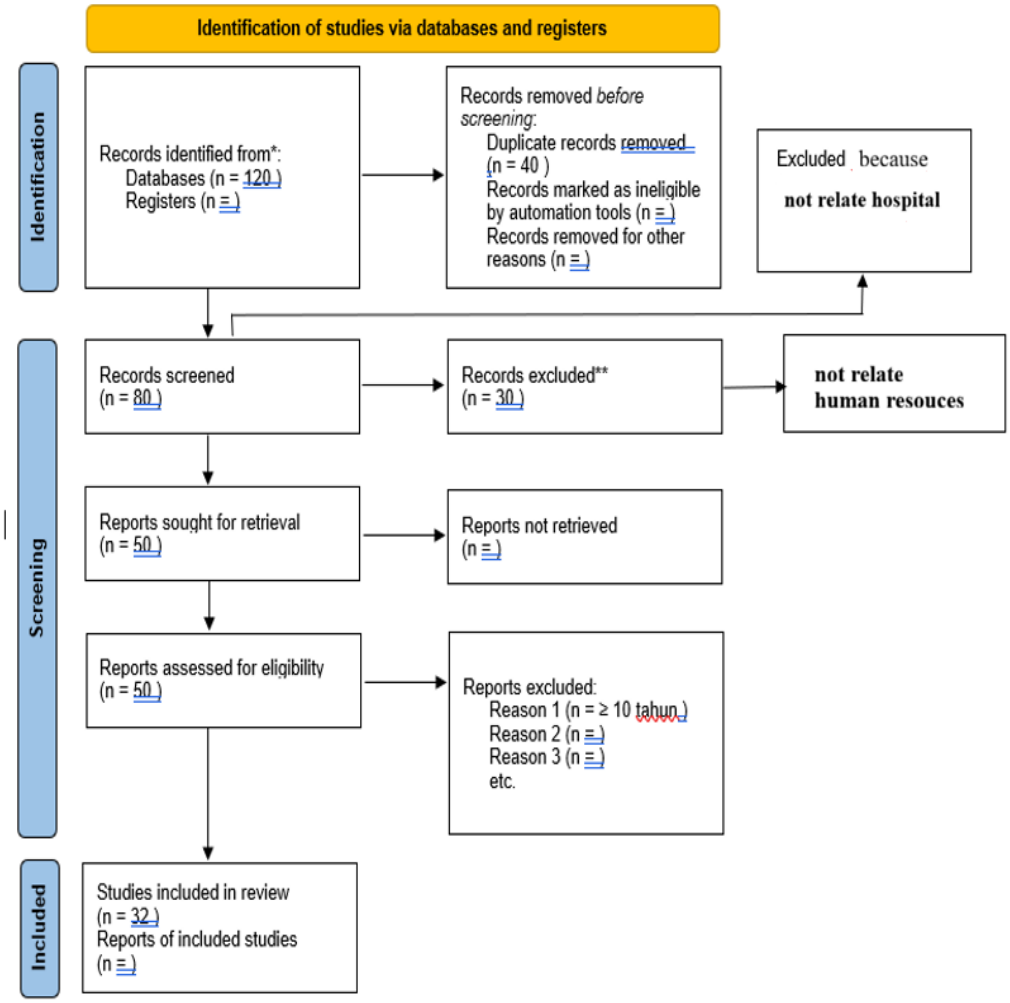


Figure 1. Prisma Flowdigram Analyze

RESULT AND DISCUSSION

Grand Theory

The grand theory underlying this study is Human Capital Theory (Schultz, 1961; Becker, 1964; Mincer, 1974). This theory was chosen for three reasons.

First, the theory provides a coherent economic logic for why organizations and individuals are willing to incur training costs: upskilling and reskilling are understood as investments that generate a stream of benefits in the form of increased productivity, earnings, and future employability. This logic allows training decisions to be analyzed within the framework of net present value and internal rate of return, as is common in investment analysis.

Second, this theory is directly tested in synthesized literature. Satjawisate et al. (2025) state that the Human Capital Theory perspective "is useful here because it views education

and skills acquisition as investments that build an individual's productive capacity," thus viewing digital competence as a vital form of modern professional capital. Rabadán-Pérez and Muñoz-Céspedes (2026) operationalize this theory at the country-sector level through a digital human capital index and demonstrate its positive association with labor productivity.

Third, this theory has the reach across levels of analysis—individual, organizational, and macroeconomic—necessary to explain the phenomena of upskilling and reskilling, which are indeed multilevel in nature.

Positioning the concept within a broader theoretical framework. In this study's theoretical architecture, Human Capital Theory is reinforced by the Resource-Based View (Barney, 1991) as a companion theory at the organizational level. While Human Capital Theory explains why skills investment is economically rational, the Resource-Based View explains how the accumulation of path-dependent and socially complex digital competencies transforms into sustainable competitive advantages that are difficult for competitors to imitate. Fang et al. (2026) explicitly uses a combination of the resource-based and knowledge-based views as the foundation of their digital transformation model.

Thus, the concept of upskilling and reskilling strategies occupies a position as a mechanism for the accumulation and reconfiguration of digital human capital that links technology investment (input) with organizational performance and productivity (output).

Middle Range Theory

Middle-range theory bridges the abstractions of grand theory with empirically testable hypotheses. This study identifies five dominant middle-range theories in literature.

a) Dynamic Capabilities Theory (Teece et al., 1997). Explains reskilling as a manifestation of reconfiguring capabilities —an organization's ability to rearrange its resource base. Fang et al. (2026) position digital strategy as a high-level dynamic capability that facilitates continuous reconfiguration of resources in an unstable digital environment.
b) Knowledge-Based View (Grant, 1996). Explains the mediation mechanism: digital strategy serves as a sense -giving device that determines what knowledge is critical, while the digital knowledge management process—capture, share, and apply—becomes the transformation engine. Fang et al. (2026) proves that digital knowledge management is the most influential driver of successful digital transformation.
c) Social Cognitive Theory and Self-Directed Learning (Bandura, 1986; Knowles, 1975). Explaining individual determinants of learning behavior. Pothisarn and Thongmak (2026) found that self-directed learning readiness had a significant positive effect on IT reskilling intentions, validating the proposition that learner agency is a necessary condition for the success of competency development programs.
d) Diffusion of Innovations and technology acceptance model (Rogers, 2003; Davis, 1989; Venkatesh et al., 2003). Explains how technology attributes influence willingness to learn. Pothisarn and Thongmak (2026) found low perceived complexity and perceived trialability as significant predictors of reskilling intention.
e) Organizational Support Theory and Social Exchange Theory (Eisenberger et al., 1986; Blau, 1964). Explains why organizational supporting the form of targeted training programs, incentives, and recognition—creates a reciprocal obligation on employees to invest in self-development.
f) Theory of Planned Behavior (Ajzen, 1991). Provides an intention–behavior structure that serves as a testing framework for Pothisarn and Thongmak (2026), including the role of past behavior as a predictor of actual behavior.

Analysis of Variables and Relationships Between Variables

same keyword co-occurrence network (co-word analysis or keyword co-occurrence analysis), namely Figure 1 in network visualization mode and Figure 2 in overlay visualization mode. In this technique, key terms are treated as nodes, while the co-occurrence of two terms in the same document is treated as a relationship (link) between the nodes.

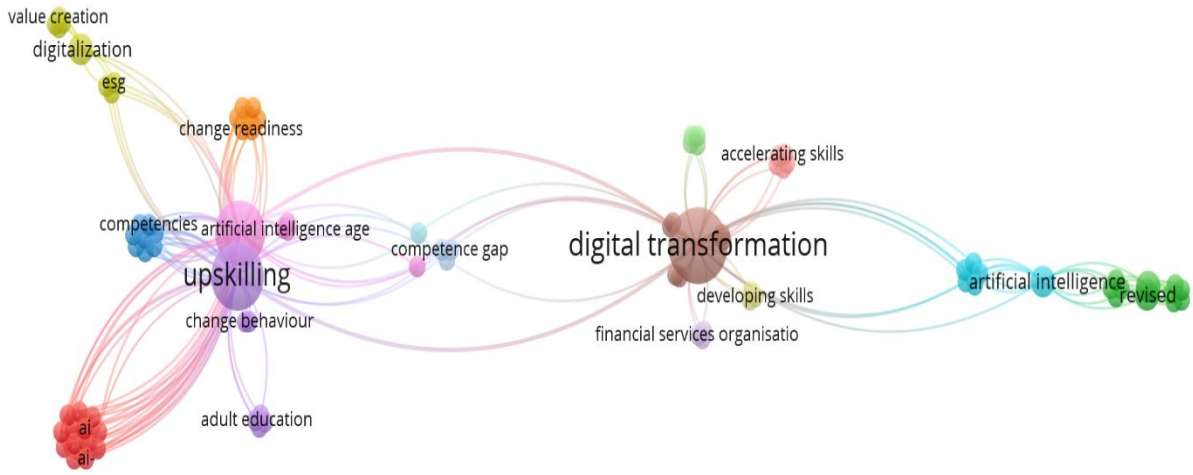


Figure 2. Network Visualization Mode



Figure 3. Overlay Visualization Mode

1. Basic Visualization Interpretation

The analysis in this section relies on two VOSviewer software outputs that represent the same literature corpus through two different colorization schemes. The first image is a network visualization that groups keywords based on the results of the smart local moving algorithm, while the second image is an overlay visualization that colors nodes according to the average publication year between 2021 and 2026.

Three reading rules need to be emphasized from the outset to ensure that interpretations do not exceed the data's information capacity. First, node diameter reflects the frequency of occurrences of a term, not its theoretical influence. Second, the distance between nodes is inversely proportional to the strength of the co-occurrence association; two adjacent terms are more likely to appear together in the same article. Third, the thickness of the connecting lines indicates the total link strength, that is, the intensity of their co-occurrence in aggregate. Thus, this map captures the discourse structure as expressed by authors in their article keywords, not the causal structure of the economic phenomenon itself, a distinction often obscured in applied bibliometric studies (van Eck & Waltman, 2010; Donthu et al., 2021).

2. Intellectual Structure: Bipolar Configurations and Fragile Bridges

The most striking structural finding from Figure 1 is the map's bipolar architecture. The corpus is not organized around a single center of gravity, but rather two: upskilling in the left quadrant and digital transformation in the center-right quadrant. Both have the largest node diameters and serve as parent nodes for their respective satellite clusters.

This separation is not merely a layout artifact but carries substantive meaning. The upskilling pole summarizes discussions on the labor supply side competency building, adult education, readiness for change, and training implementation challenges. The digital transformation pole summarizes discussions on the firm level demand side technology adoption, capability acceleration, and sectoral context. Economically, this map separates the mechanisms of human capital formation from the mechanisms of technological change that drive the demand for that human capital.

What is more noteworthy is the nature of the bridge between the two poles. The link connecting upskilling and digital transformation is depicted as a long and relatively thin curve, and the only intermediary node explicitly occupying the space between them is the competence gap of a small diameter. The interpretation is stark: the literature has documented the technology push and the training response separately but has not yet built a sufficient body of knowledge regarding the transmission mechanisms between the two. The competence gap, which in the labor economics framework is a key connecting variable between technological change and the need for human capital investment, is in fact one of the weakest nodes in the network. This is a structural hole in the network analysis sense, and at the same time, it represents the most valuable theoretical contribution of this study.

The overall structure of the map also shows a high degree of fragmentation. There are dozens of color clusters for a relatively limited number of nodes, a number of small nodes clustered unlabeled on the right side of the map, and several peripheral clusters barely linked to the core of the network. This low network density is a typical sign of an emergent and unconsolidated field of study: vocabulary is not yet standardized, measurement traditions are not yet established, and knowledge accumulation is still additive rather than cumulative.

3. Cluster Anatomy and Its Theoretical Content

The following table summarizes the main clusters and their economic readings.

Table 1. Cluster Anatomy and Its Theoretical Content

Cluster (Color)	Characterization Node	Analytical Domain	Theoretical Equivalent
Purple–magenta	Upskilling, challenges, adult education	Human capital investment and barriers to its implementation	Human capital theory (Becker, 1964)
Chocolate	Digital transformation	Organizational level technological changes	Digital transformation as a strategic process (Vial, 2019)
Red	Ai and its derivatives	AI as a learning object and trigger for skills needs	Automation and creation of new tasks (Acemoglu & Restrepo, 2019)
Cyan-green	Artificial intelligence and right satellite	AI as a general-purpose technology adopted by organizations	General purpose technology (Brynjolfsson et al., 2021)
Yellow-olive	Digitalization	Digitalization of work processes	IT–organization complementarity (Bresnahan et al., 2002)
Blue	Competencies	Competency architecture	Task-based approach (Autor et al., 2003)
Orange	Change readiness	Behavioral and organizational readiness	Dynamic capabilities (Teece, 2007)
Light blue	Competence gap	Skills mismatch	Skill mismatch and adjustment friction

Cluster (Color)	Characterization Node	Analytical Domain	Theoretical Equivalent
Violet	Financial services organization	Sectoral context	Industry specificity
Indigo–dark purple	Accelerating skills, developing skills	Early period skills acceleration agenda	Post-pandemic response

Two critical notes emerge from this table.

First, there is a serious terminological dislocation between ai and artificial intelligence. Both terms refer to identical referents, but VOSviewer places them at opposite ends of the map: ai is in the lower-left quadrant within the upskilling orbit, while artificial intelligence is in the right quadrant within the digital transformation orbit. Methodologically, this indicates that a thesaurus has not been implemented to unify synonyms and abbreviations, resulting in a split in frequency and a distorted cluster structure. Substantively, however, the separation is informative: it reveals two distinct epistemic communities the education and human resource development community, which treats AI as an object to be mastered by workers, and the strategic management and information systems community, which treats AI as an instrument of organizational transformation. These two communities write about the same phenomenon with disparate vocabularies. In writing up the results, both readings should be presented simultaneously: as technical limitations that need to be corrected during the data cleaning stage, and as findings of disciplinary fragmentation.

Second, the sectoral context is barely represented. The only node that explicitly mentions industry is financial services organizations, with a small diameter. For studies specifically targeting the financial services industry, this finding has two opposing but equally important implications. On the one hand, it strengthens the justification for novelty: the literature explicitly linking upskilling and reskilling strategies to the institutional characteristics of the financial sector is still very limited. On the other hand, it requires caution in generalizations: most of the available evidence is cross-sectoral, and the financial services industry has specific characteristics—high regulatory intensity, the dominance of routine cognitive tasks that are most susceptible to automation, and relatively rigid internal career structures—that make the transferability of findings across sectors difficult to assume.

4. Temporal Dynamics: Three Waves of Discourse

The overlay visualization in Figure 2 provides a dimension not readily available from cluster maps: the order in which thematic events appear. The color gradient from indigo (2021) to yellow (2026) exhibits a very regular shift pattern and can be read as three waves.

The first wave (2021–2022), colored indigo to purple, is dominated by accelerating skills and developing skills. The vocabulary is general, normative, and urgency oriented. This is a trace of post-pandemic discourse, when the acceleration of remote work and digitalization suddenly gave rise to widespread calls for accelerated skills development without clear technological specifications or mechanisms.

The second wave (2023–2024), colored turquoise to green, is filled with large nodes: digital transformation, upskilling, competencies, change readiness, adult education, and financial services organizations. In this phase, the discourse undergoes institutionalization: from calls to programs, from urgency to competency architecture, change readiness, and organizational context. It is worth noting that the two largest nodes in the map are in this wave, meaning the intellectual mass of the corpus will be formed in 2023–2024.

The third wave (2025–2026), highlighted in bright yellow, encompasses AI, artificial intelligence, digitalization, challenges, and—most significantly— the competence gap. This phase marks a shift from generic digitalization to skills disruption specifically driven by artificial intelligence.

This temporal reading yields one noteworthy conclusion. The competence gap and challenges nodes emerged in the most recent wave, after the solution nodes (upskilling, developing skills, accelerating skills) had dominated for the previous two to three years. In economic logic, this sequence is reversed: identifying gaps should precede designing interventions. The observed pattern indicates that the literature moves prescriptively first and diagnostically later —solutions are offered before the problem is adequately quantified. In other words, the emergence of the competence gap in 2025–2026 can be read as an internal correction in the literature: a belated realization that adjustment frictions, implementation barriers, and skills mismatches are unresolved empirical issues.

5. Interpretation within the Framework of Economic Theory

The overall map configuration consists of a skill-biased technological change framework and, more specifically, a task-based approach. The digital transformation and AI clusters represent the technology side that shifts the composition of tasks; the upskilling pole represents the response to human capital investment; and the competence gap represents the transitional disequilibrium between the two (Autor et al., 2003; Acemoglu & Autor, 2011).

The map's weakness lies precisely in its invisibility. No nodes refer to economic outcome variables, productivity, wages, returns to training, retention, internal mobility, or cost efficiency—are found. Nor are any nodes referring to causal identification strategies such as field experiments, difference-in-differences, or firm-level panel data. This absence confirms that the mapped corpus is dominated by managerial-descriptive and normative literature, rather than estimation-based labor economics literature.

The implications are fundamental for the positioning of the study. Claims that upskilling and reskilling are rational responses to digital transformation, as implied by the map's structure, have so far relied on normative arguments and anecdotal evidence, not on causally identifiable estimates of the returns to training investments. Within the framework of human capital theory, firm-specific training is only economically rational if the present value of productivity gains exceeds the training costs plus the risk of poaching (Becker, 1964)—a calculus not represented at all in the vocabulary of this map. Similarly, the complementarity thesis—that technology investments only yield productivity gains if accompanied by complementary investments in human capital and work reorganization (Bresnahan et al., 2002; Brynjolfsson et al., 2021)—is an available theoretical foundation that has not been exploited by the mapped corpus.

Research Gaps That Can Be Reduced

Based on the structural and temporal readings above, at least five research gaps can be formulated sequentially according to their level of importance.

1. Transmission mechanism gaps. The weak link between the digital transformation and upskilling poles leaves unanswered questions: through what mechanisms does technology adoption translate into specific skill needs, and what variables mediate and moderate this relationship.
2. Gaps in measuring outcomes. The absence of variables for productivity, wages, and training outcomes suggests that the economic effectiveness of upskilling and reskilling programs has not been adequately estimated. Further research needs to be done from the question of "what organizations do" to "how big their impact is."
3. Causal identification gaps. The dominance of descriptive and case study designs leaves room for the application of quasi-experimental designs to company- or individual-level data.
4. Sectoral specificity gaps. The marginalization of financial services nodes highlights the extent to which prudential regulations, job structures, and task characteristics in this sector shape competency development strategies.

5. The diagnostic gap. The late emergence of the competence gap indicates that the instruments for measuring the competence gap—its taxonomy, validity, and reliability—are still not well established and worthy of a separate agenda.

Practical and Policy Implications

For the management of financial services organizations, this map suggests that training investments designed without prior competency gap diagnosis risk becoming expenditure without measurable returns. The sequence demonstrated in the literature—solutions precede diagnosis—is precisely the pattern that should be avoided in practice. The change readiness cluster provides further confirmation: upskilling barriers are not solely technical curricular, but also behavioral and organizational, so intervention design must include the change readiness dimension.

For policymakers, the absence of any reference to public policy instrument training subsidies, active labor market policies, national qualifications frameworks, or professional certification—is a noteworthy finding. The mapped discourse focuses almost entirely on organizational responsibility, while the market failure dimension in training provision, which classically justifies public intervention, remains largely untouched.

CONCLUSIONS AND RECOMMENDATIONS

Conclusion

1. The presence of the "financial services organization" node attached to the center of digital transformation shows that the financial sector acts as a pioneering industry (first-mover) that is both most vulnerable and most responsive to the pressures of digitalization.
2. The sub-clusters "change readiness", "change behavior", and "esg" highlight the postulate that economic resilience does not solely depend on physical capital expenditure (capex) of technology, but rather on organizational behavioral governance and sustainability.

Limitations

Several qualifications are necessary to maintain the appropriateness of this discussion. First , all of the above inferences are derived from a visual reading of the two images, not from tables of occurrences and total link strength ; therefore, statements about link size and strength are ordinal, not cardinal. Second , keyword co-occurrence is only a proxy for intellectual proximity and depends heavily on indexing practices and the author's habits of defining keywords. Third , the minimum frequency threshold set in VOSviewer also determines the number of nodes shown, so an absent node is not necessarily absent from the corpus—it may simply be below the threshold. Fourth , the color values in the overlay are averages of publication years, and therefore cannot be treated as the date of first appearance of a concept. Fifth , as discussed, the lack of a thesaurus to unify AI and artificial intelligence could potentially affect the clustering results, and improvements at this stage are recommended before the results are finalized.

Future Research Agenda

Based on the identified gaps, eight research agendas are proposed.

1. An empirical study in the context of Indonesian financial services. Testing the upskilling - reskilling model in commercial banks, rural banks, insurance companies, financing companies, and FinTech providers, taking into account differences in scale and regulatory segmentation.
2. Longitudinal and panel designs. Repeated measures to capture the lag between training investment, competency accumulation, and productivity realization, while also testing the direction of causality that cannot be established through cross-sectional designs.

3. Measurement of actual behavior based on objective data. Utilizing learning management system data, certification records, and digital learning footprints to replace self-report measures.
4. Testing the study habits construct. Development and validation of a professional study habits instrument as an empirically stronger predictor than intentions.
5. Evaluating the effectiveness of pedagogical interventions. Satjawisate et al. (2025) emphasized that research must go beyond advocacy to testing which interventions are most effective in building digital competencies. Experimental and quasi-experimental designs are essential.
6. Cost-benefit analysis and return on investment in training. Estimation of the internal rate of return of reskilling programs in financial services institutions, including calculation of the opportunity cost of learning time.
7. Cross-level research using multilevel modeling. Integrating individual, work unit, and organizational data using hierarchical linear modeling to examine assumed but rarely tested cross-level effects.
8. An examination of the ethical dimensions and governance of AI competencies. Development of a training, assessment, and certification framework for human-centric competencies—algorithmic skepticism, bias assessment, and data governance—identified as critical gaps in the literature.

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