Journal of Human Resource Management
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HR Advances and Developments
ISSN 2453 – 7683 www.jhrm.eu

The Future Competencies and Skills Development Cycle: A New Workforce Model in the Context of Digital Transformation and Artificial Intelligence

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ABSTRACT

Purpose- This paper addresses the urgent need to adapt employee development practices to the requirements of digital transformation and artificial intelligence (AI). While existing literature highlights the importance of future skills, it lacks a systematic, lifecycle-based approach for strategically designing employee development across all stages of the employee journey.

Aim(s)- The aim of this paper is to evaluate how employee development can be designed as an integrated, lifecycle-based process to build sustainable competencies in times of digital transformation and AI. The analysis examines how lifecycle-oriented approaches support the development of future-oriented competencies such as digital literacy, adaptability, and complex problem-solving through continuous and strategically embedded learning.

Design/methodology/approach- This study applies a structured theoretical review complemented by the bibliometric analysis workflow (seven-step science mapping approach) to ensure methodological rigour. The analysis synthesises literature from 2018–2025 on future skills, learning and development strategies, and AI in HR, prioritising Web of Science– and Scopus-indexed journal articles and systematic reviews, complemented by selected practitioner studies and reports for contextual relevance.

Findings- The paper identifies digital literacy, adaptability, complex problem-solving, and AI-enabled decision-making as key competencies. It introduces the Future Competencies & Skills Development Cycle, an original conceptual model developed by the author of this paper, which combines strategic learning frameworks, continuous reskilling, and competency-based development. By embedding development across the employee lifecycle, the model ensures an integrated approach.

Limitations of the study- As a primarily conceptual and literature-based study, the paper includes only preliminary qualitative insights and lacks empirical validation or pilot testing. Future research should test the effectiveness of the proposed model in diverse organisational contexts and examine ethical implications such as data protection, algorithmic bias, and transparency in AI-driven HR analytics.

Originality/value- This paper synthesises existing frameworks and extends them with the lifecycle-based Future Competencies & Skills Development Cycle. It offers strategic guidance for HR professionals, organisational leaders, and researchers on embedding future-oriented skills into employee lifecycles under digital transformation and AI, ensuring methodological transparency and providing a foundation for future empirical validation.

KEY WORDS

Future Competencies, Skills Development, Lifecycle Model, Human Resource Management, Digital Transformation, Artificial Intelligence, Reskilling

JEL Codes: J24, M12, M53, M54, O33

DOI: 10.46287/TWKU1629

1 INTRODUCTION

Digital transformation is not only the conversion from analogue to digitally supported work processes with the help of IT systems, which most companies have already largely completed, but represents a continuous optimisation of business models, processes, and innovations (Verhoef et al., 2021).

It represents an ongoing socio-technical change process that affects all organisational levels, from operational workflows to strategic decision-making, and requires both technological adaptation and cultural transformation (Mikołajczyk, 2022). For employees, this means they are increasingly confronted with the challenge of flexibly adapting to new situations in their day-to-day work.

Regional analyses emphasise coordinated, high-skilled talent development to meet rapidly changing industry demands and technological shifts (Sharef et al., 2024). Interdisciplinary synthesis indicates that AI is reshaping HRM and job design across functions, creating new competency demands alongside opportunities (Pan & Froese, 2023). In this context, labour market actors must adapt to new challenges and manage uncertainty effectively (Drewes & Hägerbäumer, 2025). The World Economic Forum's Future of Jobs reports (2020; 2025) predict that around half of all employees will require retraining by 2025, with AI, Big Data, and technology literacy among the fastest-growing skills globally, while creative thinking, resilience, flexibility, curiosity, and lifelong learning have further increased in importance.

However, the acquisition of future-oriented competencies and skills does not end there; the demand for qualifications continues to grow. Technology and technological change are closely linked to employee skills, as workers must continuously learn to use new tools and systems (Bünnagel, 2024). Vocational training and qualification are thus becoming key pillars of corporate development. Before employees can be empowered, it is necessary to determine which specific tasks they currently face in their work areas, as well as those they will face in the future (short, medium, and long term). A skills-matching perspective maps current and required skills to build dynamic capabilities and enable strategic agility (Jooss et al., 2024).

In times of constant restructuring corporate success depends not only on product innovations and adapted business models but also on the skills, competencies, and attitudes of the workforce (Ambrosat & Grünwald, 2023). In addition to technical expertise, digital competencies and future skills, which are particularly relevant for the future world of work, must be promoted. Future skills combine technical, cognitive, and socio-emotional abilities that enable individuals to navigate complex, rapidly evolving environments and remain adaptable across roles and industries (Drewes & Hägerbäumer, 2025).

Drewes and Hägerbäumer (2025) advocate the integration of AI-related future skills into company-specific competency models. This is understandable given the rapid pace of development: AI, as a disruptive technology, is constantly gaining importance and will have a lasting impact on employee activities across functions and business areas. Reviews also specify conditions under which AI-HRM interactions yield benefits or risks for employees and organisations (Basu et al., 2023). Consequently, organisations must maintain flexibility and readiness for change, while employees continuously adapt to dynamic tasks and learning environments.

The aim of this paper is to provide practical answers how employee development can be designed in times of digital transformation and AI to ensure the identification and sustainable development of future-oriented competencies and skills. By integrating theoretical frameworks with best practice examples, the paper seeks to bridge the gap between academic discussion and organisational application. The literature review highlights key development demands, the role of competency-based talent strategy, and practical implementation measures. Application examples from companies illustrate practical implementation.

The central outcome of this paper is the Future Competencies & Skills Development Cycle, an original conceptual model developed by the author of this paper, which provides an original, lifecycle-based framework for integrating future-oriented competencies and skills into workforce development under digital transformation and AI.

Based on the identified research gap, the following research questions guide the argumentation of this paper:

RQ1: How can integrated, lifecycle-oriented development models contribute to building sustainable competencies in the context of digital transformation and AI?

RQ2: Which competencies, particularly digital literacy, adaptability, and complex problem solving, require strategically embedded and continuous learning processes for their effective development?

RQ3: In what ways do proactive, strategy-driven reskilling initiatives enhance organisational agility and innovation capacity compared to reactive measures?

2 METHODOLOGY

This study applies a structured theoretical review methodology to analyse and complemented by the Bibliometric Analysis Workflow (seven steps) (Donthu et al., 2021) to ensure methodological rigour and structured science mapping. The review process followed three main stages: literature identification, selection, and synthesis.

To foreground consolidated evidence, we prioritised Web of Science–indexed systematic reviews that map antecedents–phenomenon–outcomes between AI and workplace results (Pereira et al., 2023). The bibliometric workflow was applied throughout the identification, selection, and synthesis stages to structure and visualise the literature base, following the seven steps of defining purpose, data collection, data cleaning, analysis, visualisation, interpretation, and discussion (Donthu et al., 2021).

Although the present study does not include an empirical validation, the proposed model was theoretically developed and is presented as a conceptual contribution. It has not yet been empirically tested or piloted in organisational settings. Nevertheless, it is grounded in consolidated empirical evidence drawn from systematic reviews, international frameworks, and corporate best-practice cases. This approach provides indirect validation through the convergence of findings across multiple, independent studies and applied contexts. Future research may build on this conceptual framework and examine its practical implementation and impact in diverse organisational contexts.

For the skills strand, we included a recent review that consolidates digital transformation skills into six overarching skillsets with actionable indicators (Bouwmans et al., 2024).

In the identification stage, relevant literature was gathered through systematic searches in academic databases such as Web of Science and Scopus (with Google Scholar used for forward/backward snowballing), as well as practitioner sources including consultancy reports and publications from international organisations. To strengthen transparency and reliability, systematic literature reviews (SLRs) were deliberately included, as they provide consolidated evidence across multiple studies. The search focused on the period 2018 to 2025 to ensure the inclusion of current perspectives, while seminal works published earlier were also considered. Search terms included combinations of future skills, competencies, talent management, digital transformation, artificial intelligence (AI), learning and development, and HR strategy.

The selection stage applied clear inclusion and exclusion criteria. Eligible publications included peer-reviewed journal articles, books, book chapters, and authoritative reports from recognised organisations, provided they addressed competencies and skills in connection with digital transformation, AI, or the future of work, and demonstrated relevance to strategic HR and employee development. Publications were excluded if they lacked direct relevance to workforce development, were opinion-based without empirical or conceptual grounding, or duplicated content already covered in more comprehensive works.

The final synthesis stage involved a thematic analysis of the selected literature to identify recurring concepts, theoretical frameworks, and empirical findings. The studies were categorised according to their main competency focus, methodological approach, and relevance to the development of the proposed Future Competencies & Skills Development Cycle.

Together with company case studies and international reports, these systematic reviews ensured that the analysis integrates both theoretical and applied perspectives and covers a broad spectrum of geographic and sectoral contexts.

The bibliometric workflow was applied throughout the identification, selection, and synthesis stages to structure and visualise the literature base. It served to map thematic clusters linking AI, digital transformation, and competency development, thereby guiding the conceptual model design and reinforcing the analytical foundation of the study. This methodological approach ensured that the model could be systematically derived from existing evidence while addressing identified research gaps.

Table 1 provides an overview of the key literature sources, including their topic, method, main findings, relevance to this study, and country of origin. The insights from this review serve as the conceptual foundation for the development of the Future Competencies & Skills Development Cycle, presented in this paper as the author's original contribution.

Table 1. Bibliometric Clusters Derived from the Reviewed Literature

Cluster / Theme	Representative Sources	Main Focus / Findings	Conceptual or Practical Contribution
1. Future Skills & Competency Models	Drewes & Hägerbäumer (2025); Brasse et al. (2024); Holtel (2024); Ambrosat & Grünwald (2023); Sharef et al. (2024)	Identify key future-oriented competencies, emphasising adaptability, interpersonal skills and AI-related capabilities; highlight need for integrated, dynamic frameworks.	Provides the conceptual foundation for the Identify Future-Oriented Development Needs phase of the model.
2. Digital Transformation & AI in HRM	Pan & Froese (2023); Basu et al. (2023); Pereira et al. (2023); Mikołajczyk (2022); Verhoef et al. (2021); Vrontis et al. (2022)	Examine AI-driven changes to HRM, outlining opportunities and risks for recruitment, learning, and performance; define capability dimensions in digital transformation.	Informs the Contextual Adjustment stage by linking technological and organisational change to competency development.
3. Competence Frameworks & Taxonomies	European Commission (2019, 2020, 2024); Vuorikari et al. (2022); Weinert (2001); Robles (2012); Rikala et al. (2024)	Provide structural, standardised classifications (ESCO, DigComp) and conceptual definitions distinguishing competencies from skills; propose metrics for skill-gap analysis.	Underpins the Align Talent Strategy phase by offering frameworks for mapping, measurement and classification.
4. Learning & Development Strategies	Devine (2021); Mok (2022); Jackson & Bridgstock (2021); Shet & Pereira (2021); Dries (2013); Sparrow et al. (2014); Bünnagel (2024)	Explore continuous learning, skills-based HR systems and competency-based career paths; emphasise strategic integration of learning into talent management.	Supports the Implement Development Measures stage and links learning design to organisational strategy.
5. Corporate Practice & Empirical Insights	Amazon (2021, 2022); IBM (2017); Finkelstein (2019)	Document large-scale corporate reskilling and skills-first initiatives; illustrate practical applications of AI-based and project-based learning.	Provide applied evidence validating the Implement and Renewal dimensions of the model.

Source: own processing based on bibliometric clustering following the Bibliometric Analysis Workflow (Donthu et al., 2021).

The insights from this review serve as the conceptual foundation for the development of the Future Competencies & Skills Development Cycle, an original conceptual model developed by the author of this paper.

The combination of structured search, transparent selection criteria, and systematic synthesis ensures the methodological robustness of this review. By incorporating diverse yet thematically aligned sources, including systematic literature reviews, practitioner insights, and corporate initiatives, the analysis establishes the basis for the Future Competencies & Skills Development Cycle, a comprehensive and practically relevant model for future-oriented workforce development in the context of digital transformation and AI.

3 RESEARCH FINDINGS AND LITERATURE REVIEW

The transformation of work through digitalisation and AI brings fundamental changes in the competencies and skills required to remain employable and competitive. The World Economic Forum (2025) lists technological skills such as AI, big data, and cybersecurity among the fastest-growing competencies globally. However, technical knowledge alone is not sufficient.

Holtel (2024) emphasises rising cognitive demands such as critical thinking and decision-making, which are also listed among key skills in recent labour market outlooks (World Economic Forum, 2025). Drewes and Hägerbäumer (2025) highlight the importance of interpersonal and self-management skills, including adaptability, communication, and social responsibility. These so-called future skills also include digital literacy, creativity, and problem-solving abilities.

Companies must therefore invest not only in technical reskilling but also in broader human capabilities that enable lifelong learning and readiness for change. Survey evidence suggests that embedded, co-/extra-curricular and paid work experiences are perceived as particularly effective for employability development (Jackson & Bridgstock, 2021). For managerial roles in Industry 4.0, research proposes a coherent set of competencies linked to social sustainability that can be embedded in competency models (Shet & Pereira, 2021).

This section organises the reviewed literature into conceptual, applied, and strategic perspectives to provide a structured understanding of key findings.

Despite broad agreement on their importance, organisations often struggle to operationalise such skills. Recent synthesis consolidates digital transformation skills into overarching skillsets with actionable indicators, supporting operationalisation in practice (Bouwmans et al., 2024).

A precise distinction between competencies and skills is lacking in many HR models. Weinert (2001) defines competencies as the combination of cognitive abilities, motivation, volition, and social readiness that enable individuals to solve problems responsibly in dynamic situations. In contrast, Robles (2012) describes skills as trainable abilities that can be developed through practice, training, and experience to perform specific tasks effectively.

This conceptual differentiation clarifies that skills represent concrete, learnable abilities, whereas competencies comprise broader, integrated capabilities that combine knowledge, skills, and attitudes to enable effective performance in changing environments.

In this paper, the terms competence and competency are used interchangeably, while a distinction is maintained between competencies and skills.

In line with the European competence tradition, a competence may encompass several interrelated competencies that collectively enable effective performance in complex work contexts (CEDEFOP, 2017). Such conceptual clarity forms the theoretical foundation for designing structured development strategies and understanding skill progression.

Complementing definitional clarity, validated instruments exist to assess digital-skill levels and their determinants among employed adults (van Laar et al., 2019).

Several international frameworks provide useful classification systems. One example is the ESCO taxonomy developed by the European Commission. According to the European Commission (2024), ESCO offers a standardised structure to assess and align skills, qualifications, and occupational profiles across the labour market. It enables organisations to map existing capabilities, identify skill gaps, and define role profiles aligned with strategic business needs.

In practice, the European Broadcasting Union has applied ESCO to clarify job requirements in media and technology roles (European Commission, 2019; European Commission, 2024). The House of Skills platform in the Netherlands uses ESCO to support personalised reskilling pathways and improve talent mobility (European Commission, 2020).

This aligns with research proposing competency sets linked to social sustainability in Industry 4.0 contexts (Shet & Pereira, 2021). Complementary research consolidates digital transformation skills into six overarching skillsets with actionable indicators that can be aligned with ESCO-based role profiles (Bouwmans et al., 2024).

In parallel, technology firms have developed scalable approaches to workforce development. Amazon (2021) launched the Upskilling 2025 programme with a multi-billion-dollar investment to reskill 300,000 employees in areas such as cloud computing and machine learning. Amazon (2022) also introduced the Machine Learning University to train its workforce in AI-related competencies. IBM (2017) promotes a skills-first approach through its new collar initiative, prioritising practical skills and on-the-job experience over academic credentials in IT roles. These examples demonstrate that future-oriented workforce transformation is already being applied in corporate settings.

From a strategic HR perspective, many organisations are shifting from role-based to skills-based talent development. Devine (2021) argues that competency-focused approaches help close skill gaps, enhance workforce agility, and support internal mobility. Strategic talent-management approaches typically encompass analysis, planning, implementation, and evaluation (Sparrow et al., 2014). Dries (2013) suggests that competency-based systems increase transparency and enable more flexible career paths.

Nevertheless, the current research landscape remains fragmented. Brasse et al. (2024) note that many models for identifying future skills are either based on limited expert opinion or derived from

unstructured data, making them difficult to apply in practice. Moreover, such models often fail to capture the organisational complexity and adaptability required to implement them effectively across departments, locations, and business units. These limitations highlight the need for a more integrated and lifecycle-oriented framework that connects future skills with strategic talent development. For measurement approaches and firm-level skill-gap diagnostics that complement these taxonomies (see Rikala et al., 2024).

The following table provides an overview of key categories of competencies and skills that are considered essential for future work environments.

Table 2. Categories of Competencies and Skills Relevant for Future Work Environments

Category	Description	Example skills	Future skills	Critical insights
Technical competencies	Ability to effectively apply knowledge and methods in specialised technical domains.	Data analysis, programming, AI model training	Yes, e.g. AI model fine-tuning, cloud-based analytics	Technical skills alone are insufficient; digital transformation also requires governance and strategy capabilities (Verhoef et al., 2021).
Cognitive competencies	Capacity for critical thinking, complex problem-solving, and adaptive reasoning in uncertain contexts.	Critical thinking, scenario planning, decision modelling	Yes, e.g. AI-assisted decision-making, systems thinking	AI reshapes task design in HRM, raising demands on judgement and problem-solving (Pan & Froese, 2023).
Social and interpersonal competencies	Ability to collaborate, communicate, and manage relationships in diverse, multidisciplinary teams.	Negotiation, cross-cultural communication, virtual teamwork	Yes, e.g. digital collaboration, intercultural competence in virtual settings	Frameworks identify collaboration and communication as core skill sets for digital transformation (Bouwmans et al., 2024).
Self-management competencies	Capacity to regulate own behaviour, learning, and performance in dynamic environments.	Time management, resilience building, self-directed learning	Yes, e.g. learning agility, adaptability in AI-driven workflows	Employability is strengthened by continuous, embedded learning alongside work-based experiences (Jackson & Bridgstock, 2021).
Transversal competencies	Broad abilities transferable across roles, sectors, and tasks.	Creativity, innovation facilitation, ethical judgement	Yes, e.g. responsible AI use, design thinking for digital innovation	Strategy-led reskilling and transversal competencies support organisational agility in AI-enabled workplaces (Pereira et al., 2023).

Source: Author's own processing based on WEF (2025); Vuorikari et al. (2022); Holtel (2024), and Drewes & Hägerbäumer (2025).

Table 3 builds on the bibliometric clusters identified in Table 1, translating them into operational competency categories and skill domains that inform the design of the Future Competencies & Skills Development Cycle.

In summary, the literature highlights that future-oriented employee development requires a strategic approach combining systematic skills assessment, integration of technical and transversal skills, adoption of competency-based planning, and the use of AI-enabled learning tools. At the same time, a critical evaluation reveals persistent weaknesses: competency frameworks remain overly static, corporate initiatives emphasise technical skills at the expense of socio-emotional ones, and reskilling strategies are too often reactive rather than proactive.

Overall, the reviewed studies emphasise the importance of linking conceptual understanding with practical implementation, providing the foundation for the Future Competencies & Skills Development Cycle presented in the following section.

4 THE FUTURE COMPETENCIES & SKILLS DEVELOPMENT CYCLE

The Future Competencies & Skills Development Cycle is an original conceptual model developed by the author of this paper (Gonçalves da Silva, C. A.) to provide an integrated and holistic approach for building competencies and skills that meet future workforce requirements. It represents the central contribution and outcome of this study, moving beyond a mere synthesis of existing literature to present a structured, actionable framework. The model was designed in response to gaps identified in both academic research and organisational practice, where competency foresight, talent strategy, learning interventions, and evaluation are often treated as separate initiatives, lacking integration and continuity.

The model synthesises insights from relevant academic literature, established talent management frameworks, and best practice examples from leading organisations, and transforms them into a new conceptual structure. Its added value lies in operationalising fragmented theoretical concepts into a coherent, cyclical model that can be directly applied in corporate practice. Each component is directly linked to the next, ensuring that insights and outcomes from one phase systematically feed into the following stages. Each component of the cycle can be operationalised through qualitative and quantitative indicators that link future-oriented competencies to specific HR processes and development interventions across the employee lifecycle.

This cyclical design enables organisations to address future-oriented development needs as an ongoing, adaptive process rather than as a series of disconnected actions, thereby creating a dynamic mechanism for continuous workforce renewal. The model also bridges a critical gap in organisational practice: while future-oriented competencies are frequently acknowledged at a strategic level, they are still rarely embedded in daily HR operations.

By explicitly connecting long-term foresight with operational talent measures, the cycle ensures that forward-looking competencies are not only identified but also actively developed, implemented, and sustained within everyday business routines. This shift makes it possible to move from reactive training initiatives toward anticipatory, strategically embedded workforce planning. As such, the model offers guidance not only for HR departments but also for executives and decision-makers seeking to align workforce development with broader organisational objectives.

Moreover, the cycle highlights that competencies and skills cannot be defined ad hoc or addressed only when an immediate need arises. Instead, they must be identified, prioritised, and embedded proactively through structured methods such as trend scanning, systematic skill gap analysis, and the use of established taxonomies like ESCO or DigComp. In this way, the model operationalises foresight and ensures that development measures remain anchored in a forward-looking perspective.

Figure 1 provides a visual representation of the four sequential and interlinked components of the Future Competencies & Skills Development Cycle. It illustrates the cyclical and iterative nature of the process, showing how identifying future skill needs, aligning talent strategy, implementing development measures, and enabling ongoing contextual adjustments continuously interact and reinforce one another. The closed-loop design underlines that no stage stands alone; progress in one area influences the others, creating a self-reinforcing system.

In sum, the Future Competencies & Skills Development Cycle is more than a descriptive framework; it is a normative model that offers organisations practical orientation and scholars a structured basis for further empirical testing. It provides a bridge between strategic foresight and operational HR measures, enabling organisations to develop sustainable competencies and skills for the age of digital transformation and AI.

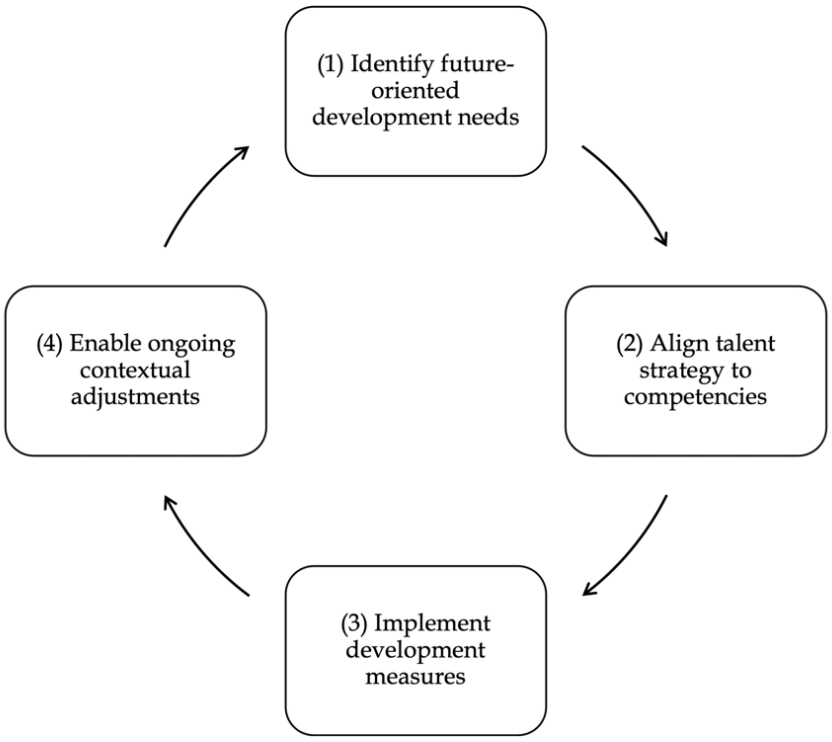

Fig 1. The Future Competencies & Skills Development Cycle

Source: Author's model and illustration (Gonçalves da Silva, C. A.), developed with reference to synthesised literature (e.g. WEF, 2025; European Commission, 2024; Vuorikari et al., 2022; Devine, 2021).

Each phase of the Future Competencies & Skills Development Cycle is conceptually operationalised through measurable indicators and corresponding interventions. The "Identify" phase employs diagnostic indicators such as skill-gap analyses and trend scans to determine future competency needs. The "Align" phase uses classification frameworks like ESCO or DigComp to translate these competencies into talent strategies. The "Implement" phase focuses on developmental indicators, including participation in AI-enabled learning, mentoring, or reskilling programmes. Finally, the "Adjust" phase integrates evaluative metrics such as feedback loops, HR analytics, and performance outcomes to ensure continuous improvement and contextual relevance.

In the following sections, each of the four components of the Future Competencies & Skills Development Cycle will be examined in detail. This step-by-step discussion will outline the purpose of each stage, its practical implementation, and the way it contributes to the overall cycle.

4.1 IDENTIFY FUTURE-ORIENTED DEVELOPMENT NEEDS

The first component focuses on recognising the technological, market, and strategic trends that shape future competency requirements. It involves systematic trend scanning of factors such as AI adoption, digitalisation, and changing customer expectations. Reports such as the World Economic Forum's Future of Jobs Report (2025) or the European Commission's DigComp framework (Vuorikari et al., 2022) provide valuable external orientation by highlighting competencies and skills that are likely to define future labour markets.

At the same time, a detailed skill gap analysis must be conducted to compare current organisational capabilities with anticipated requirements. Unlike trend scanning, which offers broad insights at the global or sectoral level, skill gap analysis delivers company-specific diagnostics. This distinction is crucial: while global studies may highlight the importance of digital literacy, adaptability, or socio-emotional skills, each organisation will face different challenges depending on its workforce structure, strategic priorities, and cultural context. A PRISMA-based review clarifies the skill-gap concept and catalogues measurement approaches suitable for firm-level diagnostics (Rikala et al., 2024).

In addition, internal workforce analytics and HR information systems should be used to quantify identified skill gaps through measurable indicators such as proficiency levels, training participation, or

role-specific competency coverage. This ensures that foresight activities are directly linked to actionable HR metrics and can be monitored over time.

By combining external foresight with internal assessment, organisations can avoid generic, one-size-fits-all measures and instead design targeted initiatives with high strategic relevance and long-term value.

Foresight and analysis therefore provide the foundation for all subsequent steps in the Future Competencies & Skills Development Cycle, ensuring that investments in workforce development are aligned with both external transformation dynamics and internal organisational needs. By clearly identifying which competencies and skills will be required in the short, medium, and long term, organisations create the basis for systematic workforce planning. This stage can thus be operationalised through quantitative and qualitative indicators, such as the share of roles mapped to future-skill taxonomies, or the number of identified emerging skill areas, to evaluate progress in early foresight implementation. Recognition alone, however, is insufficient; the insights gained must be systematically embedded in a coherent talent strategy to translate identified competencies into measurable objectives and actionable development plans. The next step is therefore to anchor identified competencies within a structured workforce strategy that directly links them to organisational objectives and translates them into measurable outcomes.

4.2 ALIGN TALENT STRATEGY TO COMPETENCIES

The second component of the Future Competencies & Skills Development Cycle ensures that talent strategies are grounded in well-defined and measurable competencies rather than static job descriptions. Instead of focusing solely on titles or predefined roles, this approach places competencies and skills at the centre of workforce planning. This shift is crucial, as traditional job-based structures often fail to capture the dynamic and cross-functional requirements of digital transformation and AI adoption.

A central tool in this process is the use of structured classification systems such as the European Skills, Competences, Qualifications and Occupations (ESCO) taxonomy. ESCO enables the systematic mapping of technical, core, and transversal skills in a standardised manner. Such frameworks allow HR departments to organise internal skill data, identify transferable capabilities, and create transparent career paths. They also link competency requirements with learning and development programmes, making workforce planning more strategic and forward-looking. A recent systematic review consolidates digital transformation skills into six overarching skillsets with 44 underlying skills, which can be aligned with roles and development pathways (Bouwmans et al., 2024). For managerial roles in Industry 4.0, research proposes a coherent set of competencies linked to social sustainability that can be embedded in competency models (Shet & Pereira, 2021).

To operationalise this alignment, organisations should establish measurable competency indicators within their HR systems, for example by mapping roles to ESCO-based profiles, tracking the percentage of employees whose current skills match future-skill targets, and identifying capability gaps per strategic function. This makes it possible to continuously assess alignment between business goals and workforce capabilities, transforming talent strategy into an adaptive, data-driven process.

Recent studies emphasise that skills-based workforce planning improves adaptability, enhances internal mobility, and reduces dependency on external recruitment. In this way, aligning talent strategy with competencies ensures that strategic priorities are effectively embedded in day-to-day HR practices. It also supports succession planning and internal redeployment by providing a transparent view of workforce strengths and development needs across lifecycle stages.

Figure 2 illustrates how the ESCO taxonomy can be leveraged to design a skills-based talent strategy. The visual shows the structured categorisation of technical, core, and transversal skills, making explicit the links between organisational roles and specific competency profiles. It underlines how moving from job-based to skills-based planning strengthens workforce agility and creates a direct connection between strategic foresight and operational HR measures.

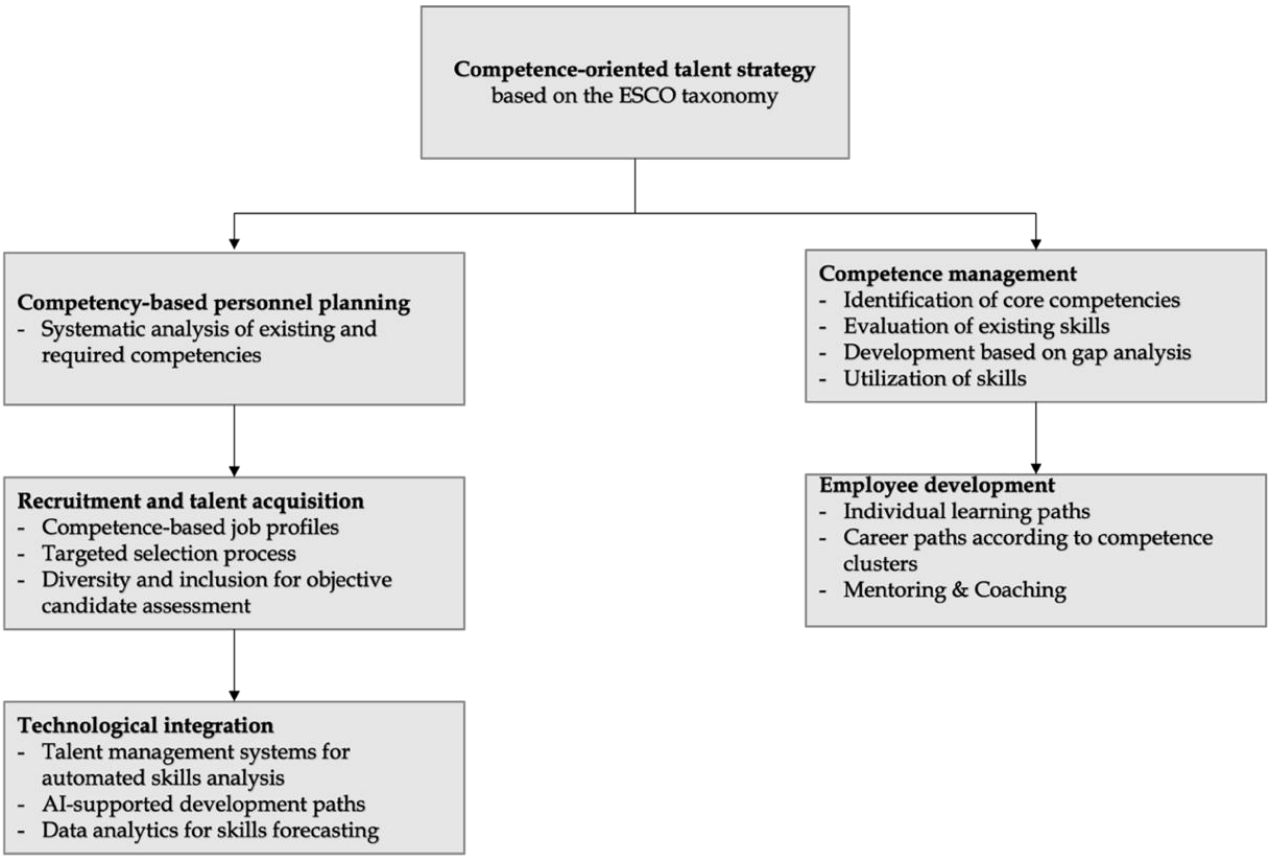

Fig 2. Competence-Oriented Talent Strategy Based on the ESCO Taxonomy

Source: Author's own illustration based on Sparrow et al. (2014); European Commission (2024); Jooss et al. (2024), and Devine (2021).

The next step translates these strategically aligned competencies into concrete learning and development measures that equip employees with the required future-oriented skills and ensure ongoing capability renewal.

4.3 IMPLEMENT DEVELOPMENT MEASURES

Once future-oriented competencies have been identified and aligned with talent strategy, they must be operationalised through targeted development measures. This stage translates strategic planning into concrete learning and development activities that enable employees to acquire, apply, and continuously expand the required competencies and skills. Reviews show that AI can profoundly reshape HR processes while surfacing practical challenges and opportunities for action (Pan & Froese, 2023).

Implementation can take various forms, ranging from digital learning platforms and AI-enabled assessments to mentoring programmes, internal mobility tools, and project-based assignments. Development should not be confined to individual training sessions but embedded across the entire employee lifecycle, ensuring that skills are systematically built and reinforced from recruitment to release. A configurational synthesis explains the conditions under which AI and HRM interactions yield beneficial or adverse outcomes, informing the design of learning and policy interventions (Basu et al., 2023).

To ensure effective implementation, development activities should be guided by measurable performance and learning indicators, such as completion rates, post-training skill assessments, behavioural change metrics, or participation in cross-functional projects. Tracking these indicators enables organisations to evaluate the impact of learning interventions on both individual performance and organisational capability building.

Examples from leading organisations illustrate the diversity of approaches: Amazon's Upskilling 2025 initiative reskills employees in cloud and AI technologies (Amazon, 2021); IBM's new collar jobs programme prioritises skills over formal credentials (IBM, 2017); and Unilever's FLEX platform promotes agile reskilling through project-based experiences (Finkelstein, 2019). A recent systematic review links AI adoption to workplace outcomes and offers an agenda for targeted interventions across HR functions (Pereira et al., 2023).

These initiatives demonstrate how targeted learning systems, digital platforms, and skills-first approaches can be combined to create scalable and adaptive development infrastructures that support continuous workforce renewal.

Figure 3 outlines how development activities can be systematically embedded across the employee lifecycle. It highlights that effective employee development is not a one-off event but an ongoing process that creates a consistent and reinforcing learning environment, strengthening adaptability, engagement, and long-term retention.

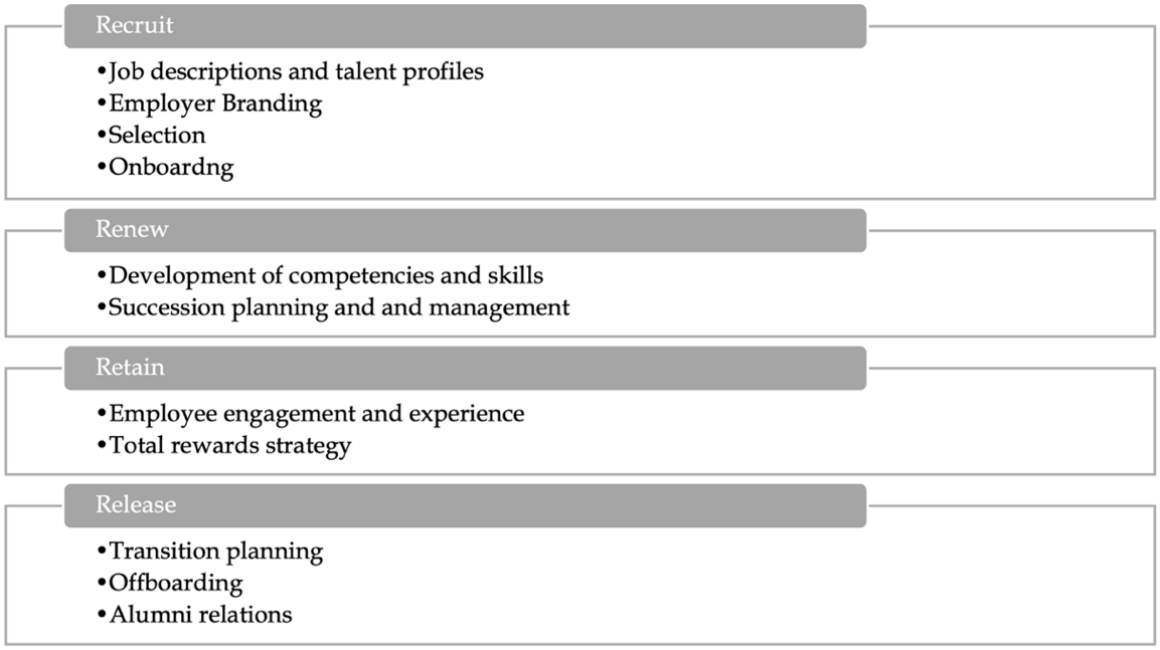

Fig 3. Development Activities Across the Employee Lifecycle

Source: Author's own illustration based on Mok (2022).

While implementation provides concrete opportunities for skill development, continuous monitoring and evaluation are essential to maintain relevance. Rapid technological progress, shifting market conditions, and evolving business priorities require that development activities are regularly reviewed and adjusted. The final component of the cycle therefore focuses on contextual adjustment to ensure sustained alignment with organisational and environmental change.

4.4 ENABLE ONGOING CONTEXTUAL ADJUSTMENTS

The final component of the Future Competencies & Skills Development Cycle ensures that development measures remain relevant and effective over time. Regular evaluation, feedback integration, and contextual adaptation are essential for addressing evolving organisational priorities, market shifts, and regional differences. This iterative process allows the model to remain agile and sustainable, ensuring that employee development efforts are continuously aligned with both current and anticipated needs. Because transformation proceeds through stages and affects structures and metrics, capability priorities and development portfolios should be revisited iteratively (Verhoef et al., 2021).

To operationalise this stage, organisations should establish feedback loops and measurable review indicators, such as periodic competency audits, post-programme evaluations, and employee learning analytics. This data enable evidence-based adjustments to development programmes and ensure that learning systems remain aligned with strategic objectives.

While most talent models stop at implementation, the Cycle emphasises ongoing adjustment as a defining feature. It thereby transforms employee development into a dynamic, learning-oriented system that integrates evaluation, reflection, and continuous redesign as inherent components of the process. Evidence on intelligent automation shows that HRM is framed as a new approach to managing employees, offering opportunities while raising technological and ethical challenges, reinforcing the need for continuous recalibration (Vrontis et al., 2022).

In this context, adaptability and reflexivity become measurable outcomes in themselves, assessed for instance through organisational learning indices, innovation readiness scores, or workforce resilience indicators. Continuous monitoring of these factors ensures that development strategies remain future-fit and responsive to systemic change.

Table 3. Life Cycle Approach to Digital Talent Management

Recruit	Renew	Retain	Release
In job descriptions, focus on work results and core competencies for success, not just technical skills or credentials.	Recognise and improve the skills of your existing workforce.	Measure employee engagement to identify opportunities for improvement.	Transition planning must consider the entire spectrum of job changes, including transfers/ promotions, mergers and acquisitions as well as redundancies.
Maintain and position your company's brand to attract the best talent.	Promote a culture of upskilling and reskilling.	Use an intuitive and empathetic leadership style to keep employees healthy, motivated and efficient in a virtual environment.	In the event of voluntary turnover, conduct an exit interview to talk openly about the reasons for leaving and receiving valuable feedback.
Utilise a technology-enabled hiring process that is unbiased to screen, evaluate and identify high-potential talent in a time-efficient manner.	Understand succession planning and management as a continuous process to avoid staff shortages and loss of knowledge.	A total rewards strategy (compensation, benefits, career management, performance recognition and work-life balance) is a more comprehensive way to realise the company's employer value proposition.	The offboarding process must be linked to succession planning in order to identify internal candidates for the position that will soon become vacant.
Expand the orientation process to ensure employees connect organically with the organisation's culture and to enhance their skills and competencies.		Create personalised and relevant employment offers that appeal to a wide range of employees.	For example, consider alumni groups on social media sites such as LinkedIn as a potential source of future employees and customers, brand ambassadors and an excellent source of information.

Source: Author's own processing based on Mok (2022).

In summary, the Future Competencies & Skills Development Cycle offers a structured, repeatable and adaptable framework for future-oriented employee development. By linking foresight, strategic alignment, targeted action and continuous improvement, the model enables organisations to foster resilience, adaptability and innovation capability in the face of rapid change. Through its cyclical and data-informed structure, it moves beyond static planning and embeds learning, evaluation, and renewal as permanent organisational capabilities. Unlike many existing approaches, it does not merely describe isolated interventions but consolidates them into a coherent cycle.

5 DISCUSSION AND CONTRIBUTION

The Future Competencies & Skills Development Cycle provides a strategic framework for aligning workforce development with the evolving demands of digital transformation and AI. By embedding future-oriented competencies into a continuous cycle, the model supports the development of an adaptable and resilient workforce capable of navigating technological, structural, and cultural change. It translates abstract future skill concepts into actionable HR processes and encourages a shift from reactive to proactive talent strategies. In doing so, it responds directly to gaps identified in the literature review, where existing models often treat foresight, talent strategy, learning interventions, and evaluation as isolated processes (Brasse et al., 2024). Building on consolidated evidence, recent reviews offer a structured

lens to link AI adoption to workplace outcomes across HR functions, which helps target interventions more effectively (Pereira et al., 2023).

From a practical perspective, the model strengthens the transition from role-based to skills-based development logic, as advocated by Devine (2021) and supported by large-scale corporate examples such as Amazon's Upskilling 2025 and IBM's new collar initiative. Skills-based workforce strategies enable organisations to respond more flexibly to shifting business priorities, enhance internal mobility, and improve employee engagement. Furthermore, by incorporating tools such as digital learning systems, talent marketplaces, and AI-supported skills assessments, the model becomes scalable across various company sizes and industries.

The Future Competencies & Skills Development Cycle operationalises this requirement by embedding classification, forecasting, and evaluation mechanisms directly into the strategy alignment and implementation process, thereby linking conceptual foresight to measurable organisational outcomes.

The contribution of this model lies in its integrative nature. It connects theoretical insights on future skills and competency taxonomies with practical HR measures, thereby offering both academic and managerial value. Conceptually, it builds on established literature but extends existing approaches by proposing a cyclical, lifecycle-based framework that ensures continuity and feedback across all stages of the employee journey. This cyclical integration represents a methodological advance over fragmented models by combining foresight, strategy, action, and review into a single evidence-based process.

Despite these strengths, the model has clear limitations. First, it remains conceptual and lacks empirical validation. As Brasse et al. (2024) note, many current approaches to identifying and applying future skills are either expert-driven or technology-led and not sufficiently grounded in real-world application. Future research should therefore test the model's effectiveness in diverse organisational contexts, sectors, and cultural environments. Quantitative studies could examine its impact on performance indicators such as workforce adaptability, innovation rate, or reskilling effectiveness, while qualitative research could explore adoption dynamics and change management processes. Second, implementing such a framework requires considerable investment in HR analytics, change management, and technological infrastructure. Smaller companies in particular may face resource constraints and require phased adoption strategies to realise their potential.

The model also assumes a degree of cultural readiness that may not be present in all organisations. Moving from rigid job descriptions to flexible competency-based systems requires a fundamental change in mindset, leadership behaviour, and internal processes. As Sparrow et al. (2014) note, integrating talent development into strategic planning necessitates shifts in HR structures and decision-making processes. Without strong executive sponsorship and alignment between corporate and HR strategies, the implementation of such a model risks becoming fragmented or symbolic.

Further challenges include the quality and availability of skills data, the need to integrate with existing HRIS platforms, and compliance with data protection regulations when implementing AI-supported assessment tools. Moreover, the fast pace of technological innovation, particularly in areas such as generative AI and predictive analytics, means that even well-designed competency frameworks require continuous updating to remain relevant. Complementary evidence provides definitions and measurement approaches for skill-gap diagnostics that can support such updates and inform planning (Rikala et al., 2024). Developing standardised data protocols and interoperable analytics interfaces could mitigate these limitations and facilitate cross-organisational benchmarking.

At the same time, the Future Competencies & Skills Development Cycle offers a valuable orientation tool for organisations seeking to proactively shape their workforce transformation. By connecting foresight with operational talent measures, it ensures that forward-looking competencies are not only identified but also actively embedded in daily business operations, a step that remains underdeveloped in many organisations today. The model thus serves as a bridge between macro-level trends in digital transformation and micro-level HR practices, enabling organisations to translate abstract competency frameworks into measurable behavioural and organisational change.

From a scholarly perspective, the model contributes to the growing field of strategic HR development by integrating fragmented insights into a coherent, iterative framework. It complements existing literature on skill taxonomies, talent strategies, and learning technologies, while also providing a basis for further empirical study. Future research could explore its applicability across industries, compare adoption

patterns in different cultural contexts, and assess its impact on organisational performance and employee outcomes over time.

Overall, this discussion reinforces the central thesis of the paper: organisations must fundamentally rethink how they approach employee development. In a world of accelerating change, linear development models are no longer sufficient. What is required is a dynamic, evidence-informed learning system that evolves continuously in response to technological, organisational, and societal change. The Future Competencies & Skills Development Cycle operationalises this principle by linking foresight, strategy, implementation, and evaluation within a continuous feedback loop, representing one step toward that goal.

The findings reaffirm the growing relevance of skills-based workforce models and continuous learning strategies.

5.1 LIMITATIONS AND ETHICAL CONSIDERATIONS

While the Future Competencies & Skills Development Cycle provides a theoretically grounded framework, several limitations must be acknowledged. The model remains conceptual and has not yet been empirically validated through case studies, surveys, or longitudinal testing. Its applicability and transferability therefore require further testing across different organisational contexts, sectors, and cultural environments. In addition, the study's reliance on secondary data and literature synthesis, while methodologically rigorous, may limit its ability to capture context-specific dynamics and organisational nuances.

From a practical perspective, the increasing use of AI in HR processes introduces challenges related to transparency, accountability, and governance. Pereira et al. (2023) show that the adoption of AI affects multiple stages of the employee lifecycle and has diverse implications for employees and organisational outcomes, highlighting the need for careful oversight. Vrontis et al. (2022) emphasise that intelligent automation requires responsible management and continuous adaptation to ensure that technology-driven processes support rather than replace human decision-making. The European Commission (2024) stresses the importance of transparent and standardised frameworks for aligning competencies and occupations, which enhance comparability and accountability in workforce planning.

To address these challenges, organisations should adopt transparent algorithmic auditing procedures, establish robust AI governance frameworks, and ensure strict compliance with data protection principles such as the GDPR.

6 CONCLUSION

In response to the disruptive effects of digital transformation and AI, this paper has argued for a fundamental shift in how organisations approach employee development. Incremental training measures are no longer sufficient in a context of rapidly changing job profiles, shortened innovation cycles, and evolving competency demands. Instead, organisations require strategic, future-oriented frameworks that promote continuous reskilling, workforce adaptability, and proactive talent planning.

The Future Competencies & Skills Development Cycle, developed by the author, offers such a framework. It combines four interlinked components: the analysis of development needs, competency-based talent strategy, implementation of learning measures, and continuous contextual adjustment, into a holistic, cyclical process. This interconnected design ensures that insights from one phase flow directly into the next, enabling a dynamic, self reinforcing system. By integrating long term foresight with operational HR measures, the model closes a common gap in practice where forward looking skills planning often remains detached from day to day business operations.

The evaluation of the three guiding research questions further supports the relevance of this approach.

First, RQ1 examined how integrated, lifecycle-oriented development models contribute to building sustainable competencies. The synthesis of literature and best practices indicates that such models are indeed more effective than fragmented initiatives. Second, RQ2 explored which competencies require strategically embedded and continuous learning processes. Across the reviewed studies, digital literacy, adaptability, and complex problem solving consistently emerge as key competencies that depend on long-term, structured development strategies. Third, RQ3 addressed how proactive, strategy-driven reskilling

initiatives influence organisational agility and innovation capacity. Evidence shows that organisations applying anticipatory, data-driven reskilling strategies achieve higher adaptability and innovation outcomes, whereas reactive measures remain insufficient to close skill gaps in the long term.

Together, these findings confirm that the proposed Future Competencies & Skills Development Cycle offers a theoretically grounded and practically relevant response to the challenges of digital transformation and AI. The discussion has shown that this approach strengthens the transition from role-based to skills-based talent strategies, improves internal mobility, and supports scalability through the use of digital learning systems, AI enabled skills assessments, and talent marketplaces. At the same time, it acknowledges the organisational and cultural prerequisites for success, such as leadership commitment, HR analytics capability, and openness to change. In this respect, the model not only provides structural guidance but also highlights the behavioural and cultural dimensions necessary for sustainable implementation.

The synthesis of conceptual and applied insights underscores that sustainable workforce development requires an integrated, evidence-based approach linking foresight, competency architecture, and continuous learning. The Future Competencies & Skills Development Cycle operationalises this logic by connecting theoretical foundations with measurable outcomes. Although conceptually robust, the model still requires empirical testing to assess its validity across organisational types, sectors, and cultural environments. Future studies should evaluate its measurable effects on innovation rate, employee engagement, and learning effectiveness. In addition, further research could employ longitudinal and cross-sector analyses to validate its long-term applicability and examine ethical dimensions related to AI-driven HR analytics, fairness, and data protection.

From a scholarly perspective, the model contributes to the growing field of strategic HR development by consolidating fragmented insights on competencies, talent strategies, and learning technologies into a coherent whole. It provides a novel theoretical proposition in the form of the Future Competencies & Skills Development Cycle. From a practical standpoint, it serves as a blueprint for organisations aiming to embed future-oriented competencies into their corporate DNA, making employee development a strategic driver of innovation, performance, and resilience. This dual relevance ensures that the model can function as both a conceptual lens for academic analysis and a decision-support tool for practitioners.

To remain competitive, organisations must shift from reactive skill acquisition to anticipatory, data driven, and continuously adaptive development systems. This transformation requires the integration of HR analytics, learning technologies, and evidence-based decision-making to ensure agility and accountability in workforce planning. Recent reviews provide a structured lens linking AI adoption to workplace outcomes across HR functions, which supports the targeting of strategic HR interventions (Pereira et al., 2023). Ultimately, the development of future-oriented competencies is not merely an HR task; it is a strategic imperative for every organisation seeking to remain relevant and successful in the age of AI and constant transformation. By embedding this model into organisational strategy, companies can evolve from reactive training toward continuous capability renewal, aligning human potential with technological progress to achieve lasting competitiveness and organisational resilience.

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