

Comprehensive Talent Development Framework for a Future-Ready Workforce in the Age of AI: Upskilling and Reskilling as Strategy

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Abstract

The rapid evolution of emerging technologies, particularly artificial intelligence (AI), poses significant challenges for modern workforce development programs. AI is reshaping job roles and skill requirements, especially for information technology (IT) professionals who must continuously update their skills. To address these challenges, companies need strategies for sustainable career development, including upskilling and reskilling. This research examines AI's impact on workforce development and proposes a sustainable, future-ready talent development framework. The study involves a comprehensive literature review and a qualitative case study analysis of IT professionals in a governmental organization. The research aims to provide leaders and policymakers with practical approaches for digital workforce development. By exploring the perspectives of human resources and talent development professionals, technical managers, leadership, and employees, along with findings of other research, the study proposes a future-ready workforce development strategy for organizations to implement. Unlike previous studies that focus on the economic or ethical impacts of technological change, this research considers the multifaceted factors relevant to AI's impact and proposes a Comprehensive Talent Development Framework that enables organizations to tackle the challenges of emerging technologies. Including a case study from a government organization's information technology department enhances the proposed framework's relevance and applicability to other organizations.

Keywords

AI, Emerging Technologies, Talent Development Framework, Upskilling, Reskilling, Future-Ready Workforce, Age of AI

1. Introduction

“Disruptive technologies” are innovations that significantly transform established products, services, markets, work practices, or social systems, often making existing technologies, skills, business models, or regulations less effective or obsolete (Hopster & Mass, 2024). The challenge for modern workforce development programs is the pace and frequency at which new technologies evolve and disrupt existing work processes. Recent studies on technological disruption have introduced the concept of a “future-ready workforce”—an approach that provides everyone with opportunities to develop the skills needed to participate fully in the evolving workplace. Companies need to develop a sustainable career development strategy to keep pace with the rapid evolution of disruptive technologies and market demands (Gouda, 2022). This qualitative study aims to analyze the City of Seattle IT department’s current talent development efforts as a case study and propose a future-ready workforce development framework that effectively addresses the impact of emerging technologies. The World Economic Forum’s 2023 *Future of Jobs Report* forecasts that six out of ten existing jobs will be replaced by 2027, and that 44% of the workforce will need to be upgraded (World Economic Forum (WEF), 2023). Moreover, research indicates that 75 million traditional jobs will disappear while 133 million new jobs will be created over the next five years (Gouda, 2022). Moreover, a recent global survey of companies showed that 43% plan to downsize their workforce due to technological assimilation, while 84% plan to automate their existing operations (OECD, 2023).

A thorough understanding of the current workforce climate requires assessing how the workforce has evolved through educational systems. Education should aim to equip individuals with the skills, norms, and values that contribute to society and meet the needs of the current workforce (Cutia-Pluff, 2023). Therefore, higher education institutions must align their curricula with the demands of modern businesses (Ohei et al., 2019). However, many studies show that today’s higher education systems, in both developed and developing countries, lag in producing a workforce that meets the demands of modern industries in general and of technology companies in particular (Blažič, 2022). Developed nations have attempted to address the issue through market forces and by adjusting immigration policies to attract the best minds worldwide (Vézina & Bélanger, 2020). In most developing countries, coping with the dynamic workforce demand is more challenging (Ohei et al., 2019). Even in countries like China, where educational institutions are highly focused on government priorities, recent studies show that industry-centered education cannot keep pace with technological dynamics, which have driven high demand for workforce reskilling and upskilling.

To address the skills gap, higher educational institutions implement active learning methods such as project-based learning, challenge-based learning, flipped classrooms, learning services, internships, innovative pedagogy, and rubrics (Romero et al., 2020; Omeh & Olelewe, 2021). Despite these efforts, unemployment among Information and Communication Technology (ICT) graduates in developed and

developing nations continues to rise, primarily due to a lack of industry-oriented skills (Ohei et al., 2019). Therefore, technology companies rely on internal workforce development programs to address skill gaps. Addressing the skill gap through workforce development programs is vital, as companies must adapt to the fast-changing technological demands of modern businesses by enabling their workforce to solve real-world problems (Wright, 2021). As recent advances in AI and other emerging technologies add another layer of complexity to existing talent development challenges, companies must devise a workforce development strategy that addresses the rapidly evolving skill gaps of the digital age.

Companies can accomplish workforce development in two ways. The first is enhancing existing skills to adapt to changes in current job functions and responsibilities, known as upskilling. On the other hand, some job functions may become obsolete due to technological or economic changes, and the existing workforce may need to acquire new skills that may not necessarily relate to existing competencies, a process called reskilling. Upskilling and reskilling become increasingly crucial as disruptive technologies such as artificial intelligence, digitization, and automation challenge traditional job positions and create new opportunities (Hajdú & Lukacs, 2020; Adelowotan, 2021). According to Eliseeva et al. (2019) and Martínez Bravo et al. (2021), workforce upskilling and reskilling efforts should not only focus on technical capabilities but also on soft skills such as adaptability, communication, emotional intelligence, independence, ingenuity, and organization. Technology companies' workforce development is highly susceptible to disruptive emerging technologies. Investing in a well-researched upskilling and reskilling program is becoming necessary to thrive and become competitive in the global economy. This study proposes a future-ready workforce development strategy for the City of Seattle's information technology department, with broader applicability to other technology companies and IT departments of organizations, to effectively navigate the disruptive impact of emerging technologies. For this qualitative study, the researcher has conducted an extensive literature review and interviewed key personnel from the leadership, talent development team, and technical professionals of the case study organization, the City of Seattle.

This study will contribute to improving workforce upskilling and reskilling in tech and other industries. Technology dynamics also challenge higher education institutions, and this study will benefit them by providing an appropriate approach to training technology professionals in the future, not only by relying on current workforce demand but also by considering the effects of disruptive technologies. The researcher also hopes that the study will be unique, given the rapid pace of technological change, and will primarily focus on the latest and emerging disruptive technologies. This study will provide leaders and policymakers with the best approach for investing the company's resources in digital workforce development. Not only tech companies but also other industries will benefit from the research, as current technological advancements, such as AI, will broadly impact them. The case study organization will also benefit from a well-researched work-

force development framework that enables it to become competitive and resilient in the age of disruptive technology. Moreover, studies have shown that employees of companies that consider the impact of disruptive technologies on their workforce's upskilling and reskilling efforts will benefit by seizing new opportunities quickly and gaining increased employability (Iulia & Balaci, 2023).

2. Literature Review

For this study, the literature review was intentionally limited to peer-reviewed journal articles published within the past six years to ensure the most recent developments are considered. Priority was given to empirical and conceptual research examining technological disruption, particularly the accelerating development and adoption of artificial intelligence. The review focused specifically on how these technologies are reshaping technology-related occupations and organizational workforce-development strategies. The review also considered research on AI's effects in other industries when it provided relevant evidence, comparative insights, or broader context for understanding workforce transformation. This focused approach ensured that the selected literature remained current, credible, and closely aligned with the study's purpose while recognizing the cross-industry nature of AI-driven disruption.

According to the [World Economic Forum \(WEF\) \(2023\)](#), 34% of all business-related tasks are performed by machines, while humans perform the remaining 66%. The same report estimated that the expected maturity of technologies such as GAI (Generative Artificial Intelligence) and large language models will result in 50% of business tasks being automated between 2023 and 2027. Moreover, by 2027, the fastest-growing roles—such as the 83 million jobs in technology—will be lost, while 69 million new jobs will be created ([World Economic Forum \(WEF\), 2023](#)), resulting in a net loss of over 10 million jobs. Coping with these changes requires a review of existing workforce skill development. Research shows that most talent development efforts are immature, with only 2% reporting that they have completed their programs. In comparison, 40% of organizations report they are still in their initial stages, with 54% developing and activating their programs, and 4% have not started any talent development programs ([Raman & Rosenblum, 2023](#)).

As disruptive technologies such as AI shape the future of business, organizations need to be strategic and keep their workforce skill sets aligned with these changes. Such approaches will also increase resilience during challenging economic times, where skill changes may become more critical. A recent study noted job skill sets have changed by about 25% since 2015 and are forecasted to double by 2027 ([Raman & Rosenblum, 2023](#)). Therefore, talent development managers and educational institutions should be aware of how demand for core skills dynamically changes and develop strategies to respond promptly to these changes ([Gouda, 2022](#)).

As traditional literacy and numeracy were important in the previous industrial ages, digital literacy will be an essential requirement for the workforce in the Industrial Revolution 4.0 ([Gouda, 2022](#)). Studies also showed that contrary to most

thoughts, soft skills such as critical thinking, problem-solving, creativity, originality, technology usage, technology and software design, endurance, stress forbearance, adaptability, rationality, troubleshooting and user experience, responsiveness, systems analysis and evaluation, diplomacy, bargaining, and emotional intelligence will become more suitable in the 21st century than technical skills since those skills are less susceptible and unlikely to be replaced by machines or automation (Martínez Bravo et al., 2021; Weaver, 2019; Gouda, 2022). The latest World Economic Forum (WEF) (2023) report showed that investing in upskilling and reskilling the workforce with 21st-century skills will yield a return on investment within a year and enable companies to become more efficient, competitive, and innovative, with higher employee retention. For instance, one study showed that employees prefer to work for organizations that promote workforce development, including reskilling and upskilling, and employees from such organizations will become more loyal and more satisfied, with reduced employee turnover (Iulia & Balaci, 2023).

One of the challenges in upskilling and reskilling the workforce is identifying in-demand skills and predicting how long those demands will persist (Ralushai, 2020). Another challenge is leadership's willingness to invest in upskilling and reskilling the workforce, as the initial investment may be high (Taylor, 2023). From the employee perspective, adopting continuous and lifelong learning of new digital skills and platforms (Martínez Bravo et al., 2021) will be challenged by resistance to learning new skills and due to fear of the changing environment (Ralushai, 2020). Modern workforce development in the era of disruptive technology should also consider ethical factors such as algorithmic bias, privacy concerns, the concentration of job opportunities in specific geographic locations, exclusion of disadvantaged groups, mass unemployment, and a decline in the need for offshore jobs (Taylor, 2023; World Economic Forum (WEF), 2023). For instance, studies showed the underrepresentation of women and certain ethnic groups in technology roles (World Economic Forum (WEF), 2023). Therefore, many companies should actively invest in initiatives to address these gaps and create a more diverse talent workforce.

Talent development managers dealing with the upskilling and reskilling of their existing workforce are also required to change current processes and invest in innovative approaches (Raman & Rosenblum, 2023). Some of the alignments needed include proper understanding, articulation, and alignment of the skill sets required for a specific job role and adequate communication of the skill development plans to all employees (Raman & Rosenblum, 2023). As technology companies are pioneers of technological advancements and usually early adopters of change, their workforce development strategy should be pragmatic (Stone & Harkiolakis, 2022). Various research showed that some major technology companies may implement to thrive in the dynamic job market, include creating diverse learning opportunities, collaborating with educational institutions, promoting innovation, developing talent retention policies, focusing on upskilling and re-

skilling than hiring new skills, promoting continuous learning culture, developing hybrid roles by blending different skills of employees, focus in new skills (Weaver, 2019), and readiness to invest in new technology adoptions (Viltz-Emerson, 2021).

Upskilling and reskilling the workforce have become urgent priorities for technology companies for obvious reasons. The adoption of modern technologies is occurring at an unprecedented rate, and most employees' current skills can quickly become obsolete. Moreover, the World Economic Forum (WEF) (2023) report showed a widening skills gap, especially in sectors like technology and healthcare, where new technology-related skills are in high demand. Therefore, technology companies should also be more concerned about the economic consequences of not having a workforce relevant to the 21st century and act accordingly. Since automation and disruptive technologies have made tech job positions irrelevant more frequently than in other sectors, while creating new ones that require more complex and sophisticated skills, technology companies should be more aware of the need to continuously upskill their employees' talents (World Economic Forum (WEF), 2023). The increase in demand for technology-related skills, such as technology adoption and automation, has been consistent across WEF's 2016, 2018, and 2023 *Future of Jobs* reports (World Economic Forum (WEF), 2023). According to the latest report, emerging roles include data analysts/scientists, AI (Artificial Intelligence) and machine learning specialists, and digital transformation specialists (World Economic Forum (WEF), 2023: p. 29).

As discussed above, existing research addressed the significance of upskilling and reskilling the current workforce with skills essential for the future readiness of various businesses. However, there is a gap in understanding how disruptive technologies influence these upskilling and reskilling initiatives, specifically for technology professionals in technology companies and other organizations. Therefore, this study aims to fill this gap by offering valuable insights to help organizations effectively address the impact of emerging technologies on skill development. Although the research primarily focuses on IT organizations, the principles and strategies outlined in the framework will have broader applicability, making them relevant to other industries and sectors. This approach ensures that the findings are not only specific to the IT field but also contribute valuable insights to the broader discourse on workforce development amid technological change. By bridging the gap between concept and practice, this study aims to offer a unique and comprehensive solution to the evolving demands of the modern workforce.

3. Methodology

This qualitative study is based on a single-case study of the City of Seattle. The research explores scholarly findings on the subject matter and conducts a contextual analysis to understand the current state of skill development, and based on the findings, proposes a framework for upskilling and reskilling the workforce (Takahashi & Araujo, 2020). The research aims to explore the impact of disruptive technologies on the upskilling and reskilling of technology companies' current

workforce. The qualitative research approach allowed the use of various flexible data collection and analysis methods (Creswell & Creswell, 2018) to gain insight into workforce development within the case study organization. Several publications on the subject matter are explored to establish a conceptual talent development framework. The findings from the case study organization serve as the basis for proposing a practical talent development framework.

There are practical reasons for using a single case study for this study. First, the case study enabled the researcher to thoroughly analyze the organization's existing employee-skilling programs. The researcher sought to fully understand the existing employee development strategy and processes, primarily through written strategic and implementation documents and interviews with key individuals responsible for skill development. Second, a case study based on the practical implementation of skill development in a company, an established conceptual framework, and expert interviews can serve as a triangulation method, enhancing the research's credibility (Weerasekara & Gooneratne, 2023). Third, since the practicality and acceptance of research outcomes depend on effective communication with stakeholders (Bogenschneider, 2020), drawing on case study evidence from an actual company implementation makes the research more acceptable to similar organizations. Although a single-company case study may not generalize to the complex situation of skill development, it can enhance the reliability of the findings.

3.1. Research Questions

In the rapidly evolving global economy driven by technological advancement, companies are in a “*race against the machine*” as disruptive technologies make current skills obsolete (Fanning, 2019). Technology companies are particularly prone to the impact of disruptive technologies, as their workforce needs to develop and enhance the technical and soft skills required to operate as these technologies evolve (Gouda, 2022). Workforce development and hiring that focus on skills rather than credentials have become the most efficient and profitable talent development strategy (Raman & Rosenblum, 2023; Desmarchelier & Cary, 2022).

The research aims to explore the impact of disruptive technologies on the upskilling and reskilling of technology companies' workforce. The specific problem this research addresses is how disruptive technologies, particularly artificial intelligence (AI), have impacted the talent development, focusing on technology professionals' upskilling and reskilling.

The research questions and sub-questions planned to be addressed in this research are listed as follows:

Research Question 1: What skills do technology companies need to focus on in their upskilling and reskilling efforts?

- 1) Which digital skills will be in high demand for technology companies soon?
- 2) Which of the current digital skills of the technology workforce will be highly impacted by disruptive technologies, AI in particular?

Research Question 2: What upskilling and reskilling strategies do technology companies need to implement to have future-ready professionals?

- 1) What strategies have been used successfully so far?
- 2) What challenges may companies face in their professionals' upskilling and reskilling efforts?
- 3) How companies may design sustainable skill development plans considering disruptive technologies' impact, particularly AI?

The study involved data collection and a thorough analysis of the existing employee skilling programs available in the organization, mostly in the form of reports. Although the documentation found in the organization helps explain the various skill development efforts, except for one preliminary study by college students in 2020, none of the documents were used as a reference for this research. Therefore, the main source of information was the interviews conducted. The researcher interviewed key individuals responsible for skill development, including the leadership group and a few employees, to better understand the objectives and effectiveness of current and future workforce development plans. The researcher and the case study organization's talent development division agreed on the selection of the study's participants. Interviews followed standard research approaches and were approved through the University Research Review and Institutional Review Board processes.

3.2. Research Framework

In the contemporary global setting, technological innovations exert an extraordinary influence on jobs, societal structures, and business operations. Modern businesses prioritize efficiency and are ready to embrace change, provided that return on investment and sustainability are guaranteed (Li et al., 2023). From a societal and economic policy-making perspective, disruptive technologies present a complex matrix of challenges and opportunities, since job markets are not determined solely by supply and demand. For instance, in developing and emerging economies, where disparities in educational opportunities and digital fluency are enormous, disruptive technologies tend to exclude most low-income people, women, low-skilled workers, and marginalized communities (Hammer & Karmakar, 2021; Li et al., 2023). Psychological theories emphasize the role of work characteristics, such as autonomy and meaningfulness, in shaping job outcomes amid technological change (Bankins & Formosa, 2023; Moga, 2022). Therefore, talent development managers and policymakers should consider the impact of disruptive technologies from perspectives beyond job efficiency and economic development.

Existing conceptual frameworks of talent development usually focus on talent attraction, development, and retention strategies without considering the effects of disruptive technologies (Rettie & McLarney, 2024), as shown in **Figure 1** below. This study proposes a unique talent development framework that accounts for the impact of emerging technologies.

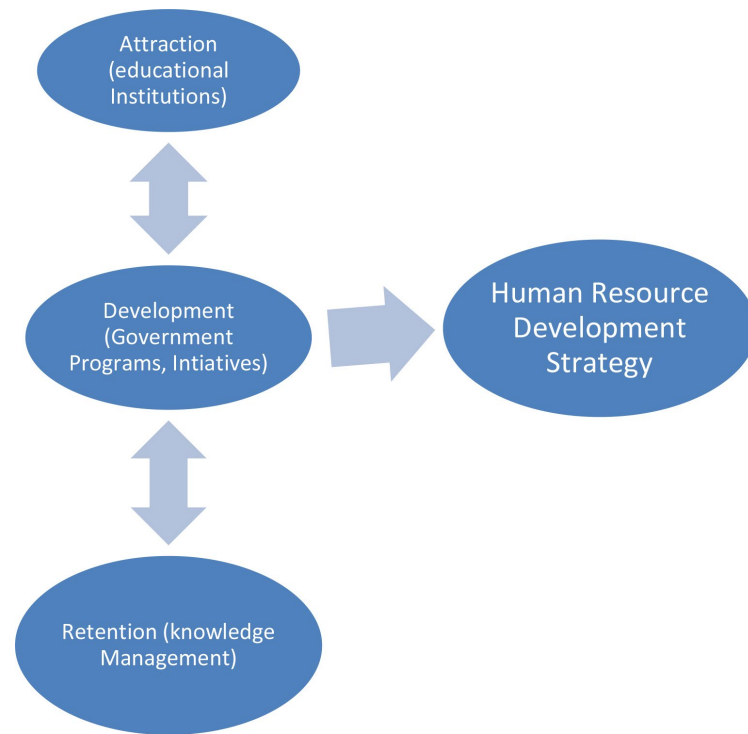


Figure 1. Talent development strategy framework (adapted from Rettie & McLarney, 2024).

3.3. Data Collection and Analysis

Qualitative research involves defining the study's scope by identifying cause-and-effect relationships among various factors. This process includes deliberately recruiting participants, conducting unstructured and structured interviews with key stakeholders, and examining relevant documents (Creswell & Creswell, 2018). Since the study aims to identify the factors that impact the workforce development of information technology professionals as related to disruptive technologies, conducting domain-specific studies requires a thorough understanding of disruptive technologies and their opportunities and challenges for government and non-government organizations (Creswell & Creswell, 2018). Consequently, data for this qualitative analysis was gathered from purposefully selected professionals who comprehensively understand technological changes and have extensive workforce development experience. Therefore, this qualitative case study will be conducted more effectively when the views of professionals and people in leadership positions are appropriately engaged. Therefore, the study focuses on individuals from the leadership, talent development, human resources, and technical teams. Hence, one individual among the seven people in a leadership role, two among the three in the talent development division, one from human resources among the five people in HR leadership, and two technical managers among about ten technical managers were included in the study. During the interview process, the researcher determined that the sample size was sufficient because data saturation was reached after the fifth participant, with subsequent interviews yielding no substantially

new themes or insights. This finding is consistent with comparable qualitative studies that achieved sufficient depth with a similarly small sample (Cooper, 2019). Therefore, the six participants included in the present study provided adequate data to address the research questions and support the thematic analysis. The two fundamental questions to be answered in this study are: What are the current highly demanded skills of IT professionals, and what are the sustainable strategies to develop a future-ready workforce? Specifically, it is essential to have domain knowledge in information technology and awareness of the case study organization's specific context to answer these questions effectively. Therefore, recruiting individuals with information technology knowledge and leadership positions is appropriate.

This study's primary data collection method involved in-depth, semi-structured, and structured interview questions with selected personnel capable of providing detailed insights and perspectives on workforce development related to disruptive technologies. The researcher designed interviews with open-ended questions to enable comprehensive analysis and capture diverse viewpoints on the topics discussed (Yadav, 2022). During the interviews, the researcher facilitated the discussion and asked follow-up questions as needed. All interviews were conducted formally via Zoom, and all meeting sessions were recorded and transcribed. The interviewees transparently communicated about the interview protocols, including the need for recording and transcription, and how their input would be utilized in the study. The other source of information for the case study was published and unpublished documents created by various functional groups of the City. Through discussions with the director and other potential research participants, the researcher learned that efforts were undertaken, documents were created, and proposals were presented to the City's leadership on talent development at various times, but none of the documents were sufficiently organized to be considered as study reference. But the researcher reviewed these resources as they serve as stepping stones for the study.

4. Findings

The research findings discussed in this section were obtained using thematic analysis of the interviews conducted using Microsoft Excel. The interview questions were designed based on particular themes related to the interview questions. The themes included in the interview questions were: future and impacted digital skills, methods to identify skills gaps, success and challenges of current upskilling and reskilling efforts, interviewees' understanding of the impact of AI, measuring upskilling and reskilling outcomes, sustainability of current strategies, ensuring equity, future strategy, and policy changes for effective upskilling and reskilling. After the interviews were conducted, the transcriptions were analyzed, and the following themes related to the research questions were identified, as shown in Table 1 below. These themes were identified using deductive coding each response against the pre-identified themes in the interview questions. Most

interviewees provided similar responses to the strategy-related questions, and two predefined themes were merged for thematic analysis. Analytic credibility was strengthened through the systematic application of a theory-informed deductive codebook. Each code was operationally defined using inclusion and exclusion criteria and was pilot-tested against selected interview transcripts before being applied to the complete dataset. The researcher repeatedly reviewed the transcripts, maintained an audit trail of coding decisions and codebook revisions, and examined contradictory or disconfirming evidence to reduce confirmation bias. Although predetermined codes, derived from the interview questions, guided the analysis, additional codes were permitted when participants introduced relevant ideas not adequately represented by the initial coding framework. Final themes were reviewed against the complete dataset and supported with representative participant quotations. A traceability matrix was subsequently developed to connect the research questions, codes, thematic findings, supporting evidence, and components of the proposed Comprehensive Talent Development Framework.

Table 1. Themes related to research questions.

Thematic area	Related research question
Digital skills of the future workforce	RQ1
Strategies to identify skills in demand	RQ1
Impact of AI on digital skills and organizational roles	RQ1
Challenges and successes of current upskilling/reskilling efforts	RQ2
Measuring effectiveness and success of programs	RQ2
Strategy for sustainable workforce development	RQ2
Ensuring equitable skill development opportunities	RQ2

The results of this study highlight key elements and foci of digital skills development vital for professionals. The first interview question focused on identifying the skills technology professionals need to develop to become future-ready as technology disrupts job roles. Most interviewees agree that cybersecurity, privacy, artificial intelligence, foundational and adaptive skills, lifelong learning, and adaptability will be the most important skills that information technology professionals need to develop, as discussed below.

4.1. Digital Skills of the Future Workforce

As organizations increasingly adopt cloud-based systems, interviewees emphasized that cybersecurity and data privacy skills are becoming essential across both public and private sectors. The respondents noted that as technology evolves, cyber threats are also becoming more sophisticated. This trend demands the ongoing development of expertise in privacy and security. A recent study by [Sani et al. \(2025\)](#) supports this view, highlighting that the expansion of digital govern-

ment services is accompanied by a rise in cyber vulnerabilities. Consequently, specialized cybersecurity skills are now critical to managing these risks. Interviewees believe professionals must adapt accordingly, placing greater emphasis on safeguarding user data and maintaining organizational integrity.

Most interviewees also cite artificial intelligence (AI) as a crucial skill for modern technology roles, with particular emphasis on ethical and responsible AI use. However, the interviewees also agreed that the public sector is lagging in its adoption of AI. For instance, there is still an ongoing discussion within the case study organization about incorporating AI tools, such as Microsoft Copilot, and interviewees underscore the urgency of AI literacy while recognizing the potential ethical challenges and policy implications that AI brings. Interviewees also observed a slower pace of adoption at the case study organization, noting that AI policies are still being drafted at the leadership level, with a focus on the responsible use of the technology, and that AI skill development opportunities are gradually being made available to employees. In the private sector, interviewees believe there will be faster adoption of AI, as it enhances productivity and enables faster, more accurate work, allowing professionals to focus on creative, strategic tasks that AI cannot replicate. Research by [Alhosani et al. \(2024\)](#) supports this notion by identifying factors influencing AI adoption in both the public and private sectors.

As reliance on digital collaboration platforms continues to grow, interviewees emphasized that foundational tools like Microsoft Office, Google Workspace, SharePoint, and Microsoft Teams remain essential across all sectors. These platforms support daily operations, enable secure document management, and facilitate effective cross-project collaboration. Some interviewees also pointed to tools such as Power BI and Power Platform as critical for data-driven decision-making, automation, and the generation of key performance indicators (KPIs). This perspective aligns with [Liu and Li \(2025\)](#), who found that AI enhances psychological availability and reduces feelings of work alienation. Given the pace of technological advancement, adaptability was highlighted as a vital skill, particularly in navigating AI-related changes. To stay current, technology professionals are encouraged to engage in continuous learning through online courses, workshops, and job shadowing—an approach supported by [Morandini et al. \(2023\)](#) and [Lang \(2023\)](#), who stress the importance of upskilling and reskilling to remain relevant and efficient in the evolving tech landscape.

A summary of the skill sets that research participants listed as important digital skills of the future is shown below ([Table 2](#)). The researcher did not provide any list of skills during the interview, but the interviewees mentioned AI and Cybersecurity in particular. They also listed other skills they thought were important, which the researcher summarized as foundational, advanced, and adaptive skills, based on the categories used in [Bouwman et al. \(2024\)](#). Foundational skills are basic digital skills commonly used in modern workplaces, such as office applications and communication tools, whereas advanced skills include programming, development tools, and specialized software. Adaptive skills include advanced soft

and personal skills that are important for value creation, such as creativity, intelligence, agility, and adaptability.

Table 2. Summary of digital skills of the future, according to research participants (RP).

Skill category	Mentioned by research participants (RP)
AI	RP1, 2, 3, 5
Foundational digital skills (like Microsoft Office, Google)	All
Advanced digital skills (like Cloud Computing, PowerBI, DevOps)	All
Adaptive Skills (like Communication, Creativity, Adaptability)	RP1, 2, 4, 6
Cyber Security (including Privacy)	R1, 2

The second question posed to the interviewees was how they identified critical and trending skills employees need as technology evolves. Interviewees shared their organizations’ multifaceted approaches to anticipating technological needs, bridging skill gaps, and collaborating with educational and industry partners, with a particular emphasis on the transformative potential of disruptive technologies such as AI. The details are discussed as follows.

4.2. Strategies to Identify Skills in Demand

Research participants listed various methods currently used and potentially applicable to identify the skills needed for upskilling, which are summarized in **Figure 2** below. The participants used various terms to describe the various methods of identifying the skills, and the figure shows the frequency of the terms mentioned under each category.

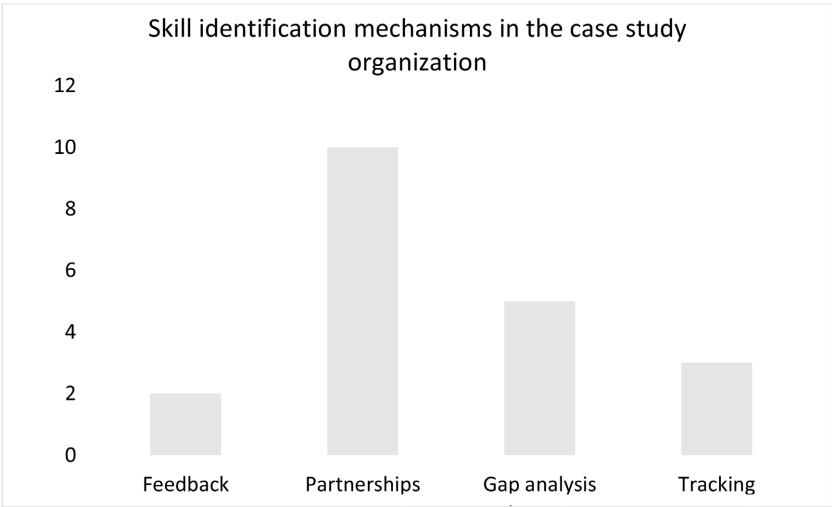


Figure 2. Summary of skill identification mechanisms in the case study organization.

Interviewees noted the growing use of skill gap analysis to pinpoint areas of

expertise gaps, particularly in high-demand fields such as AI, big data, and process automation. Identifying these gaps will help organizations collaborate with external content providers to develop specialized training programs. This approach marks a shift from generalized, mandatory training sessions to tailored learning paths, where employees can assess their proficiency levels and engage in training suited to their needs, based on skill-gap analysis. Such a skill-gap analysis-based approach aligns with the best practices discussed by [Buckley & Jorge, \(2024\)](#), who advocate a personalized microlearning approach to optimize employee engagement and retention of new skills. The case study organization exemplified this through its recent partnership with the service desk, in which support tickets indicating knowledge gaps are used to connect employees with targeted training. This method ensures that training is directly relevant to employees' roles, addressing real-time needs and improving service.

Most interviewees emphasized the value of partnering with technology vendors and consultancy firms within the case study organization. Partnerships with organizations such as Pluralsight, Gartner, and the Infotech Research Group provide timely insights into emerging industry trends. Interviewees noted that these collaborations also provide employees with access to resources critical to developing in-demand skills. For example, Pluralsight is used to conduct skill assessments and provide targeted learning pathways based on proficiency levels—beginner, intermediate, and advanced. This structured approach supports continuous learning and ensures that employees maintain relevant competencies.

The strategy of utilizing vendors and consulting firms aligns with findings from [Mutambik \(2024\)](#) and [Schlegel & Kraus \(2023\)](#), who emphasize the importance of multifaceted collaboration and the use of external expertise to remain competitive in today's highly globalized market, which is constantly disrupted by technological change. The interviewees' organization also sends employees to conferences hosted by vendors like Microsoft and Amazon, fostering direct exposure to leading-edge technology trends and innovations, including AI. Many interviewees described their organizations' balanced approach, combining top-down strategic planning with bottom-up employee feedback. They mentioned that staff feedback gathered through surveys, check-ins, and voluntary skill evaluations plays a vital role in identifying immediate training needs. The organization has a dedicated talent development division that focuses on skill gap analyses and efficient resource allocation. For example, one interviewee noted that skill tracking enables employees to locate proficient colleagues in specific tools, such as Power BI, thus facilitating knowledge sharing and enhancing internal service delivery.

The dual approach of formal planning and informal feedback aligns with methods recommended by [Duan et al. \(2023\)](#), who asserted that organizations gain a clearer understanding of skill gaps and developmental needs by involving employees in the feedback loop, particularly by setting specific and challenging goals. This inclusive model is particularly effective in fostering a responsive and adaptive workforce capable of swiftly adjusting to industry demands. The case study or-

ganizations lack formal partnerships with universities and colleges. However, one of the interviewees indicated informal ties to the University of Washington through personal connections of the university's staff who were interested in the organization's business. These academic collaborations provide a secondary channel for understanding the skills that will be critical for future roles in technology.

The case study organization also collaborates with local community colleges to keep technical skill curricula aligned with industry needs. Community colleges are recognized for their flexibility and affordability, making them accessible and effective venues for workforce development (Ramont, 2022). These institutions can quickly adapt programs to reflect emerging technologies and labor demands. Studies show that such partnerships between employers and colleges help close skill gaps in technical roles (Gauthier, 2024). This is especially true when curricula incorporate authentic learning experiences, including work-based projects and soft-skills training.

The third question that research participants asked was how they perceived the impact of AI on current and future workforce development. The interviewees' responses are summarized below.

4.3. Impact of AI on Digital Skills and Organizational Roles

Interviewees generally foresee AI dramatically enhancing productivity across various roles by taking over repetitive tasks and providing faster access to information. Interviewees believe tools like Microsoft Copilot and GitHub Copilot will streamline coding and customer service processes, highlighting a growing trend toward automation in entry-level tasks such as data entry and customer service. Interviewees believe that such automation frees professionals from routine work, enabling them to focus on higher-order responsibilities such as problem-solving, ethical decision-making, and creative solutions. This shift in responsibilities echoes the findings of Liu & Li (2025), who emphasize the importance of balancing AI-driven job automation with the need to preserve the core capabilities of professionals in roles that require human judgment and critical thinking. Moreover, some interviewees emphasized that professionals in knowledge management and office administration roles may benefit from AI that simplifies information retrieval, scheduling, and reporting, thereby streamlining workflows and boosting daily productivity. This view aligns with the findings of Schlegel & Kraus (2023), who concluded that automating most of today's back-office and administrative tasks is inevitable.

As AI gains traction, ethical use, privacy, and data security are becoming critical focus areas, particularly within government roles where public trust and regulatory compliance are paramount (Arora et al., 2025). Interviewees emphasized the importance of training staff on AI and its responsible use, including reporting ethical issues and managing biases and inaccuracies in AI-generated information. Most interviewees believe privacy, security, DevOps, and application development roles will be particularly impacted, as these professionals must develop specialized

knowledge to address AI's complexities. As AI continues to integrate into workflows, interviewees identified a need for upskilling among technology professionals, especially those in roles vulnerable to automation. Interviewees highlighted that information technology, customer service, and project management professionals must develop new competencies in AI oversight, ethical implementation, and strategic analysis to maintain relevance. However, although interviewees mentioned the importance of upskilling the current workforce as a possibility, no one recognized that some job functions would be permanently replaced by AI and become obsolete in the future (Schlegel & Kraus, 2023). The research participants' views on the potential impact of AI to displace employees from their current positions are summarized in **Figure 3**. The data show that at least 50% of the interviewees do not believe AI will affect current job positions in the near future, which is contrary to predictions about the future of workforces (World Economic Forum (WEF), 2023).

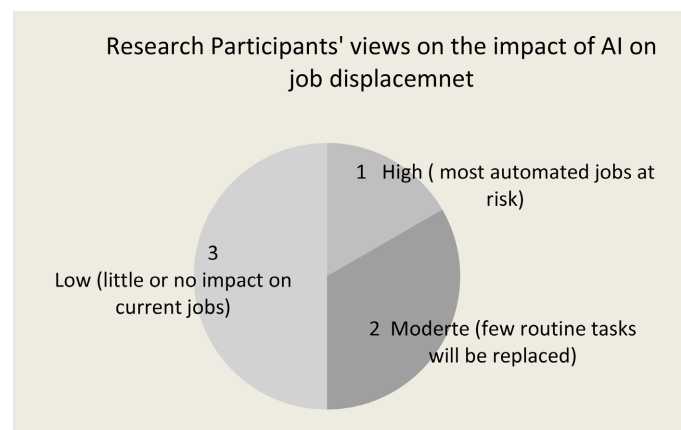


Figure 3. Research participants' views on the impact of AI on job displacement.

A recurring theme among interviewees was the potential budgetary impact and challenges to public perception associated with AI integration. Some interviewees noted that as AI takes on more routine tasks, public expectations for lower costs may arise, especially in government settings, where budget allocations are often scrutinized. Additionally, the public might question the need for specific roles if technology can perform them cost-effectively. Organizations, therefore, must balance AI-driven efficiency with the perceived value of human contributions, particularly in roles where AI cannot replicate human insight, empathy, and complex decision-making, as discussed by Stăneiu et al. (2024). These budgetary and perception challenges are also identified in research studies such as Arora et al. (2025), which emphasize that organizations in democratic societies expect transparent strategies to communicate the value of human-AI collaboration and gain public trust. In general, interviewees agree that emerging technologies are expected to impact various digital skills and roles, particularly by automating repetitive tasks, enhancing productivity, and creating demand for ethics, privacy, and security expertise. In that effect, organizations must develop policies, training pro-

grams, and upskilling pathways to adapt to these technological shifts, ensuring that professionals can take on new responsibilities where human judgment is irreplaceable.

The fourth question asked research participants about existing efforts, challenges, and success stories related to upskilling and reskilling technology professionals in the case study organization. The findings reveal that the case study organization is implementing various upskilling initiatives to align with emerging technology, which has many challenges and some success stories, as discussed below.

4.4. Challenges and Successes of Current Efforts

Interviewees stated that the predominant means the organizations currently use to provide skill development is the online training platform Pluralsight. The platform provides targeted training in technology skills such as Agile, Scrum, Cloud Computing, AI, and Cybersecurity, among others. The platform has enabled selected employees to practice cloud skills in a simulated environment, reducing the risk of exposing the organization's data and infrastructure while facilitating skill acquisition. Moreover, some interviewees from the talent development division stated that it uses various engaging events to address critical areas like security and project management, such as Cybersecurity Awareness Month and weekly Talent Development Sessions, which are open to all employees in the IT department. As discussed by [Bagdi et al. \(2023\)](#), the ongoing global increase in the market share of online platforms indicates that e-learning platforms are becoming effective means of providing scalable and secure learning environments and, hence, can be used for continuous workforce development.

According to the research participants, upskilling efforts are largely confined to departmental initiatives rather than citywide programs. However, the organization also provides career development scholarships, allowing employees to apply for individual training funding, though this initiative recently faced funding cuts. Some interviewees expressed that a more structured, role-embedded approach would be more effective. Aligning upskilling with job roles would allow employees to develop skills aligned with their responsibilities during work hours rather than relying on self-driven learning outside of work. This strategy aligns with recommendations by [Buckley & Jorge \(2024\)](#), who suggest that aligning training with job functions and employee goals enhances motivation and relevance, particularly when training is integrated into work routines and augmented by reward, recognition, and employee promotion. Challenges here include the fast pace of technological change, which requires establishing foundational knowledge before employees can advance to more specialized training, as discussed in [Schlegel and Kraus \(2023\)](#).

Interviewees highlighted the importance of creating a culture that prioritizes learning and professional development, shifting away from traditional, compulsory training toward fostering intrinsic motivation for learning. This culture of

continuous learning is promoted through initiatives such as weekly learning sessions open to all staff and engagement campaigns that encourage skill development as part of daily work. Creating such a culture, however, is challenging, as it requires leadership commitment and time-management strategies that enable employees to participate in training without detracting from their regular responsibilities. As discussed in [Schlegel and Kraus \(2023\)](#) and [Buckley & Jorge, \(2024\)](#), developing a culture of continuous learning is critical for long-term skill retention and adaptation in the tech sector. However, it requires systemic support to become truly effective.

According to the interviewees, the common challenges identified include time constraints, budget limitations, and the rapid evolution of technology skills. As is true for many organizations, the case study organization also faces difficulties ensuring employees can allocate time for training while managing their workloads ([Lang, 2023](#)). Additionally, interviewees raised concerns about funding cuts, including those affecting the career scholarship program, which limits the accessibility and scope of available training. The rapid advancement of technology also requires that foundational skills be developed before advanced training can be pursued, a process that can be challenging to manage without a structured, role-specific approach. Organizations find that a human-centric approach, consulting employees on their goals and challenges, and aligning skill development with their roles, is more effective than relying solely on employees to self-develop. This aligns with recent studies that suggest skill development strategies must be systemic, supported, individually tailored, and role-focused to effectively address the tech workforce's fast-changing needs ([Buckley & Jorge, 2024](#)).

Thus, organizations need to employ various strategies to support upskilling and reskilling, including using online learning platforms, conducting skill gap analyses, and fostering a culture of continuous learning. Challenges related to time, funding, and rapidly evolving skills highlight the need for structured, job-integrated learning approaches. By embedding skill development within roles and aligning training with organizational goals, these initiatives can more effectively prepare the workforce for the future of technology. The main challenges reported include limited licenses due to cost and scheduling conflicts, as many employees are expected to complete training during personal time. To mitigate these issues, the case study organization is working to foster a culture that supports continuous learning. By doing so, the organization recognizes that skill-building is a strategic priority.

The fifth question was how the case study organization measures the effectiveness and success of its upskilling and reskilling programs. According to the research participants, the case study organization uses a variety of metrics to assess the success of upskilling and reskilling initiatives, often focusing on platform usage, skill assessments, and certification completions. The various metrics currently used at the case study organization are summarized below.

4.5. Measuring Effectiveness and Success of Programs

The case study organization uses tools like Pluralsight and Cornerstone to moni-

tor program participation and proficiency progress. These platforms provide data on course popularity, time spent on specific learning modules, and skill assessment results, helping the organization gauge employee engagement and progression at various skill levels. For instance, Pluralsight's reporting feature, which includes the number of assessments taken and the time employees dedicate to each course, will provide reportable metrics. This data directly measures the program's reach and usage, allowing managers to identify popular content and allocate resources to high-demand skills. Buckley & Jorge, (2024) recommend using learning management system performance metrics to track training participation and conduct skill assessments as an effective method for measuring engagement and identifying where employees may need further training. However, the researcher emphasizes that organizations should not rely on these metrics, as they are usage-focused and may not fully capture the impact of upskilling/reskilling on real-world job performance.

Another practical approach used by the case study organization is to measure the success of upskilling by correlating tool adoption rates with changes in support ticket volume before and after training. For example, some interviewees described tracking specific software features, such as those in Microsoft Teams or SharePoint, to determine how effectively employees apply new skills in their roles. Such an approach helped the organization identify a correlation between a high volume of support tickets and users' challenges with the tool and, hence, implement targeted training to address these issues. They then monitored subsequent support requests and found a reduction in tickets as user competency increased, a strong indicator of successful skill-building. The researcher found that this unique approach of evaluating training success based on outcomes in the case study organization was effective. Such an approach ensures that skill-building efforts directly address operational challenges, providing measurable improvements in employee performance and productivity.

While metrics provide valuable insights into program participation and basic competency levels, interviewees acknowledged limitations in the case study organization's current measurement approaches, particularly regarding qualitative metrics such as robust methods to assess employees' confidence and readiness after training, which are essential for gauging the broader impact of upskilling. Interviewees also added the shortcomings of tracking milestone achievements, such as certifications or degrees, and the need to focus on metrics that measure long-term skill retention or job performance improvements, which are more challenging to quantify (Buckley & Jorge, 2024). Several interviewees suggested that introducing qualitative feedback mechanisms, such as surveys or interviews, could provide a more holistic understanding of training outcomes. One interviewee noted that their organization lacks formal metrics for tracking AI-related upskilling but suggested that creating AI-focused roles, such as a Chief AI Officer, could help establish metrics aligned with AI ethics, strategy, and workforce development. According to this interviewee, a dedicated AI leadership role would provide strategic

oversight, guide policy development, identify roles impacted by AI, and proactively build relevant skills to ensure a smooth transition for employees. This recommendation aligns with recent proposals by [Park \(2024\)](#) for developing a region- or industry-specific AI policy framework.

Organizations use a range of metrics to evaluate the success of upskilling and reskilling initiatives. These include measures such as platform usage data, skill assessments, support ticket volumes, and feature adoption rates. While these indicators effectively track engagement and proficiency, they often fail to capture qualitative outcomes like employee readiness and confidence. Incorporating qualitative feedback can help fill this gap and offer a more holistic view of training effectiveness. As AI integration becomes more prevalent, organizations may also benefit from establishing dedicated roles and frameworks focused on AI ethics and strategy. Such efforts can ensure workforce readiness and better align skills with the demands of emerging technologies.

4.6. Strategy for Sustainable Workforce Development

In government and private sectors, organizations implement structured yet adaptable strategies to align workforce skills with emerging technological demands, particularly AI-driven ones. The sixth interview question was about how the case study organization plans to ensure sustainable, future-ready workforce development. Research participants shared approaches ranging from multi-tiered professional development initiatives to data-driven skill-mapping tools, each addressing the unique challenges of preparing for disruptive technologies while acknowledging current resource limitations. One of the research participants suggested a multifaceted strategy to advance skill readiness, emphasizing adaptability and leadership commitment, including attending annual learning conferences, securing funding for certifications, and pursuing other professional development initiatives. According to this participant, the new CTO plays a key role in pushing for skill development to be embedded in the organization's 2025 strategic agenda. While budget constraints and hiring freezes limit some initiatives, the executive leadership's dedication reflects an awareness that skill-building is central to navigating technological disruptions.

[Bobitan et al. \(2024\)](#) highlight that executive buy-in is a crucial factor in the success of upskilling programs. Leadership support for strategic skill development helps establish a culture of continuous learning and adaptability across the workforce. Some interviewees recommend using gamification to increase employee engagement in AI upskilling, for example, by incorporating beginner-level AI courses into a competitive campaign. This approach fosters enthusiasm and emphasizes the importance of acquiring AI-related skills. Weekly dedicated training time further demonstrates management's commitment to workforce development. [Buckley & Jorge, \(2024\)](#) also found that gamification enhances engagement and retention in training, especially for emerging technology skills.

A few interviewees described using a "services and skills matrix" that maps re-

quired competencies across organizational functions, allowing for targeted identification of skill gaps in emerging areas such as generative AI. By documenting required skills at novice, intermediate, and expert levels, this matrix provides a clear view of where development is needed to align with future technological advancements, participants suggested. The organization can proactively allocate training resources and connect teams with specific upskilling opportunities as AI becomes more prevalent. According to [Lagrutta et al. \(2024\)](#), developing a structured skills matrix and a well-established knowledge exchange platform will enable organizations to allocate resources strategically, ensuring workforce development is aligned with long-term goals and reducing the risk of reactive, ad hoc training. One interviewee noted that skill development is managed at the departmental level without a citywide approach, with proactive managers identifying relevant skills independently. According to this participant, this method tends to be reactive, addressing immediate needs rather than preparing for future disruptions, potentially hindering sustainable workforce development. Research by [Mhlongo \(2024\)](#) recommended a centralized knowledge-sharing hub, as decentralized approaches may lead to fragmented skill-building and gaps in key areas, where a unified, forward-looking strategy is necessary to anticipate and prepare for industry changes.

As organizations strive to ensure sustainable skill development in anticipation of future disruptions, structured frameworks such as the services and skills matrix, along with gamification initiatives, play a key role. These tools offer targeted engagement and efficient resource allocation. However, effective implementation also depends on strong leadership commitment and a clearly defined strategic vision. Challenges persist, especially in organizations with decentralized or department-specific training initiatives. Such fragmentation can hinder their ability to respond proactively to rapid technological changes. Aligning skill development with strategic technology plans can help build a more adaptable and resilient workforce capable of managing emerging complexities.

The rapid evolution of disruptive technologies, particularly artificial intelligence (AI), has necessitated a shift in workforce policies and programs ([Iuga & Socol, 2024](#); [Zaidan & Ibrahim, 2024](#)). Hence, research participants were asked to forward their views on how organizational policies and programs must be adjusted to accommodate technological changes. Interviewees recognized the importance of policy framework adjustment, effective change management, continuous learning, and implementation that ensures equity. Most interviewees recognized that the case study organization, as a public-sector organization, is lagging in initiating, developing, and implementing policies to proactively integrate disruptive technologies. However, almost all interviewees acknowledged the leadership team's initiative to develop an AI policy as a good start.

As noted by the interviewees and confirmed by the researcher, the newly developed AI policy emphasizes ethical use, privacy, and equity, but lacks guidance on employee skill development and technological adoption. This gap highlights a

missed opportunity to prepare the workforce for AI integration. Recent studies also recommend that government-led AI policies not only promote responsible deployment but also prioritize workforce readiness (Karaboğa et al., 2020; Sloane & Wüllhorst, 2025). One interviewee emphasized the importance of broader technological adaptation frameworks that ensure the ethical use of organizational funds and resources. In addition to governance, organizations must equip employees with the knowledge and skills to apply new technologies responsibly. Doing so can reduce risks associated with AI and automation while enhancing their overall benefits.

The interviewees highlighted the critical role of change management in navigating technological disruptions, emphasizing the importance of maintaining operational stability while implementing technological advancements. According to the interviewees, a designated change management lead will be responsible for assessing the impact of new technologies, identifying potential resistance, and coaching staff through the transition. This perspective aligns with existing research highlighting the effectiveness of change management strategies, such as structured training programs and phased technology rollouts, to help organizations transition smoothly while minimizing disruption (Andronikidis, 2025). The interviewee noted that a recent payroll system upgrade in their organization faced significant challenges due to inadequate change management planning. This real-world example underscores the importance of strategic planning in mitigating resistance and ensuring the smooth implementation of upskilling efforts.

A key theme in the interview was the importance of fostering a growth mindset and promoting lifelong learning among employees. Interviewees emphasized that technologists and professionals must stay open-minded and continually update their skills to remain relevant in a rapidly changing environment. The talent development division within their organization plays an active role in encouraging a culture of learning and adaptability. This organizational support helps employees view learning as an ongoing responsibility rather than a one-time event. Scholarly research supports this perspective, highlighting that continuous professional development is critical for workforce resilience. According to Brynjolfsson (2022), upskilling and self-directed learning are essential for organizations to sustain a competitive advantage.

4.7. Ensuring Equitable Skill Development Opportunities

Another significant point discussed in the interview was equity and inclusivity. Research participants were asked to share their views on how to ensure equal access to upskilling and reskilling opportunities within the organization, particularly for employees with little or no digital skills. Most interviewees emphasized the importance of ensuring equity in providing upskilling and reskilling opportunities to employees, including using an “*equity toolkit*” in recruitment processes and offering inclusive internship programs, such as *paid summer youth initiatives*, to address employees with different backgrounds and technological know-how.

Most interviewees were concerned that technological changes may exacerbate existing inequalities and that their organization should create opportunities for growth for those employees with less or no digital skills. This aligns with research indicating the need to develop equitable workforce policies that provide equal access to training, resources, and job opportunities so that technological advancements benefit all demographics rather than increasing the digital divide (Socol et al., 2024).

Another approach suggested by most interviewees is to design targeted upskilling programs for positions susceptible to automation or displacement by artificial intelligence. According to the research participants, because technological changes affect job positions differently, employees in roles potentially replaceable by AI should be provided with comprehensive retraining programs that include career transition opportunities. These views of the research participants are supported by recent research that showed that companies with targeted reskilling programs effectively address skill gaps created by technological advancement (Dundur & Bheemanagouda, 2024). Interviewees also suggested another way to ensure equitable access to upskilling and reskilling: a tiered training track ranging from beginner to advanced levels, so opportunities cater to varied skill levels. According to the interviewees, this can be achieved by actively encouraging participation from entry-level employees, particularly those from underrepresented backgrounds and individuals with less digital skills, to promote upward mobility and workforce diversity. This view of the interviewees is supported by a recent study by Ofstad and Bartel-Radic (2024), who showed the importance of categorizing employees into groups that encourage interaction and mutual support within a continuous learning environment.

The interviewees also suggested ensuring equity in upskilling and reskilling by utilizing adaptive digital learning platforms that allow employees to self-assess their skills and generate customized learning paths. Although this approach allows personalized learning for novice and experienced employees, it may not be ideal for those with minimal digital skills because the platforms require some digital literacy. Therefore, organizations need to find ways to support marginalized groups to address equity among employees with a broad spectrum of skills, including mentoring programs and cooperative learning strategies, as discussed in Ofstad and Bartel-Radic (2024).

As previously mentioned, this study focuses on understanding the impact of disruptive technologies, particularly AI, on the upskilling and reskilling of technology professionals. The case study organization selected for this research is a public organization, the City of Seattle. Although the diversity of the research participants was well designed (two developers/managers, one from HR, two from the talent development division, and one from the leadership team), the idea saturation was reached so quickly that there was no need to add more participants. However, the insights obtained from these few individuals were substantial for the research, as all the interviewees were highly experienced and had historical

knowledge of the organization and of ongoing technological and societal changes. The inability to include the view of professionals and leaders from other departments of the organization, the private sector, and shortcomings in understanding the extent of the technological change and its impact by the research participants can be considered significant limitations of this study.

The researcher also realized that some interviewees underestimated the impact of disruptive technology on the current and future workforce and did not seem to appreciate the drastic impact of AI and other disruptive technologies. One even said, “I do not consider AI a disruptive technology”. A 2020 study by Princeton University students, titled “*Future of Work for the City of Seattle*,” proposed several workforce development strategies. However, the researcher found no evidence of a structured upskilling and reskilling initiative within the city’s talent development division. Aside from offering access to open learning platforms such as Pluralsight and, more recently, LinkedIn Learning, there appeared to be limited coordinated efforts to support systematic skill development. Therefore, the city’s talent development division should develop a comprehensive workforce development strategy that is dynamic, consistently evaluated, and implemented throughout the organization.

4.8. Summary of Findings

The study aimed to answer two major research questions, with the corresponding sub-questions. The first research question seeks to identify a set of skills that will be in high demand in the future and those that may be significantly affected by disruptive technologies, AI in particular. The second research question evaluates the strategies, successes, and challenges of current upskilling and reskilling efforts, and how technology companies and information technology departments within organizations may design a sustainable workforce as disruptive technologies continue to evolve.

The interview with research participants from the case study organization helped validate and compare the findings of other research referenced in this study and answer the research questions. For the first research question, research participants were asked about their views on the skill sets that current upskilling and reskilling efforts should focus on. Interviewees consistently mentioned AI (Artificial Intelligence), Power BI, Office Applications (Excel, PowerPoint, SharePoint, Teams, Copilot, OneDrive), Cloud-based computing, Project management, Critical thinking skills, Cyber Security, Data analysis, Business Process Automation, Digital Collaboration, Communication, Generating KPIs, cross-project collaboration, while emphasizing the importance of lifelong learning and adaptability.

The technological skills mentioned by the research participants are consistent with other researchers’ findings. The findings show that, at least for the case study organization, having foundational digital skills along with soft skills such as critical thinking and communication is crucial for the future of the workforce. Although interviewees have a good awareness of AI and recognize it as becoming one

of the skills in demand for the future, the case study organization currently neither uses AI for any of its job functions nor approves any AI models, mainly for fear of privacy and data security. However, there is an ongoing effort to create awareness of AI by encouraging employees to take AI courses on Pluralsight, and the leadership has been developing an AI policy. Most interviewees have not thought much about which of the existing job functions and skills will be replaced by AI but are unable to list skills that will be at high risk of replacement by AI. However, some of them recognized the augmentative power of AI while being inclined to deny that the technology will make some job positions obsolete.

Developing a future-ready workforce requires proper consideration of technological trends, proactive leadership that makes timely decisions, investment in talent development, and employees' willingness to adapt to changes. As discussed above, the case study organization is a public organization with a traditional hierarchical structure that increases the challenges of adopting disruptive technologies, let alone taking swift action in talent development. In this regard, private organizations and tech companies may be better suited to adapt and prepare their workforce for the future.

The current talent development framework in the case study organization follows the traditional *Attract → Develop → Retain* scheme (Kapur, 2022), which assumes educational institutions produce trainable talent that can be competitively recruited by providing attractive packages. Organizations develop those talents internally by providing training that meets the organizational need, motivates the employee, ensures the maximum potential of the employee, and retains the best talent as long as possible through rewards and opportunities.

Due to technological disruptions, most process-based tasks can be easily automated. Hence, some job positions become irrelevant, and employees need to up-skill their existing talent or acquire new skills through reskilling programs. This requires a paradigm shift from both the employee and the employer perspectives. As the case study organization's IT department employees engaged in the study witnessed, the current talent development strategy focuses on providing self-learning opportunities on digital platforms. It also includes completing a few mandatory courses and attending unstructured meetings and conferences. There is no formal and comprehensive assessment of the organization's current and future workforce needs and skill gap analysis that considers technological changes.

The success story in the case study organization includes using digital platforms that are open to all employees, the willingness of most employees to learn new skills and leadership talent development support. The case study organization has purchased unlimited licenses from Pluralsight and LinkedIn that enable employees to sharpen their skills or learn new ones anytime. There are also some efforts to guide employees to get training on some trending technologies, including AI. Although having digital platforms that provide accessible online training for almost all skills needed for a modern workplace is a great opportunity, studies showed that such a generic, one-fits-all approach would not be effective unless supported by a tar-

geted, well-designed, comprehensive, individually tailored, rewarding upskilling and reskilling programs that are well supported by the leadership and continuously monitored and evaluated (Buckley & Jorge, 2024). The organization should develop an inventory of its current and future skill needs, identify those skills at risk of replacement, and provide guidance on employees' learning paths. Providing employees with learning opportunities also needs to be supported by providing employees enough time to learn the skills, including dedicated work hours for training, perhaps with obligations to provide credentials obtained after training, and allowing them to demonstrate those skills on actual tasks, which will motivate them to become lifelong learners.

The challenges of having a well-structured upskilling and reskilling program in the case study organization include budget constraints, sluggishness to adapt to technological changes due to the hierarchical structure of the organization, underestimating the impact of disruptive technologies on the future of the workforce, and policy-related issues. Budget constraints have challenged the case study organization. Unfortunately, one of the recent cost reduction strategies was cutting part of the budget allocated for talent development, while technological disruption is at its peak. On the other hand, studies show that many jobs will become obsolete soon, while more jobs requiring new skills are created, necessitating inventive upskilling and reskilling programs. The case study organization's slow adoption of new technologies and tools, such as AI, hinders the leadership from proactively acting and addressing the future challenges the organization's workforce might face. The organization is currently, a few years after the release of disruptive AI tools, discussing the pros and cons of technology and the privacy and security challenges these technologies pose.

The researcher also noticed a quite established underestimation of the impact of disruptive technologies on the current workforce. In this case, it may be worth repeating the famous quote from Lakhani (2023), "*AI won't replace humans—but humans with AI will replace humans without AI*". Organizations need to realize that automation and AI will completely replace some existing job positions and should plan their talent development strategies accordingly. Employers need to proactively identify those job positions and employees who will be affected early and design a reskilling program that ensures talent retention. On the other hand, the future workforce should have new skills that did not exist before, and employees should have the resources and time to learn those new skills and be ready for those jobs. Moreover, although some of the current job functions may remain, the way of doing jobs will change, making upskilling highly relevant.

Although it is imperative to include most of the organization's employees in upskilling and reskilling programs, there are a lot of challenges. First, the hierarchical structure of the case study organization challenged technological adoption. This is true even in the organization's IT department, where most employees better understand the technological changes and tools. Secondly, the decision to make technological choices and adopt new technologies in public organizations

also becomes more complicated due to political, economic, ethical, and societal factors. Existing data governance, security, and privacy policies will also impact decision-making on adopting technological changes. Therefore, regulatory and compliance policies must also be reviewed to accommodate technology adoption while being vigilant of people's safety, privacy, and security.

This qualitative case study research approach, supported by IT and talent development professionals with strong organizational knowledge and technical expertise in the technology field, is justifiable. However, due to the slow adoption of technology in the case study organization—and likely in many public institutions—there are barriers to planning and executing an aggressive workforce upskilling and reskilling strategy. As a result, the research contribution is limited to proposing a conceptual talent development framework that organizations can adopt to build a sustainable, future-ready workforce. Given that disruptive technologies, including AI, pose significant threats to existing jobs in both public and private sectors, this research offers value by introducing a talent development strategy that integrates technological impact, organizational strategy, employee adaptability, educational institutions, industry stakeholders, and policy development. These interconnected elements are essential for preparing organizations for future workforce demands. The details of the proposed conceptual model are discussed below.

5. The Proposed Comprehensive Future Ready Talent Development Framework

The proposed conceptual framework places disruptive technologies, like AI, at the core of future-ready workforce development. The model emphasizes interconnectivity between educational institutions, industry stakeholders, organizational talent development strategies, employees, and policy development to ensure an integrated approach to sustainable, future-ready workforce development in technology companies. The proposed framework is holistic and aims to transform the classical attract → develop → retain workforce development into an adaptive, innovative, and dynamic process.

The proposed comprehensive talent development framework (Appendix B: **Figure A1**) places disruptive technologies, particularly artificial intelligence (AI), at the center of workforce transformation. The model illustrates the dynamic interrelationship among educational institutions, industry stakeholders, organizational talent development strategy (upskilling and reskilling), employee adaptability, and policy, each acting as interlocked gears driving a comprehensive and future-ready talent development strategy. Since disruptive technologies have the potential to reshape roles, alter demand patterns, and accelerate the shelf-life of skills, placing AI at the heart of talent development allows other stakeholders to anchor their efforts around the force that transforms them.

The seven thematic areas established through the study informed the five inter-related components of the proposed Comprehensive Talent Development Frame-

work: educational institutions, industry stakeholders, employee adaptability, organizational strategy, and policy, with disruptive technologies (AI) as a central driving component. Themes on future digital skills and strategies for identifying in-demand skills emphasize collaboration between educational institutions and industry stakeholders to align curricula, training, and credentials with evolving workforce needs. Findings related to AI's impact on digital skills and organizational roles highlight the importance of employee adaptability, including continuous learning, critical thinking, and readiness to assume redesigned responsibilities. The challenges, successes, and effectiveness of current upskilling and reskilling initiatives directly inform organizational strategies for designing, implementing, evaluating, and continuously improving workforce-development programs. Finally, the themes of sustainable workforce development and equitable skill-development opportunities demonstrate the importance of organizational and governmental policies that promote long-term investment, inclusive access, accountability, and support for employees affected by technological disruption. **Table 3** presents a traceability matrix showing how these thematic findings support each component of the proposed framework.

Table 3. Traceability matrix relating research themes with proposed framework.

Thematic area	Proposed framework component
Digital skills of the future workforce	Educational institutions
Strategies to identify skills in demand	Industry stakeholders
Impact of AI on digital skills and organizational roles	Employee adaptability
Challenges and successes of current upskilling/reskilling efforts	Organizational strategy (upskilling and reskilling programs)
Measuring effectiveness and success of programs	Organizational strategy (upskilling and reskilling programs)
Strategy for sustainable workforce development	Policy
Ensuring equitable skill development opportunities	Policy

Although educational institutions may remain relevant in providing the skills demanded by various industries, they are under scrutiny for being slow to respond to market needs as they focus heavily on instruction and standardized assessments that do not reflect real-world problem-solving, adaptability, or innovation. The model advocates curriculum adaptability in educational institutions, driven by real-time input from industry stakeholders. This requires educational institution flexibility, faculty upskilling, and regular curriculum reviews aligned with technological trends. Therefore, universities and colleges must evolve from siloed, discipline-specific instruction to hybrid models incorporating project-based learning, cross-disciplinary collaboration, and industry-aligned curricula. Moreover, informal learning providers—boot camps, online learning platforms, and credentialing platforms should also play an increasingly vital role in democratizing skill acquisition, especially in AI-related fields.

As the pace of technological change accelerates, the half-life of a skill—the time it takes for a specific skill set to become obsolete—continues to shrink, making internal talent development increasingly critical. To address this, companies must invest in employee skill development. This can be achieved through both upskilling and reskilling initiatives. Upskilling involves enhancing existing employees' skills within their current roles while reskilling focuses on preparing them for transitions into new or emerging roles by learning entirely new competencies. These efforts can be supported through objectively designed programs, including micro-certifications and custom, role-specific training. Delivering such training in modular and flexible formats ensures accessibility and alignment with evolving workforce needs.

Industry stakeholders are increasingly shifting from being passive consumers of educational outcomes to active co-designers of workforce competencies. This transition is reshaping both hiring practices and internal talent development strategies. As a result, a strategic approach to workforce development should include the creation of in-house learning labs and AI-powered training systems. These tools can help prepare employees for emerging roles by aligning training with real-time industry needs. Industry partners also play a critical role in designing agile credentialing systems and establishing job taxonomies. Additionally, they contribute to the development of learning ecosystems that reflect the rapid pace of change in the world of work.

The conventional model of front-loaded education followed by a fixed career path is becoming obsolete. Therefore, the framework underscores the necessity of cultivating a lifelong learning employee mindset that proactively seeks new knowledge to maintain employability, drive innovation, and take responsibility for learning new skills. Although companies should fund upskilling and reskilling programs, the ultimate responsibility of acquiring new skills and continuously updating them is in the hands of employees. Employees should actively engage in skill development programs, apply skills in their job functions, and seek mentorship and peer learning opportunities. In addition, local, organizational, and national policies should support inclusive and future-ready talent development strategies by encouraging public investment in digital reskilling, promoting acceptance of micro-credentials, creating tax incentives for corporate learning programs, and supporting training for underprivileged employees. Equity-focused initiatives such as scholarships, accessible online learning platforms, community outreach programs, and youth training should ensure that all individuals, regardless of socioeconomic status, are part of the talent development effort.

In summary, the Comprehensive Future Ready Talent Development Framework demonstrates that no single sector can address the skill transformations of the age of AI and other disruptive technologies. As the central gear, disruptive technologies, such as AI, force the reconfiguration of how we think about education, industry collaboration, employee development, and policymaking. Through the metaphor of interlocking gears, this framework calls for synchronized motion

across all sectors to ensure dynamic, strategically future-ready talent development. Only through shared responsibility, continuous innovation, and policy support can we build a resilient, future-ready workforce equipped for the complexities of the digital age. Implementing such a holistic talent development framework will ensure enhanced workforce efficiency and agility, improved talent retention and job satisfaction, guaranteed public safety and digital trust, optimal resource management, increased security, and better alignment of innovation with social equity. For technology companies and IT departments of organizations, this model provides a conceptual and practical pathway for creating a resilient, future-ready workforce capable of navigating technological disruptions.

6. Discussion

The findings from this study have several critical implications for talent development practices, particularly in the context of rapid technological disruption driven by artificial intelligence (AI) and related emerging technologies (Madanchian & Taherdoost, 2025). The proposed future-ready workforce development framework responds to the complex demands of the 21st-century labor market by redefining talent development beyond the traditional goals of attracting and retaining talent. It calls for a dynamic, integrative strategy that anticipates change, fosters adaptability, and aligns workforce capabilities with the trajectory of technological innovation.

A key implication of the proposed framework is its recognition of disruptive technologies, especially AI, as foundational forces reshaping the future of work and the competencies they demand. As AI continues to transform job roles, automate cognitive tasks, augment end-to-end workflows, and redefine organizational structures, workforce development strategies must prioritize agility and continuous alignment with evolving technological trends. Organizations that fail to account for this paradigm shift risk cultivating outdated skillsets that undermine long-term competitiveness and innovation capacity. Strategically, this entails moving beyond traditional one-size-fits-all, reactive training models to embrace proactive, skill-oriented, targeted planning. Talent development professionals must engage with industry foresight and consult with technology firms, research institutions, and labor economists to identify skill demands emerging at the edge of innovation. Integrating such forward-looking intelligence into organizational learning systems ensures that upskilling and reskilling initiatives remain relevant and anticipatory, rather than obsolete by the time they are delivered.

Another practical implication is the establishment of continuous feedback mechanisms between industry and formal and informal educational institutions. Traditional curricula often lag behind the pace of technological change, creating a misalignment between graduate competencies and labor market needs. The proposed framework recommends a systemic loop whereby businesses regularly communicate skill gaps, emerging job roles, and evolving professional standards to educational providers. This approach enhances curriculum responsiveness and

facilitates the co-creation of learning pathways tailored to industry requirements. Learning institutions that complement traditional degrees with modular, work-integrated micro-certifications aligned with AI-driven occupations can better prepare graduates for fluid and complex career trajectories. Furthermore, informal education providers—such as coding boot camps and online platforms—play an increasingly important role in complementing traditional institutions by rapidly deploying niche skill-acquisition programs in high-demand areas.

The study and current literature reveal a persistent gap in understanding the scale, effectiveness, and urgency of talent development efforts required in the digital age. Despite increased investment in training programs, the case study organization, for instance, lacks a structured approach to diagnosing current skill gaps and designing agile interventions. Therefore, the research proposes institutionalizing periodic skill-gap assessments and establishing responsive learning ecosystems to facilitate agile upskilling and reskilling programs. Such ecosystems must be adaptive by design, incorporating learning analytics, individualized development plans, and AI-enabled personalization. More importantly, organizations should create psychological safety and motivational structures that promote a culture of lifelong learning. Employees must recognize the necessity of continuous skill renewal and support the cultivation of digital, creative problem-solving, and interdisciplinary skills, ensuring they become future-ready professionals.

At the macro level, the study underscores the urgent need for policy adaptation in response to technological disruption. At the organizational, local, and national levels, policymakers must confront AI's profound implications on labor regulations, compliance norms, and social protection. Current policy instruments were primarily designed for industrial-era and early information-age work models and may be inadequate to address algorithmic bias, data privacy, cybersecurity, new job classifications, and equitable access to digital skills. Therefore, legislative bodies and policy developers must modernize labor laws and promote policies that safeguard employees and society without jeopardizing technological innovation. This includes crafting frameworks that ensure universal access to digital reskilling opportunities, support the ethical deployment of AI, and prevent the exacerbation of socioeconomic disparities in the workforce. Moreover, global coordination among governments may be necessary to harmonize standards and mitigate cross-border challenges related to automation and digital labor.

Finally, a significant implication of the framework is that employees play an active role in their career development. The future of work requires workers to embrace a mindset of self-directed learning, digital fluency, and career agility. While institutions provide the infrastructure, motivation to learn must be internally driven. Organizations can support this shift by embedding skill development into performance management systems, rewarding continuous learning, and enabling flexible learning modalities. Employees should also be responsible for their skill development and readiness for the ever-changing job topology.

The findings of this study, aligned with contemporary literature, underscore a

significant and persistent gap in both the recognition and strategic response to technological disruption, including from artificial intelligence (AI), within workforce development frameworks (Madanchian & Taherdoost, 2025; Olaitan & Mapanga, 2024). Although there is growing recognition of the transformative potential of these technologies, current organizational responses often fail to reflect the scale or urgency highlighted by academic and industry research. In this regard, one area for future research is exploring the root causes of the lack of urgency many organizations exhibit in developing comprehensive, future-relevant workforce strategies. Future studies should examine whether this inertia stems from cultural resistance, limited executive technological literacy, short-term operational pressures, or structural constraints such as resource limitations. Additionally, understanding how perceptions of leadership, governance models, and organizational maturity influence technology adoption and workforce planning could provide valuable insights for overcoming implementation bottlenecks.

The present study was conducted primarily in a public organization's information technology (IT) divisions. This limited scope may obscure insights that could emerge from organizations operating at the forefront of technological innovation. It will be interesting to understand how talent development is conducted in technology-oriented companies, particularly those that develop or adopt AI at scale and are usually considered to possess a higher degree of digital readiness and leaders with greater awareness of future skill demands. Therefore, the researcher recommends replicating this study within private-sector, technology-driven firms. The other approach may be to conduct a comparative analysis between tech-savvy and traditional organizations, which could shed light on best practices, strategic foresight, and the tangible impact of leadership awareness on workforce development outcomes.

Although this study focused on the IT workforce, disruptive technologies are expected to affect various occupations in finance, human resources, marketing, operations, and customer service. Therefore, future research with a more holistic approach by including diverse organizational functions may enable broader risk assessment and inform cross-functional talent development strategies. Such research should investigate how different departments, organizational hierarchies, and policy environments shape the workforce's readiness and adaptability. In particular, the intersection between internal corporate strategy and external policy frameworks, such as national digital literacy campaigns or incentives for workforce innovation, warrants deeper exploration. Additionally, longitudinal studies tracking how particular roles evolve or disappear over time could help forecast trends and guide more proactive workforce planning.

The proposed workforce development model provides a foundational framework, but it requires further refinement to enhance its practical utility. A critical recommendation for future work is to develop and integrate skill assessment mechanisms into the model. These mechanisms should be capable of dynamically identifying and validating current and emerging skills required by the modern

workforce. Such studies may consider designing and testing modular learning pathways that map specific skill acquisition to career progressions. These pathways should incorporate measurable learning outcomes, digital credentials, and performance indicators, enabling organizations and employees to track development and readiness objectively. They should also leverage AI-driven learning analytics to further personalize learning experiences and optimize reskilling and upskilling programs.

The study also recommends exploring how formal and informal educational institutions can better respond to the evolving technological landscape by developing dynamic, industry-aligned curricula. Future research may examine how universities, vocational institutions, and informal learning platforms can build continuous feedback loops with industry stakeholders to maintain curricular relevance. This includes investigating best practices for integrating labor market intelligence into academic planning and evaluating institutional agility in curriculum redesign. Additionally, the role of collaborative innovation hubs—bringing together educators, employers, and technology developers—should be considered (Qiu et al., 2020). Research could also assess how accreditation bodies and educational policy frameworks support and incentivize curriculum reforms. These efforts are essential to ensure education systems remain responsive to technological and labor market changes.

Future research may also explore how organizational workforce development strategies interact with broader national systems, including talent development policies, educational reforms, data privacy and security regulations, and labor market laws. Examining the degree of alignment or disconnect between these policy layers can provide valuable insights into their effectiveness. It would also be beneficial to assess how well existing public-private partnerships (PPPs) support workforce development goals. Additionally, such research could investigate the inclusivity of these systems in offering equitable opportunities for low-income, displaced, or underrepresented populations. Understanding how national policies can be adapted to reduce the risks of digital exclusion is crucial. This line of inquiry would help ensure that workforce development efforts are both effective and socially equitable.

7. Conclusion

The rapid advancement of emerging technologies, particularly artificial intelligence (AI), poses substantial challenges to contemporary workforce development efforts. As AI continues to redefine job roles and skill demands, workforce strategies must incorporate sustainable career development through both upskilling—enhancing existing competencies—and reskilling—acquiring new skills in response to job displacement. This dissertation investigates the impact of emerging technologies, in particular AI, on workforce development and introduces a sustainable, future-ready talent development framework that positions disruptive technologies at the core of workforce strategy. The proposed conceptual model highlights the interconnected roles of educational institutions, industry stakeholders, organizational

talent development divisions, employees, and policy frameworks in fostering an integrated approach to workforce readiness in technology companies and IT departments of organizations. The research methodology includes an extensive literature review and a qualitative case study involving talent development, leaders, and information technology professionals within a governmental organization.

The study aims to help organizational leaders and policymakers by providing actionable insights for strategic investment in digital workforce development. By capturing the perspectives of HR and talent development professionals, leaders, and employees, the research offers a practical framework adaptable across various organizational contexts. Distinct from earlier studies that primarily focus on the economic or ethical dimensions of technological change, this research underscores the strategic implications of AI on workforce transformation. It reveals the complex considerations talent development professionals must navigate in preparing a modern, future-ready workforce amid rapid global and technological shifts. Directions for future research are also proposed.

Declaration of Generative AI and AI-Assisted Technologies in Manuscript Preparation

During manuscript preparation, the authors used ChatGPT and Grammarly solely for limited language editing of selected sentences to improve clarity. No AI tool was used to generate research content, analyze data, interpret results, or prepare references, the ideas, argument, and intellectual contribution of the paper are entirely original. All AI-assisted suggestions were reviewed, revised where necessary, and approved by the authors, who take full responsibility for the final manuscript.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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Appendix A: Proposed Comprehensive Future Ready Talent Development Framework

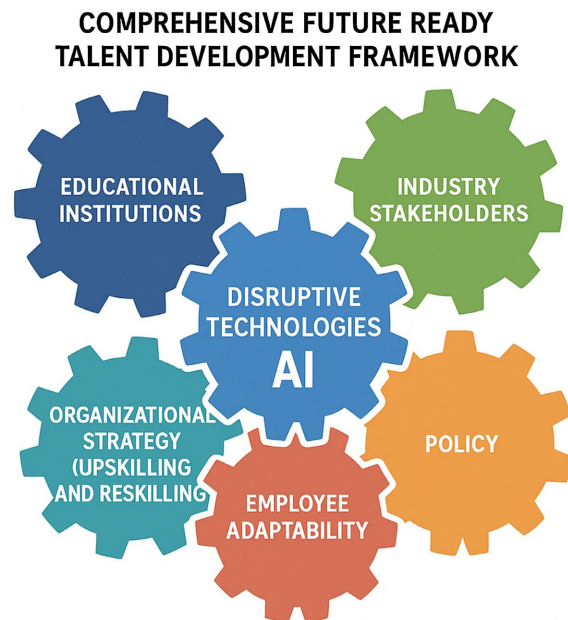


Figure A1. Proposed future ready talent development framework.