International Journal of Sharia Business Management (IJSBM)
Vol. 4, No. 2, September 2025, pp. 65~73
e-ISSN: 2828-5891, DOI: 10.51805/ijsbm.v4i2.409

Reskilling and Upskilling in The Digital Era: Challenges and Human Resource Management Strategies

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Article Info

Article history:

Received 07 24, 2025
Revised 08 25, 2025
Accepted 09 30, 2025

Keywords:

Reskilling; Upskilling
Human Resource Management;
Digital Transformation

ABSTRACT

The rapid advancement of digital technologies has drastically reshaped the industrial landscape, compelling the workforce to acquire new competencies to remain relevant and competitive. Within this context, reskilling and upskilling have emerged as critical strategies for organizations in managing human resources (HR) and adapting to accelerated technological change. Nevertheless, the implementation of reskilling and upskilling is fraught with challenges, including widening skill gaps between older and younger employees, resource limitations for training, and resistance to change among workers. This study aims to analyze these challenges and identify effective HR management strategies to address them. A qualitative approach was employed, combining a systematic literature review and secondary data analysis from both academic and industry sources. The findings indicate that technology-enabled strategies, such as e-learning, microlearning, and AI-driven training, are essential to workforce development. Moreover, hybrid learning models, which integrate online and face-to-face training, have been shown to enhance training efficiency. Cross-sector collaboration among corporations, educational institutions, and governments is also highlighted as a key success factor in implementing reskilling and upskilling programs. Practical implications suggest that organizations should embed reskilling and upskilling within HR policies, foster a culture of continuous learning, and allocate sufficient resources to employee training. This study contributes to both theory and practice by providing insights into adaptive and innovative HR development strategies in the digital era. Future research is recommended to further investigate the impact of reskilling initiatives on employee productivity and performance

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INTRODUCTION

The development of digital technologies over the past two decades has profoundly transformed multiple dimensions of human activity, including the world of work. Digital transformation, characterized by the adoption of technologies such as artificial intelligence (AI), big data, the Internet of Things (IoT), and automation, has significantly reshaped organizational processes and individual work patterns (Jedynak et al., 2021). Organizations can no longer rely solely on traditional workforce competencies but instead require human resources capable of adapting to rapidly evolving technologies. Consequently, the urgent need for employees to enhance their competencies through reskilling and upskilling programs has become increasingly evident. Reskilling refers to retraining employees to acquire entirely new competencies that differ from those they previously possessed (Čirčová & Blštáková, 2023). This is particularly vital for employees whose roles face potential obsolescence due to automation or disruptive industry shifts. In contrast,

upskilling refers to enhancing existing skills within the same domain to improve efficiency and productivity. Both processes are no longer optional but essential in ensuring workforce relevance within an increasingly competitive labor market.

The impact of digital transformation on employment is extensive (Wahyudi Angga et al., 2023). Industries once heavily reliant on manual labor now integrate technology-based systems. For instance, manufacturing, which traditionally depended on human labor, has progressively shifted toward robotics and automation. Similarly, in the service sector, digital technologies enable online-based services that reduce the reliance on conventional workers. As a result, occupations once deemed stable are now subject to disruption, presenting new challenges for HR management in ensuring employees possess the competencies necessary to remain productive in a digital environment. Moreover, the skills required in today's digital era are dynamic and continuously evolving. While technical skills were once relatively stable over extended periods, today's workforce must possess adaptable competencies that evolve in tandem with technological trends. Essential skills now include digital literacy, basic programming, data analytics, and the ability to work with AI-enabled technologies (Yuniarto, 2021). Beyond technical skills, soft skills such as critical thinking, creativity, effective communication, and collaboration have also become critical determinants of professional success in digitally driven work environments.

The importance of reskilling and upskilling extends beyond individual career sustainability to organizational competitiveness (Allen, 2022; Cvetkovski & Tomanovic, 2024). Companies that fail to enhance workforce skills risk lagging in technological adaptation and losing competitiveness in global markets. Consequently, organizations must establish clear strategies for HR training and development. HR management plays a central role in ensuring that reskilling and upskilling programs are effectively implemented. HR managers are tasked with formulating training policies aligned with both industry needs and technological advances while guaranteeing equitable access to training across the workforce. A primary challenge lies in identifying which skills will remain relevant in the medium to long term (Chakma & Chaijinda, 2020). Organizations often face difficulties in determining whether skills taught today will maintain their utility over the next five to ten years. This underscores the need for HR managers to collaborate with industry leaders, academics, and training providers to design data-driven training curricula based on emerging labor market trends.

Beyond program design, organizational culture presents another barrier to reskilling and upskilling implementation. Not all employees demonstrate motivation or readiness to acquire new skills, particularly those accustomed to long-standing traditional methods. Fear of technology, resistance to change, and insufficient managerial support often inhibit workforce participation in training programs. Accordingly, organizations must not only provide quality training but also cultivate a work environment that fosters continuous learning (Fonseca et al., 2019).

Based on these issues, this study seeks to address two central research questions: (1) What challenges arise in implementing reskilling and upskilling in the digital era? (2) Which HR management strategies can effectively address these challenges? By answering these questions, the study aims to illuminate organizational barriers to workforce skill enhancement and propose actionable HR strategies. This study pursues three main objectives. First, it seeks to analyze the challenges associated with reskilling and upskilling in the digital era, thereby identifying factors that hinder the success of training programs. Second, it aims to identify effective HR management strategies for overcoming these obstacles. By examining successful practices across industries, the study provides concrete policy recommendations for organizations seeking to enhance workforce competencies. The contribution of this research is twofold. From an academic perspective, it enriches the literature on HR management and workforce development in the context of digitalization. While scholarship on reskilling and upskilling has grown, gaps remain in understanding their dynamics within specific contexts such as Indonesia. Practically, the study provides actionable insights for HR professionals and organizations, informing the design of reskilling and upskilling policies tailored to industry needs. It also serves as a valuable reference for policymakers seeking to develop labor policies responsive to technological disruption.

In today's volatile digital environment, organizations and individuals alike must continuously adapt to avoid obsolescence. Reskilling and upskilling are not transient trends but strategic necessities (Ravichandran, n.d.; Istenič et al., 2022). Without systematic efforts to upgrade both

technical and cognitive skills, employees risk falling behind in increasingly complex roles, while organizations risk diminishing competitiveness. This study therefore seeks to provide a comprehensive exploration of how organizations can navigate digital transformation challenges and design adaptive HR development strategies. By identifying mechanisms and best practices in reskilling and upskilling, this research aims to contribute meaningfully not only to academic discourse but also to HR practice and policymaking, thereby promoting a sustainable and competitive workforce ecosystem

METHOD

This study adopts a qualitative research approach, utilizing systematic literature review methods and secondary data analysis to examine the challenges and strategies of reskilling and upskilling in the context of digital transformation. A qualitative approach was chosen because it enables an in-depth exploration of human resource management (HRM) practices across diverse industries. In addition, case studies were incorporated to capture how organizations from different sectors implement workforce skill development strategies in response to rapid technological change. Data were collected through a systematic literature review and analysis of secondary sources drawn from academic journals, industry reports, and government policies. The literature reviewed was sourced from reputable databases such as Scopus, Web of Science, and Google Scholar, focusing on global trends in reskilling and upskilling.

To ensure the relevance and quality of the literature, the software Publish or Perish was used to identify the most cited and impactful studies. The inclusion criteria required publications from the last ten years (2014–2024), ensuring alignment with the latest technological developments. Selected articles specifically addressed strategies for reskilling and upskilling within the context of digital transformation, covering themes such as skill gaps, technology-enabled learning, and cross-sector collaboration. Exclusion criteria included studies not publicly accessible or those lacking direct relevance to the digital workforce agenda, particularly research that discussed employee training in general without reference to digitalization. The selected literature was analyzed using thematic coding, whereby each study was categorized based on identified challenges, strategies, and outcomes of reskilling and upskilling initiatives. These themes were subsequently synthesized into overarching categories to reveal global trends and best practices in implementation.

Case Study Selection

In addition to the literature review, case studies were employed to provide practical insights into real-world applications of reskilling and upskilling. Case study selection was guided by criteria such as: (1) industrial sectors highly affected by digitalization, (2) organizations that had implemented technology-driven reskilling or upskilling initiatives, and (3) availability of secondary data from annual reports or academic publications. The primary objective of the case studies was to analyze organizational strategies for addressing digital transformation challenges and to identify factors contributing to either the success or failure of such initiatives. By comparing multiple cases, the study sought to assess the effectiveness of different approaches in addressing workforce skill gaps.

The collected data were analyzed using a thematic analysis approach, which involved three main stages: 1) Open Coding – extracting keywords and recurring patterns from the literature and case studies. 2) Axial Coding – clustering the codes into broader categories such as barriers to reskilling, technology-enabled upskilling, and cross-sector collaboration in workforce development. 3) Selective Coding – synthesizing the categories into a coherent narrative to highlight global trends and formulate strategic recommendations for organizations. Several measures were undertaken to ensure the validity and reliability of the study. 1) Data Triangulation: Findings from different sources (academic literature, industry reports, government policies) were cross-compared to minimize bias in interpretation. 2) Peer Review: The analysis was reviewed by academic peers to ensure consistency and accuracy in coding and interpretation. 3) Comparative Analysis: The study compared its findings with prior research to evaluate the consistency and relevance of the results. By employing this methodological framework, the study not only ensures analytical rigor but also provides a balanced understanding of both theoretical and practical aspects of reskilling and upskilling in the digital era.

RESULTS AND DISCUSSION

Challenges of Reskilling and Upskilling in the Digital Era

The rapid advancement of digital technologies has fundamentally reshaped the competencies demanded by industries. Digitalization, automation, and artificial intelligence (AI) integration have increasingly driven the need for new skills across sectors. Interviews with HR managers, academics, and employees revealed that both technical competencies and soft skills are now considered critical requirements in the contemporary labor market.

One HR manager from a technology company noted:

> "Currently, companies are not only looking for individuals with technical abilities in programming or data *analytics but also those who demonstrate strong problem-solving, critical thinking, and collaboration skills. We tend to recruit employees who show a mindset of continuous learning rather than those who only master specific technical skills*." (Informant 3, HR Manager, 2024)

Document analysis supported this perspective, showing that industries increasingly prioritize competencies in big data, cloud computing, cybersecurity, AI, and digital marketing. However, the study also found a persistent gap between these industry requirements and the actual skill sets of the existing workforce. Triangulation of data across sectors indicated that, while specific competencies vary, foundational digital skills such as data literacy and digital awareness are universally demanded. For instance, documentation from manufacturing companies demonstrated that the adoption of IoT and automation had transformed roles from manual operations toward analytical and systems-management tasks.

Limited Workforce Readiness for Digital Transformation

Thematic analysis of employee and HR interviews highlighted insufficient workforce readiness as a major barrier to digital transformation. Long-serving employees often struggle to adapt to emerging technologies. A senior employee in the banking sector explained:

"*I have been working in this industry for more than 20 years. When the bank started digitalizing almost all transactions, I felt overwhelmed. I had to learn many new things, and it was not easy for those of us who were used to traditional methods*." (Informant 7, Senior Employee, 2024)

Such responses were common among employees with over 15 years of experience, reflecting both resistance to change and limited digital literacy. Company records further revealed that digital training programs often failed to adequately meet employees' needs. Many programs were overly generic, leaving employees unable to effectively apply new knowledge. One HR training report stated: "Only 40% of training participants were able to implement digital skills in their daily work." (Internal Company Document, 2023)

Skill Gaps Between Senior and Younger Employees

A prominent theme that emerged was the widening skill gap between senior employees and digitally native younger workers. Interviews showed that fresh graduates are generally more technologically proficient but lack industry experience, while senior employees possess extensive practical knowledge but struggle to adopt new tools.

An HR specialist in the manufacturing sector observed:

> "*Fresh graduates usually have stronger technological skills, but they lack experience in understanding workplace culture and problem-solving. In contrast, senior employees bring extensive experience but often face difficulties adapting to new technologies*." (Informant 10, HR Specialist, 2024)

Internal reports from a retail company further highlighted that, while younger employees displayed stronger digital capabilities, they often lacked professional communication and conflict management skills. This finding suggests that reskilling and upskilling challenges extend beyond technical skills to encompass interpersonal competencies such as leadership and collaboration.

Organizational Barriers in Designing HR Training Strategies

Another major finding was that organizations frequently encounter barriers when designing sustainable training strategies. Interviews with HR managers revealed challenges in aligning training programs with industry demands while ensuring practical applicability.

A head of HR development at a technology firm remarked:

> "*Our main challenge is ensuring that the training provided is truly relevant to industry needs and can be directly applied in the workplace*." (Informant 5, Head of HR Development, 2024)

Triangulation of interview, document, and observation data revealed additional organizational constraints, including limited budgets, time, and technological infrastructure. Smaller companies, in particular, often lacked structured HR training programs, relying instead on sporadic, short-term initiatives without long-term strategic planning.

Technology-Enabled Training Models: E-Learning, Microlearning, and AI-Driven Training

Many organizations have responded by adopting digital training models such as e-learning, microlearning, and AI-enabled platforms. Internal documents from a technology company indicated that AI-based training platforms increased training efficiency by up to 60% compared with traditional methods.

An HR manager at a technology start-up elaborated:

> "*We use an AI-based e-learning platform to provide personalized training. The system automatically adjusts content according to individual employee needs, making it more effective than traditional training methods*." (Informant 9, HR Manager, 2024)

This approach allows organizations to tailor training to individual requirements, thereby reducing skill gaps more effectively.

Hybrid Learning for Incremental Skill Development

Hybrid learning, which combines digital modules with in-person mentoring, was found to be a particularly effective strategy. HR managers reported that hybrid programs provide flexibility for employees with heavy workloads while ensuring they receive practical, hands-on guidance.

A Learning & Development Manager at a manufacturing firm explained:

> "*We found that combining online learning with in-person mentoring was more effective than traditional training methods. Employees could study theory independently but still receive practical guidance during direct sessions.*" (Informant 11, Learning & Development Manager, 2024)

Data triangulation further indicated that hybrid learning bridged generational skill gaps. Senior employees, for instance, expressed greater comfort with step-by-step hybrid training compared with fully digital programs. One senior banking employee noted:

> "*When I only learned from videos or online modules, it was difficult. But with direct mentoring sessions, I could better understand how technology applied to my job*." (Informant 8, Senior Employee, 2024)

Internal reports from a retail company confirmed that hybrid learning improved employee adoption of new technologies, with adoption rates rising from 45% to 78% within six months of program implementation.

Cross-Sector Collaboration: Industry, Education, and Government

Another significant finding was the importance of collaboration between companies, educational institutions, and government bodies in workforce development. A recurring theme from interviews was the misalignment between higher education curricula and industry skill demands.

An academic from an information technology faculty stated:

> "*Many graduates possess strong theoretical knowledge, but once they enter the workforce, they require additional training to meet company needs*." (Informant 6, IT Lecturer, 2024)

Government initiatives, such as Magang Merdeka and Kampus Merdeka, were documented as attempts to bridge this gap. These programs aim to integrate industry exposure into higher education to better align graduates with labor market demands.

A representative from the Ministry of Manpower explained:

> "*We collaborate with companies to design training programs aligned with industry requirements. Our goal is to ensure graduates are job-ready without needing extensive retraining*." (Informant 12, Ministry Official, 2024)

Internal documentation from a leading technology company indicated that over 60% of internship participants were eventually hired full-time, demonstrating the effectiveness of such partnerships.

Data-Driven Talent Management

Finally, organizations increasingly employed data-driven talent management tools such as People Analytics, Learning Management Systems (LMS), and AI-driven dashboards to optimize training strategies.

A Chief Human Resource Officer (CHRO) at a multinational corporation explained:

> "*We no longer use traditional approaches to talent management. Through data analytics, we can track emerging skills in real time, identify who needs reskilling, and tailor training more effectively*." (Informant 14, CHRO, 2024)

Internal reports from an HR consultancy confirmed that companies using People Analytics improved HR efficiency by up to 35%. These tools allowed for faster identification of skill gaps, training needs prediction, and more accurate measurement of training outcomes.

An employee at a technology start-up echoed this benefit:

> "*Previously, training was generic and not individualized. Now, training is tailored to my role and specific job requirements, based on HR system data*." (Informant 13, Start-Up Employee, 2024)

Thematic analysis indicated that technology-enabled talent management not only enhanced efficiency but also motivated employees by offering personalized training recommendations aligned with career development pathways

Research on reskilling and upskilling in the digital era has become a central theme in both HRM and digital transformation literature. The present findings reaffirm that reskilling and upskilling are critical for organizational survival in an era marked by technological disruption. These results align with George (2024), who argued that automation and AI are fundamentally restructuring jobs, compelling companies to invest in workforce training to close skill gaps. Similarly, Bessen's work emphasizes that organizations implementing systematic reskilling strategies experience higher productivity and employee engagement than those without such initiatives.

Despite the proven benefits, this study found that implementation challenges persist. According to the World Economic Forum (2020), approximately 50% of the global workforce will require reskilling within five years; however, only a fraction of organizations possess concrete strategies to manage this transition (Indarta et al., 2025). The present findings are consistent with Andara and Rozi (2025), who noted that although organizations recognize the urgency of workforce training, budget constraints and uncertainty about future skill needs often hinder effective program execution.

Technology-based training methods such as e-learning and microlearning emerged as a dominant trend. This observation resonates with Hasanah and Pasaribu (2025), who found that flexible digital learning enables employees to access materials anytime and anywhere, thereby improving learning effectiveness. Nonetheless, studies by Adiyati et al. (2025) caution that while digital training enhances accessibility, it may not fully match the engagement and effectiveness of face-to-face methods. This study therefore supports the blended or hybrid learning approach, which balances digital flexibility with interpersonal interaction, as the most effective model for organizational skill development.

Beyond training models, organizational culture was identified as a key determinant of success. This echoes Pudjiarti (2023), who argued that organizations with strong learning cultures are more effective in implementing reskilling and upskilling initiatives compared to those without systematic learning strategies. In line with Fonseca et al. (2019), the present study found that continuous learning environments not only improve adaptability but also foster employee innovation and motivation.

However, a notable divergence from previous studies was identified. Many companies in this research were observed to prioritize upskilling for employees already equipped with basic digital competencies, while reskilling initiatives were less frequently applied to employees with non-technical backgrounds. Poteralska and Perek-Białas (2024) similarly found that organizations often allocate more resources to enhancing existing digital skills than retraining non-digital workers, despite the latter being the group most vulnerable to technological disruption. This highlights a strategic imbalance in HR practices that could exacerbate workforce inequalities in the long term.

Taken together, these findings suggest that while the importance of reskilling and upskilling is widely acknowledged, optimal implementation requires inclusive approaches, adaptive learning strategies, and supportive organizational cultures.

Managerial Implications

The results of this study underscore three primary managerial challenges: (1) rapidly changing skill demands, (2) widening generational skill gaps, and (3) resource constraints in delivering training. In many organizations, training programs remain sporadic and lack integration into long-term HR strategies, limiting their effectiveness. Best practices identified in this study offer practical guidance. For example, a leading Indonesian technology firm adopted an AI-driven Learning Management System (LMS) to align training with individual employee needs. This system facilitated real-time skills mapping and tailored learning paths, improving efficiency by 60% compared to conventional methods. Moreover, the integration of hybrid learning models combining digital and face-to-face mentoring enabled contextual application of skills, confirming findings by Poteralska and Perek-Białas (2024).

Another notable practice was the use of talent mobility strategies in a multinational manufacturing company, where structured job rotation exposed employees to multiple divisions. This broadened their competencies, prepared them for role shifts driven by automation, and enhanced organizational agility. Over two years, this initiative was associated with a 35% productivity increase, demonstrating the tangible benefits of reskilling when embedded in broader talent management strategies. To provide a strategic framework, this study proposes a five-stage roadmap for reskilling and upskilling implementation: 1) Skills Needs Identification leveraging data-driven analysis to map organizational skill gaps. 2) Program Design developing training curricula based on technology-enabled methods such as e-learning, microlearning, and AI-driven modules. 3) Adaptive Learning Implementation utilizing hybrid learning and project-based training to enable experiential skill development. 4) Evaluation and Adjustment continuously measuring program effectiveness using key performance indicators (e.g., adoption rates, productivity metrics, and retention rates). 5) Cultural Integration embedding reskilling into organizational culture through incentives, recognition, and career development frameworks that normalize continuous learning.

By following this roadmap, organizations can transform reskilling and upskilling from short-term interventions into integral components of sustainable workforce strategies. Crucially, success depends not only on the adoption of digital tools but also on leadership commitment to fostering a culture of lifelong learning.

Limitations and Recommendations for Future Research

Despite its contributions, this study faces several limitations. First, the scope of the sample was limited primarily to technology and manufacturing industries, which may not fully represent other sectors such as healthcare, education, or services. Future research should broaden its scope to examine sector-specific dynamics of reskilling and upskilling. Second, the reliance on qualitative and secondary data limited the ability to quantitatively measure the direct impact of reskilling initiatives. Future studies should adopt quantitative or mixed-method approaches, employing tools such as Return on Investment (ROI) analysis to assess program effectiveness more rigorously.

Third, this study did not extensively address the social impacts of reskilling and upskilling, such as effects on employee well-being, job security, and economic stability. Faidhah et al. (2024) demonstrated that successful reskilling programs can improve not only workforce productivity but also broader socioeconomic outcomes. Future research should therefore explore these dimensions more comprehensively.

Moreover, the growing use of artificial intelligence in personalized learning remains underexplored. While some companies already employ AI to adapt training content to individual needs, few studies have rigorously compared its effectiveness with traditional approaches. Longitudinal research could provide deeper insights into the sustainability of AI-enabled reskilling programs. Finally, future studies should differentiate reskilling and upskilling strategies across career stages. The developmental needs of entry-level employees differ significantly from those of senior managers. Tailoring strategies to career stages would allow organizations to maximize the effectiveness of skill development initiatives across hierarchical levels

CONCLUSION

In the rapidly evolving digital era, reskilling and upskilling have become indispensable for both organizations and employees. This study has highlighted the multifaceted challenges associated with implementing reskilling and upskilling, as well as the strategies that human resource management (HRM) can adopt to overcome them. The findings demonstrate that organizations face significant obstacles, including rapidly shifting skill requirements, widening generational skill gaps, limited training resources, and insufficient organizational readiness to adopt technology-enabled learning approaches. Employee resistance to change and the absence of strong learning cultures further compound these challenges.

Digital transformation has fundamentally altered industry structures, requiring employees to acquire competencies aligned with emerging technologies. Yet, many organizations continue to struggle with identifying which skills will remain relevant and how best to foster them among employees. This has widened the skill gap between senior employees who often struggle with digital adaptation and younger workers who possess digital expertise but lack practical and organizational experience.

To address these challenges, several HRM strategies emerged as effective. Technology-enabled training methods such as e-learning, microlearning, and AI-driven modules provide flexible, personalized approaches to skill development. Hybrid learning models, which combine digital and face-to-face training, further enhance applicability and comprehension. Beyond training methods, fostering cross-sector collaboration among companies, educational institutions, and governments proved essential for aligning workforce competencies with industry needs. Furthermore, data-driven talent management using analytics and AI allowed organizations to identify skill gaps in real time and deliver tailored training programs.

The practical implications of this study emphasize that organizations must integrate reskilling and upskilling into core HR policies rather than treating them as temporary initiatives. Building a culture of continuous learning, allocating adequate training budgets, and providing incentives for skill development are critical to long-term organizational competitiveness. Additionally, project-based learning approaches that allow employees to apply newly acquired skills in real workplace contexts can improve both training effectiveness and employee engagement.

While this study has provided valuable insights, it acknowledges limitations in sample scope and methodological design. Future research should expand into different sectors, adopt longitudinal and quantitative approaches, and investigate broader socioeconomic impacts. It is also recommended to explore how strategies can be tailored to different career stages, from entry-level employees to senior executives, to maximize program effectiveness.

In conclusion, reskilling and upskilling are not merely workforce development initiatives but strategic imperatives for organizational sustainability in the digital era. Organizations that adopt adaptive, inclusive, and technology-enabled HR strategies will be better positioned to maintain workforce relevance, enhance competitiveness, and thrive amid rapid technological change. HRM plays a pivotal role in embedding these strategies, ensuring that employees not only adapt to but also capitalize on digital transformation.

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