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Review

AI in the Workplace: A Systematic Review of Skill Transformation in the Industry

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Abstract: Artificial Intelligence (AI) applications streamline workflows, automate tasks, and require adaptive strategies for effective integration into business processes. This research explores the transformative influence of AI on various industries, such as software engineering, automation, education, accounting, mining, legal services, and media. We investigate the relationship between technological advancements and the job market to identify relevant skills for individuals and organizations for implementing and managing AI systems and human–machine interactions necessary for actual and future jobs. We focus on the essential adaptations for individuals and organizations to flourish in this era. To bridge the gap between AI-driven demands and the existing capabilities of the workforce, we employ the Rapid Review methodology to explore the integration of AI in businesses, identify crucial skill sets, analyze challenges, and propose solutions in this dynamic age. We searched the Scopus database, screening a total of 39 articles, of which we selected 20 articles for this systematic review. The inclusion criteria focused on conference papers and journal articles from 2020 or later and written in English. The selected articles offer valuable insights into the impact of AI on education, business, healthcare, robotics, manufacturing, and automation across diverse sectors, as well as providing perspectives on the evolving landscape of expertise. The findings underscore the importance of crucial skill sets, such as technical proficiency and adaptability, to successfully adopt AI. Businesses respond strategically by implementing continuous skill adaptation and ethical technology to address challenges. The paper concludes by emphasizing the imperative of balanced skill development, proactive education, and strategic integration to navigate the profound impact of AI on the workforce effectively.

Keywords: automation; skill development; workforce dynamics; artificial intelligence; technological advancements

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1. Introduction

In the ever-evolving landscape of technology, Artificial Intelligence (AI) is a powerful force transforming industries worldwide Wamba-Taguimdje et al. (2020). To truly comprehend the ground-breaking impact of AI, we need to explore its fundamental building blocks, including neural networks, which are like the digital counterparts of brains, enabling computers to learn and make decisions, much like humans. Machine learning is another crucial aspect where computers improve their abilities and adaptability without explicit programming (Kumar et al. 2023). At the same time, Big Data analytics involves navigating vast amounts of data to uncover insights. Deep learning, a form of machine learning, uses neural networks to tackle complex problems. These elements collectively indicate AI's multifaceted nature, redefining traditional notions of software engineering and execution (Kumar et al. 2023). This transformation extends beyond machines; it is about

reshaping how we work and what we work on. AI applications are used in various sectors to optimize workflow, automate routine tasks, and improve decision-making (Anagnoste et al. 2021; Brown and Berzin 2021). In the robotics industry, the emergence of chatbots enables natural interaction between humans and digital systems, highlighting the shifting dynamics of human-to-robot and robot-to-robot collaboration in the workplace (Anagnoste et al. 2021). The educational sector is also going through a paradigm shift, focusing on expediting skill growth through AI-driven learning possibilities (Faraj 2022), impacting the teaching and learning process. As universities struggle to fulfill their role in the digital age, preparing students for a dynamically changing job market becomes critical (Dos Santos et al. 2023; Faraj 2022).

AI technologies—such as ChatGPT—already significantly impact various sectors. AI enhances diagnostics, personalized medicine, and patient care in healthcare through advanced algorithms and conversational agents. The finance sector benefits from AI in automating fraud detection, risk analysis, and providing personalized investment advice. Retail and e-commerce are leveraging AI to optimize supply chains, personalize customer experiences and create targeted marketing content. AI improves efficiency and quality control in manufacturing through automation and predictive analytics. Education is being reshaped by AI through personalized learning and intelligent tutoring systems, with ChatGPT assisting in student guidance and material customization. Human Resources is seeing improvements in candidate screening and employee engagement with AI-driven solutions. Lastly, customer service is being revolutionized by AI-driven chatbots and virtual assistants, which handle complex inquiries and reduce the burden on human representatives. These sector-specific applications underscore AI's broad and transformative impact across different industries (George et al. 2023). Usman et al. (2024) highlight that the widespread adoption of AI brings about notable ethical, social, and economic issues, including job displacement, privacy risks, and algorithm biases.

In this context, businesses are increasingly turning to AI for development and cost reduction, leading to organizational reforms (Kumar et al. 2023). However, there is still much to be understood about the impact of AI adoption on employees' work outcomes. In this dynamic AI-driven work environment, job crafting—the process by which employees personalize their job roles to better fit their interests, skills, and values, enhancing job satisfaction and engagement—appears as a critical adaptability mechanism (Cheng et al. 2023; He et al. 2023). In the post-pandemic period, we have witnessed the increased adoption of Robotic Process Automation (RPA) in accounting, highlighting AI's transformational potential (Lui and Shum 2022). Industries such as services (He et al. 2023) and mining (Chirgwin 2021) are also undergoing significant shifts toward automation, improving productivity while raising concerns about job security and skill development (Chirgwin 2021; He et al. 2023). Professional services companies are utilizing digital technology and AI for skill-based planning, stressing innovation and service quality (Baral et al. 2022).

Robots and automation are transforming operations in the manufacturing industry, creating a demand for skilled workers (Bal 2021). The impact of these automation technologies on jobs is a concern in various industries and deserves careful consideration (Filippi et al. 2023). The advance of AI is bringing new changes in the job market, with almost all occupations being somehow impacted by AI adoption (Frey and Osborne 2017). The increase in technological unemployment (Lima et al. 2021) and changes in the skills demanded from workers (Lima et al. 2021) emphasizes the role of robots and autonomous systems in enhancing human capacity in different types of occupations (O'Donovan et al. 2023). The World Economic Forum has identified the shortage of digital skills as a substantial obstacle, given the digitalization and integration of robotics across industries (Jurczuk and Florea 2022).

In this work, we investigate the relationship between technological advancements and the evolving demand of the job market, focusing on the essential adaptations and developments necessary for individuals and organizations to adopt, manage, and interact with AI systems. Our research is focused on the growing gap between the demands of the job market, which are increasingly shaped by AI technologies, and the current capabilities

of the workforce. As industries continue to adopt AI, there is a risk of a mismatch between the skills that employers require and the skills that employees possess (Dos Santos et al. 2023). This can lead to inefficiencies in the workforce and job displacement (Bukartaite and Hooper 2023; Lui and Shum 2022), making it difficult to integrate AI into various sectors fully. Our investigation aims to explore the skills demanded for implementing AI in organizations.

This work employs the Rapid Review methodology (Cartaxo et al. 2018) to address this critical issue, offering a comprehensive analysis of integrating AI technologies into business operations and workforces across various industries, such as software engineering, automation, education, accounting, mining, legal services, and media. We analyzed the Scopus database, retrieving 20 articles for in-depth analysis. The choice of RR as the methodology is justified by its ability to synthesize existing research, providing timely and relevant insights quickly. Unlike Systematic Literature Reviews, which can take six months to two years, RRs typically take about five weeks, allowing for a faster response to rapidly evolving technological trends. This expedited process is crucial for understanding the swift advancements and their implications in AI technology, ensuring that businesses and stakeholders can make informed decisions based on the latest evidence. By defining broader research questions a priori, RR enables a more targeted search and efficient extraction of precise information from selected studies, maintaining academic rigor while significantly reducing the time required for comprehensive analysis Khangura et al. (2012).

The expected results of our research include a detailed understanding of how businesses integrate AI into their workforce, the specific skill sets crucial to successful AI adoption, the challenges that hinder this integration, and a diverse set of strategies businesses employ to address these challenges. We expect to identify patterns, trends, and variations across different industries, offering a comprehensive picture of the current landscape of AI integration and its impact on workforce dynamics. We aim to contribute to the literature by providing significant insights, identifying challenges, and proposing potential solutions in AI and the future of skills. This contribution includes informing strategies for enhancing workforce readiness in the AI era and facilitating a smoother integration of AI into the workplace.

The structure of this work is organized as follows: Section 2 explores the existing literature to examine the intersection of artificial intelligence and future skills. Section 3 describes the application of the Rapid Review methodology in detail. Section 4 presents the study's findings. Section 5 addresses the research questions, providing comprehensive responses. Finally, Section 6 presents the final remarks and summarizes our study's conclusions.

2. Literature

AI is no longer a future concept but is actively utilized in various domains. Soni et al. (2020) assert that nearly every industry employs AI technologies, encompassing healthcare, finance, gaming, and more. The adoption of AI is attributed to factors such as advancements in computer technology, enhanced transparency through code sharing, and the availability of open-source software. They propose a global trend where companies proudly identify themselves as "AI companies", underscoring AI's significant role in today's society. Progressing further, Soni et al. (2020) identify multiple ways AI positively influences businesses. They emphasize the quick identification of patterns in big data, rapid visualization and analytics, improved product design, and the provision of accurate insights. These advantages are anticipated to introduce novel service levels, increase profits, expand businesses, and enhance efficiency and cost structures. The study also establishes a connection between the success of AI and the broader concept of the Fourth Industrial Revolution, or Industry 4.0, highlighting AI's pivotal role in advancing other technologies. The discourse subsequently transitions to AI startups, acknowledging the United States as a prominent player in AI development and the growing interest from investors. Soni et al. (2020) recognize that AI heavily relies on software that is susceptible to vulnerabilities. They identify obstacles concerning systemic failure modes, repeatability, transparency, and

explainability in AI systems. Despite progress, there are instances where deep learning algorithms yield unreliable outcomes. Additionally, Soni et al. (2020) briefly touches upon ethical challenges in AI, encompassing trust, bias, and ethics issues. These aspects deserve attention for the commercial utilization of AI applications. Lastly, the research indirectly indicates the challenge of a shortage of skilled professionals in AI. As the adoption of AI grows, so does the demand for talent in this domain.

Rožman et al. (2023) present a comprehensive analysis of the transformative impact that artificial intelligence has on education. They strongly advocate for educational institutions to adapt to these changes. Specifically, they investigate students' perspectives regarding the emerging job opportunities in the Data and AI Cluster, underscoring the essential role of analytical thinking, problem-solving skills, and collaborative work in preparing students for a rapidly evolving job market. AI is a valuable asset in education, simplifying tasks and customizing learning experiences. Rožman et al. (2023) emphasize the importance of grasping numerical concepts and understanding data to enable students to thrive in an information-driven world. However, challenges loom, including concerns about privacy and potential biases. Failure to address these issues can hinder the seamless integration of AI into daily work routines. To overcome these obstacles and promote the effective adoption of AI, practical strategies are recommended by Rožman et al. (2023). Educational institutions should provide students with a solid foundation in AI knowledge, integrate AI concepts into regular coursework, and ensure that students possess proficiency in handling quantitative information. In addition, it is crucial to cultivate adaptable and AI-ready skills to build a versatile workforce. Addressing privacy concerns and promoting fairness are vital components of this endeavor. Rožman et al. (2023) propose that by implementing these strategies, educational institutions can fully exploit the potential of AI, leading to a more streamlined and efficient learning experience for educators and students. The study acts as a guiding compass, navigating the education path in a world where AI is integral to the educational journey.

Franken and Wattenberg (2019) explore the profound impact of Artificial Intelligence on the industrial workforce. They explore how AI applications, such as robotics and automation, drive transformative changes. The authors emphasize that AI affects algorithms and significantly influences people and organizational structures in various tasks, ranging from production work to management. de Lima (2021) proposes the development of a model designed to enable the collaborative assessment of the impact of AI and automation technologies on employment. Employing the Soft Design Science Research methodology, he introduced two innovative models. The first model uses crowd computing to gather comprehensive insights into the effects of automation technologies across various occupations. The second model utilizes groupware to facilitate a collaborative evaluation of the impact of specific technologies within an organization. Franken and Wattenberg (2019) envision AI to act independently, support human tasks, optimize resource usage, and introduce novel working models. They anticipate AI's autonomy. Regarding skills, the research underscores that success in the era of digitalization depends more on the adaptability of employees and executives than on technology or investment. The authors highlight the need for skills such as understanding AI applications, ensuring secure and transparent AI solutions, and grasping data-driven business models. Strategies are suggested to address concerns about job displacement and the possible societal consequences of AI, including reorganizing management, fostering cooperation, and prioritizing ongoing qualifications. The complexities of the digitalized working world call for flexible organizational structures, less hierarchical settings, and participative leadership. Franken and Wattenberg (2019) provide practical examples of AI applications, such as predictive maintenance and chatbots, to illustrate efficiency gains and improved customer experiences. However, they cautiously discuss potential risks related to data security and privacy. In conclusion, the authors stress the necessity of reimagining the role of people, work design, and organizational structures in the face of rapid digitization. They view AI not as a threat, but as a tool to enhance human work.

These works make it clear that while adopting AI brings numerous benefits across various sectors, it also presents several challenges that must be addressed. The subsequent section will outline the methodology used in this research to review the literature and provide a comprehensive understanding of these challenges and strategies to overcome them.

3. Methods

This work uses the Rapid Review (RR) methodology (Cartaxo et al. 2018) to conduct the literature review on AI and the future of skills. The primary aim of this work is to comprehensively analyze the integration of AI technologies into business operations and the workforce. Therefore, the goal is to propose a comprehensive set of skills necessary for AI adoption, address challenges, and provide practical solutions that align with their goals.

According to Khangura et al. (2012), RRs define broader research questions a priori, which enables a more targeted search and efficient extraction of precise information from selected studies. This approach maintains academic rigor while significantly reducing the time required for comprehensive analysis. Although this review was not registered in any formal database due to the simplifications inherent in the RR methodology, the review protocol and selection data are publicly available on Zenodo (Babashahi et al. 2024) to ensure transparency and accessibility. The following sections outline the procedural steps to find articles through this RR.

3.1. Research Design

To direct the Rapid Review, the following research questions (RQ) were employed:

RQ1: How are businesses integrating AI technologies into their workforce?
RQ2: What are the skill sets required for AI adoption?
RQ3: What are the skill gaps or challenges they face in adopting AI?
RQ4: What are the strategies employed to address these challenges?

In this work, RQ1 explores how organizations or businesses incorporate AI into their daily operations and workforces. RQ2 identifies the essential skills and knowledge required for the effective use of AI. RQ3 examines the challenges encountered during the adoption process. Ultimately, RQ4 explores the strategies and solutions employed by businesses to address these challenges, offering insights into the steps taken to ensure the successful integration of AI technologies.

3.2. Search Strategy

Scopus was used as the primary database to uncover the main studies because of its reputation for comprehensive multidisciplinary literature coverage. It comprises various relevant digital libraries (Cartaxo et al. 2018) and can mitigate the database gap and provide a representative set of articles for the research topic (Motta et al. 2019). The search string was refined to find a balanced quantity and quality yield. Table 1 shows the specific string employed in this RR.

Table 1. Search string used in Scopus database.

Search String
TITLE ((AI OR “Artificial Intelligence” OR “Machine Leaning” OR robot* OR automation) AND (workforc* OR employ* OR skill*) AND (gap* OR challeng* OR obstacl* OR strateg* OR soluti* OR future*)) AND PUBYEAR > 2019 AND (LIMIT-TO (LANGUAGE , “English”)) AND (LIMIT-TO (DOCTYPE , “ar”) OR LIMIT-TO (DOCTYPE , “cp”))

The search was conducted on 14 November 2023, with a time restriction set from 2020 until the search date.

3.3. Selection Procedure

Selecting articles involved excluding those published before 2020, reading the titles and abstracts, and reviewing the full articles. The inclusion criteria for selecting studies are

- The document must be published in 2020 or after.
- Document types were limited to conference papers and journal articles.
- The language of the document was limited to English.
- The study must answer at least one research question.

The exclusion criteria for selecting studies are

- Abstracts, editorials, reviews, or other publication types not considered as primary study.
- Short papers.
- Gray literature, such as news and blogs.

It is important to note that only one researcher performed the screening process. However, this approach aligns with the Rapid Review methodology, allowing such simplifications to expedite the review process. While we acknowledge that a single person's analysis may introduce some bias, this methodology ensures a timely and efficient review.

Figure 1 shows the selection procedure results, according to the PRISMA flow diagram (Haddaway et al. 2022). The search was made in Scopus, returning 39 documents.

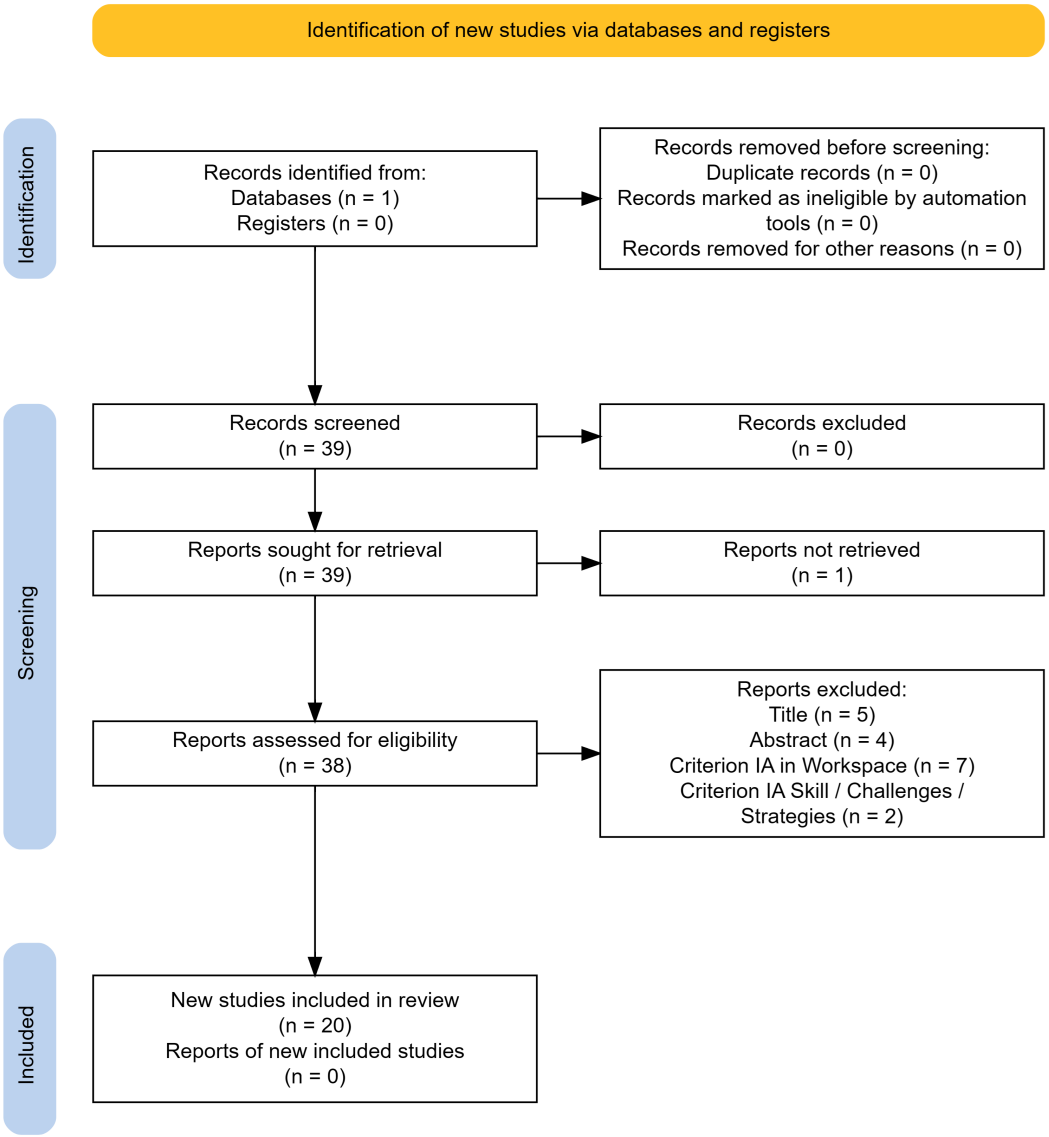

Figure 1. PRISMA flow diagram for this Rapid Review.

We excluded one article due to lack of access. The remaining 38 documents were screened by a solo researcher, analyzing titles—excluding five documents—and abstracts—excluding four documents. The remaining articles were analyzed for eligibility and focused on their alignment with the research questions. We excluded 9 papers for not answering the research questions: 7 failed to discuss AI in the workplace, and another 2, although included in the discussion of AI in the workplace, failed to present discussions about skills, challenges, or strategies for AI adoption. At the end of the analysis, 20 papers were selected.

Following the PRISMA statement (Page et al. 2021), we also considered studies that initially appeared to meet the inclusion criteria but were ultimately excluded upon full reading. For instance, Cheng et al. (2023) discuss how employees face challenges in organizations increasingly adopting artificial intelligence (AI) as their work environment changes. Although this paper discusses challenges and AI adoption, it was excluded in the final step of the screening process as it did not adequately answer at least one of the specified research questions, thus failing to meet the inclusion criteria.

4. Results

This section presents the results found in this review. First, we briefly summarize the data found, and perform a thematic analysis. Next, we describe a summary of the articles found. Then, we present a synthesis of the findings concerning the research questions.

4.1. Synthesis of Data

To synthesize the 20 primary studies selected, a narrative summary will summarize the results regarding AI adoption, future skills, challenges, and strategies with the research questions. Also, the studies were grouped due to their similarities in context. The following sections will present this synthesis. The distribution of articles is presented in Table 2.

Table 2. List of the Selected Papers.

Title	Year	Reference
The Current State of Software Engineering Employing Methods Derived from Artificial Intelligence and Outstanding Challenges	2023	Kumar et al. (2023)
The Role of Chatbots in End-To-End Intelligent Automation and Future Employment Dynamics	2021	Anagnoste et al. (2021)
A Proposal to Employ Artificial Intelligence Applications in Developing Prince Sattam Bin Abdulaziz University Students' Future Skills	2022	Faraj (2022)
Linking employees' challenge-hindrance appraisals toward AI to service performance: the influences of job crafting, job insecurity and AI knowledge	2023	He et al. (2023)
Impact of Robotic Process Automation on Future Employment of Accounting Professionals	2022	Lui and Shum (2022)
Skills development and training of future workers in mining automation control rooms	2021	Chirgwin (2021)
Role of Digital Technology and Artificial Intelligence for Monitoring Talent Strategies to Bridge the Skill Gap	2022	Baral et al. (2022)
Automation technologies and their impact on employment: A review, synthesis and future research agenda	2023	Filippi et al. (2023)
Empowering future care workforces: scoping human capabilities to leverage assistive robotics	2023	O'Donovan et al. (2023)
Future-oriented digital skills for process design and automation	2022	Jurczuk and Florea (2022)
Automation, artificial intelligence and future skills needs: an Irish perspective	2023	Bukartaite and Hooper (2023)
AI-Assisted Enhancement of Student Presentation Skills: Challenges and Opportunities	2022	Chen et al. (2022)
A Methodological Framework to Predict Future Market Needs for Sustainable Skills Management Using AI and Big Data Technologies	2022	Aljohani et al. (2022)

Table 2. *Cont.*

Title	Year	Reference
A Study of the Influence of Artificial Intelligence and Its Challenges: The Impact on Employees of the Legal Sector of Mauritius	2023	Beebeejaun and Gunputh (2023)
Automation in Colombia: assessing skills needed for the future of work	2022	Jones et al. (2022)
Challenges of Employing Artificial Intelligence Technologies in Iraqi Media Institutions (A Field Study)	2023	Ibrahim and Al-Hiti (2023)
Determining the human to AI workforce ratio—Exploring future organizational scenarios and the implications for anticipatory workforce planning	2022	Farrow (2022)
Human Rights, Employee Rights and Copyrights—Parallels of AI Enablers and Obstacles Across Occupations in Human-Centric Domains	2021	Saukkonen et al. (2021)
Plan and Develop Advanced Knowledge and Skills for Future Industrial Employees in the Field of Artificial Intelligence, Internet of Things and Edge Computing	2022	Paśko et al. (2022)
Skill Learning Strategy Based on Dynamic Motion Primitives for Human–Robot Cooperative Manipulation	2020	Li et al. (2020)

4.2. Thematic Analysis

This section synthesizes the results by conducting a deep comparative analysis within each article group. The distribution of articles will be demonstrated in six categories. Most articles focus on organizational and manufacturing context, education and academics, and automation technologies. The first group (Baral et al. 2022; Chirgwin 2021; Farrow 2022; Jurczuk and Florea 2022; Saukkonen et al. 2021) investigates the role of digital technology and AI across industries. The second group (Aljohani et al. 2022; Chen et al. 2022; Faraj 2022; Paśko et al. 2022) focuses on integrating AI in education. The third group (Bukartaite and Hooper 2023; Filippi et al. 2023; Jones et al. 2022; Kumar et al. 2023) explores the impact of automation and AI technologies on employment and skills. The next group, Robotics (Li et al. 2020; Lui and Shum 2022; O'Donovan et al. 2023), focuses on the impact of robotics in different sectors. Media and Legal (Beebeejaun and Gunputh 2023; Ibrahim and Al-Hiti 2023) explores the impact and challenges of AI on employees in the media and legal sector. The last group, Service Industry (Anagnoste et al. 2021; He et al. 2023), revolves around integrating advanced technologies in service-oriented industries. Through this synthesis, we can draw a clearer picture of the current state and potential trajectory of AI integration, as well as the insights and implications for skills development and workforce dynamics. The categorization of article groups is presented in Table 3.

Table 3. Article grouping by subject.

Group	Subjects	Articles
Organizational and Manufacturing Industry	Mining; workforce in services companies, corporations, entrepreneurs, and governments; manufacturing and skills in Europe; human–AI strategy in organizations; AI in medical care, HRM, and music composition	Baral et al. (2022); Chirgwin (2021); Farrow (2022); Jurczuk and Florea (2022); Saukkonen et al. (2021)
Education and Academic	Future skills at university; undergraduate presentation education; future skills for students, universities, and employers; student education and technology innovation	Aljohani et al. (2022); Chen et al. (2022); Faraj (2022); Paśko et al. (2022)
Automation and AI Technologies	Software engineering; employment in occupations and industries; public and private organizations; Colombian and USA job market and economics	Bukartaite and Hooper (2023); Filippi et al. (2023); Jones et al. (2022); Kumar et al. (2023)

Table 3. *Cont.*

Group	Subjects	Articles
Robotics Industry	Accounting and finance profession; health and social care sectors; human–robot cooperation	Li et al. (2020); Lui and Shum (2022); O'Donovan et al. (2023)
Media and Legal Industry	Law firms, lawyers, judges, legal advisors, legal departments in businesses; media institutions	Beebeejaun and Gunputh (2023); Ibrahim and Al-Hiti (2023)
Technology in Services Industry	Customer service, sales, marketing, banking, insurance, and healthcare; hospitality	Anagnoste et al. (2021); He et al. (2023)

4.3. Summary of Selected Articles

Kumar et al. (2023) provide a comprehensive overview of the current state of software engineering, focusing specifically on integrating methods derived from AI. In their study, they explore the potential impact of AI on traditional roles within the field of software development. They explore concepts such as "software 2.0", where AI, particularly neural networks, may replace human-performed programming.

Anagnoste et al. (2021) address the role of chatbots in end-to-end intelligent automation within the context of rapid technological advancements and their influence on employment dynamics. Their objective is to guide organizations in making informed decisions regarding digital transformation, emphasizing factors that affect the successful adoption of automation solutions. The study extensively examines robotic process automation, AI, and the integration of chatbots for comprehensive automation. Additionally, a case study is included to illustrate the successful deployment of a chatbot in the healthcare industry.

Faraj (2022) proposes the integration of AI applications within the education system of Prince Sattam Bin Abdulaziz University (PSAU) to develop students' future skills. The author emphasizes the importance of AI in achieving sustainable development goals and evaluates the readiness of PSAU students for AI adoption. The study assesses the requirements for employing AI applications, explores the future skills necessary for the job market, and outlines a proposal for aligning education with industry needs.

He et al. (2023) investigate the impact of employees' assessments of AI within the service industry, focusing on the hospitality sector. Their study examines how these assessments influence job-related outcomes such as job crafting, job insecurity, and service performance. The researchers utilize a sample of participants with AI experience in the service sector and employ established scales to measure various constructs. The study also discusses their findings' theoretical and practical implications, providing managers with recommendations and directions for future research.

Lui and Shum (2022) explore the effects of Robotic Process Automation on the future employment of accounting professionals, especially considering the accelerated adoption of RPA during the COVID-19 pandemic. The study investigates students' perceptions of RPA's influence on accounting careers and examines how education shapes these perceptions.

Chirgwin (2021) presents the skills development and training of workers in mining automation control rooms, specifically focusing on the role of Mine controllers. She highlights the industry's shift towards automation and the challenges posed by the lack of well-defined roles in this context. The research methodology includes qualitative data collection methods such as observations, interviews, content analysis, and audits. The study contributes to the field by addressing the challenges and opportunities in the skill development of mine controllers within the context of mining automation.

Baral et al. (2022) discuss how professional services companies use digital technology and AI to address skill gaps. The study emphasizes the adoption of AI for large-scale skill development and forecasts a significant global expenditure in this area. The research methodology involves experiments, data analysis, and the testing of hypotheses. Both primary and secondary data collection approaches are employed to study skill gaps across various organizations and examine various models for skill gap analysis.

Filippi et al. (2023) examine the impact of automation technologies, such as AI and industrial robots, on employment. They review the existing literature, highlighting the intricate and uncertain nature of these effects. The authors find that the impact of automation varies across different levels of analysis, industries, and worker characteristics. Moreover, they discuss the potential implications of these findings for both management and public policy.

O'Donovan et al. (2023) focus on the intersection between healthcare professionals and assistive robotics to identify the essential human capabilities for effective collaboration. Through a year-long co-design project, the researchers engage stakeholders, including healthcare professionals, to identify the required key knowledge, skills, and capabilities. The stress of the study is to understand and promote responsible, safe, and ethical use of physically assistive robotics in dynamic care settings.

Jurczuk and Florea (2022) shed light on the challenges faced by industries in the era of Industry 4.0 and smart factories, particularly highlighting the shortage of digital skills. The authors stress the need for an extensive digital skills framework adapted to the specific demands of the Factory of the Future. To address this issue, they employ a multi-method approach that includes a literature review, a survey-based competency framework, and an exploration of the evolving interaction between humans and machines. The research contributes to ongoing discussions on competency needs in the job market and provides valuable insights for future research and educational pathways.

Bukartaite and Hooper (2023) navigate the impact of the Fourth Industrial Revolution on the future of work in Ireland, focusing on automation, AI, and the changing skills required for knowledge workers. The authors draw on insights from interviews with professionals to discuss the shift towards lifelong learning, changes in skill requirements, and the effect of automation on Irish Small and Medium-sized Enterprises (SMEs). The research aims to provide valuable perspectives for understanding and preparing for the evolving workforce in the age of automation and AI.

Chen et al. (2022) investigate the use of AI to enhance university students' presentation skills, especially for those learning English as an additional language. The authors address the challenges associated with traditional teaching methods and propose an AI-assisted online platform. The study employs a mixed research approach, combining quantitative and qualitative methods, including a beta test with student participants from engineering and humanities disciplines, to evaluate the platform's effectiveness.

Aljohani et al. (2022) examines how to align young Saudi professionals' skills with the job market, aiming to bridge the gap between required and acquired skills. The authors utilize big data and AI to predict future skill needs, particularly emphasizing the Vision 2030 goals. A case study analyzing the Saudi job market is presented, offering recommendations in data science, NoSQL, and software engineering. This research aims to assist students, universities, and employers in matching skills to job opportunities, focusing on the technical aspects. The study is part of the "Thriving Economy Rewarding Opportunities" project, which utilizes smart systems for knowledge sharing, skill mapping, and learning monitoring. The paper contributes to Saudi Arabia's education and training investment efforts to prepare youth for the digital future and the Fourth Industrial Revolution.

Beebeejaun and Gunputh (2023) investigate the impact of integrating AI into Mauritius's legal sector on employees' performance and adaptability. The authors analyze the challenges, opportunities, and ethical considerations associated with using AI, drawing on interviews conducted with employees from 13 law firms. The primary objective is to clarify the perspectives of legal professionals regarding how AI influences their understanding, utilization, hurdles, and recommendations.

Jones et al. (2022) assess the consequences of automation on the future of work in Colombia, specifically focusing on technological advancements such as AI and robotics. The authors adopt a distinctive approach to identify skill sets resilient to automation, emphasizing work activities centered around human interaction. By utilizing the Clasificación Nacional de Ocupaciones (CNO) dataset, the study combines expert judgment with ma-

chine learning to forecast the likelihood of automation for various occupations in Colombia. This research underscores the significance of incorporating Latin American viewpoints into the global discourse on automation.

Ibrahim and Al-Hiti (2023) examine the challenges encountered by Iraqi media institutions when adopting AI technologies. The authors explore the transformative impact of AI on information gathering, content creation, and audience engagement. Additionally, insights are gathered from media professionals and decision-makers in Iraq to comprehend their perspectives on the obstacles and the importance of incorporating AI technologies in the media landscape.

Farrow (2022) explores the challenges and opportunities organizations face as they adapt to AI, considering different ratios of human-to-AI interaction in potential future scenarios. Employing a participatory approach, the study utilizes the "Futures Wheel" methodology in workshops involving diverse participants. The authors present five potential organizational scenarios, ranging from human-centric to AI-centric, and examine the implications of each scenario. This research aims to guide organizations in anticipating workforce strategies and comprehending the consequences associated with decisions regarding AI implementation.

Saukkonen et al. (2021) integrates three studies investigating the adoption of AI in Human Resource Management (HRM), primary health care, and music composition. The authors identify shared and specific opportunities and barriers in these domains by analyzing qualitative data from in-depth interviews with AI developers and experts. The study contributes valuable insights into the nuanced impact of AI adoption across different occupational fields, advocating for tailored approaches to maximize benefits and address challenges.

Paśko et al. (2022) present the educational landscape in the areas of AI, Internet of Things (IoT), and Edge Computing (EC) within European universities, with a particular emphasis on the Industry 4.0 era. The authors highlight the increasing significance of these technologies, identify gaps between academic offerings and industry demands, and explore the knowledge and perceptions of students. This research involves an extensive curricula review, developing a survey to evaluate student knowledge, and the subsequent analysis of survey results. The study's findings have implications for educational institutions, businesses, and policymakers, providing guidance in shaping future curricula and addressing the evolving needs of the job market.

Li et al. (2020) outline a skill acquisition strategy for collaborative manipulation between humans and robots, specifically focusing on exoskeleton robots used in rehabilitation training. The authors propose a two-level approach incorporating Dynamic Motion Primitives, Gaussian Mixture Models, admittance control, and an adaptive neural network controller. The objective is to facilitate compliant and safe interactions between humans and robots. The suggested strategy involves learning from demonstrations, addressing the challenges associated with multiple demonstrations, and ensuring effective robot behavior during collaboration.

4.4. Findings

In this section, a synthesis of the articles' findings is provided, aiming to gather insights into the varied integration of AI across industries and workforce sectors. Additionally, the goal is to identify emerging future skills, comprehend associated challenges, and explore strategies aligned with the four research questions.

4.4.1. RQ1: How Are Businesses Integrating AI Technologies into Their Workforce?

According to Kumar et al. (2023), businesses in the software engineering field are integrating AI technologies into their workforce and workflows, employing methods derived from artificial intelligence and emphasizing AI's role across different phases of the software development life cycle. It analyzes the evolution and impact of AI in software engineering, proposing that AI, including neural networks, could replace human-performed program-

ming. Key areas demonstrating AI's most notable achievements and potential in software engineering include the systematic evaluation of data in neural networks, structured analysis of big data pools, and the automation of routine tasks through algorithmic processes. The benefits of AI in shortening the development cycle, reducing expenses, and increasing productivity in software engineering are highlighted.

Based on Anagnoste et al. (2021), companies in different domains are employing automation on the cloud, in the premises, or through a hybrid approach, shifting their workloads to software robots, thus reshaping the old operating models, reducing routine tasks, and creating jobs that are better suited for humans. Messaging platforms are becoming the dominant communication channel worldwide and, combined with rising customer demand for self-services, empower companies to establish internal and external communications with zero need for a new user interface. Modern chatbots are impressive facilitators of human-to-robot interaction, and their market size is expected to continually increase in the coming years. Chatbots use advanced technologies such as Natural Language Processing and intent recognition to surpass language ambiguity and understand complex phrases. They can easily integrate with popular messaging applications like Messenger, WhatsApp, Slack, and Viber, and also connect with RPA robots and other technologies. These bots can create visitor profiles and customize responses to suit individual needs, initiate conversations, have a *personality*, continuously improve, and seamlessly transfer a conversation to a human operator when needed.

In Faraj (2022), the focus is on integrating AI technologies in education to prepare students for the future job market. They proposed using AI applications to develop students' future skills at the university, addressing five key areas: the learning environment, faculty members, courses, students, and graduates. In the pursuit of efficiency and cost savings, Lui and Shum (2022) indicate that companies are turning to Robotic Process Automation, a trend notably observed in accounting and finance departments where many tasks are routine and rule-based. Adopting RPA is most prominent in tax services, followed by advisory and assurance services among large accounting firms. Implementing AI in the mining industry is encountering challenges, and Chirgwin (2021) emphasizes the critical need to balance attention between humans and machines. This balance is essential to fully realize the promised benefits of autonomous mining technologies.

Nowadays, companies are actively investing in comprehensive skill development strategies to harness the benefits of AI. Baral et al. (2022) specifically explore professional services companies to see how they are adopting strategic planning by focusing on skills. The emphasis on skill-based planning reflects a proactive approach by organizations to align their workforce with the evolving landscape of digital technologies, particularly in the realm of AI.

In the healthcare sector, O'Donovan et al. (2023) highlight that the industry is increasingly adopting AI technology, aided by comprehensive frameworks and tools provided to hospital and health system leaders. These tools enable healthcare providers to work with assistive robotics, which leads to better care outcomes, increased productivity and efficiency in care delivery, and faster availability of life-saving treatments. As per Bukartaite and Hooper (2023), firms are actively integrating AI, particularly for automation and Industry 4.0. It is widely acknowledged that the automation of repetitive and simple tasks is widespread, focusing on enhancing overall efficiency. Chen et al. (2022) explores the implementation of AI in university education using an AI-assisted presentation platform. The platform is accessible through web browsers and enables students to improve their presentation skills independently. It comprises two modules: "Learning Units" which provide tips and "Course and Assignment" for submitting presentations for evaluation by AI and grading by the teacher. This approach demonstrates the effective integration of AI in university settings, providing students with customized learning experiences and valuable feedback on their presentation abilities.

According to Beebeejaun and Gunputh (2023), the legal sector is gradually adopting AI technologies. AI shapes the legal profession by assisting practitioners in various tasks,

such as identifying bias, offering initial consultation solutions, expanding information scope, and predicting legal case outcomes. A paradigm shift is highlighted towards adopting new technologies based on algorithmic developments in the sector. Ibrahim and Al-Hiti (2023) explore the transformative impact of AI on media work, encompassing the integration of artificial intelligence in information collection, content production, and audience interaction.

In line with Paśko et al. (2022), organizations strategically integrate AI technologies into their workforce and operations by aligning with market-driven trends, optimizing collaboration between technologies (technological synergy), and leveraging government support and programs. This approach effectively addresses industry concerns regarding the shortage of skilled professionals. In the context of robotics, as discussed by Li et al. (2020), the focus is on applying AI to enhance human–robot cooperative manipulation, with specific attention to exoskeleton robots. The idea is that industries can adopt AI through robotic systems that learn and replicate human skills, facilitating safe collaboration between humans and robots. Implementing a skill learning-based hierarchical control strategy is highlighted as a valuable framework for industries aiming to integrate AI technologies into their workforce, particularly in tasks involving human–robot cooperation.

Responding to RQ1, businesses increasingly integrate AI technologies into their workforce across various sectors to enhance efficiency, productivity, and innovation. In software engineering, AI automates routine tasks, accelerates development cycles, and reduces costs through advanced data analysis and neural networks. Industries like finance and healthcare adopt Robotic Process Automation and assistive robotics to streamline operations and improve outcomes. Companies leverage chatbots with Natural Language Processing for customer interactions, reducing the need for human intervention. Education sectors use AI to develop students' skills for future job markets, while the legal and media industries employ AI for content production, legal predictions, and audience engagement. Businesses also focus on skill-based planning to align their workforce with AI advancements, ensuring a strategic fit with market demands and technological progress.

4.4.2. RQ2: What Are the Skill Sets Required for AI Adoption?

According to Kumar et al. (2023), software engineers must adapt to AI tools, continuously updating skills in language processing, machine learning, machine vision, big data, and IoT technologies. The emphasis is on ongoing skill development to stay current in the rapidly evolving field of AI. As Anagnoste et al. (2021) indicate, combining technical skills, such as expertise in AI and chatbot development, with an understanding of business processes and workflows is essential for successful automation integration.

The proposal outlined by Faraj (2022) emphasizes the importance of individuals acquiring essential technical skills, including proficiency in digital, scientific, technological, engineering, mathematical, and programming domains. Soft skills such as a commitment to lifelong learning and proficiency in digital culture are crucial for AI success. He et al. (2023) underscore the significance of AI knowledge as a moderator influencing the consequences of AI evaluations on job insecurity and crafting. The use of rule-based RPA in Lui and Shum (2022) requires accountants to develop new skills for collaboration with automated systems. This represents a shift in skill requirements towards working alongside technology and emphasizes the need for ongoing expertise development. For mine controllers, Chirgwin (2021) in the context of AI adoption, exploring a mix of basic, social, and system skills is imperative. The importance of technical and emotional skills highlights a need for a combination of hard and soft skills.

Possessing the necessary skill sets is essential to integrate AI effectively (Baral et al. 2022). Achieving this involves employing innovative learning methods, with a particular emphasis on experiential learning. The focus is bridging the skills gap in rapidly changing education and training sectors. This covers a range of expertise, including fundamental, technical, leadership, and digital technology application skills. Based on recent findings by Filippi et al. (2023), Workers must adapt to technological changes by acquiring new profi-

ciencies, particularly digital skills, to minimize the risk of being replaced by automation. Higher education, technical skills, and proficiency in literacy and numeracy are key factors in reducing the risk of substitution.

O'Donovan et al. (2023) identify six human capabilities healthcare professionals value for working alongside robotics and autonomous systems. These capabilities include physical and sensory skills (performing tasks and perceiving the environment), cognitive skills (thinking, reasoning, and problem-solving), social and emotional skills (interacting with others and understanding emotions), adaptability (adjusting to new situations and learning from experience), systems thinking (understanding how different system parts work together), ethical decision-making (making ethical choices and understanding their implications). In the Factory of the Future context, Jurczuk and Florea (2022) emphasized the critical importance of digital skills, encompassing areas like process design and automation. The competencies include technical and soft skills, such as creativity, critical thinking, digital content creation, data analysis, and cybersecurity.

Bukartaite and Hooper (2023) focused on essential future skills, including programming, digital/ICT skills, data analytics, cybersecurity, creativity, communication, and emotional intelligence. The study underlines a shift towards soft skills, stressing the importance of balancing soft and hard skills, adaptability, and fostering a mindset that leads to innovation. In Chen et al. (2022), the significance of oral presentation expertise is highlighted. Aljohani et al. (2022) recommend skill sets for specific job sectors, encompassing machine learning, statistics, data visualization, web development, SQL development, IT management, and related proficiency.

In the legal sector, Beebeejaun and Gunputh (2023) underscore the need to provide law students with a foundational understanding of AI, integrating legal and technological knowledge. They suggest incorporating AI-related modules into curricula and offering continuous professional development courses. Jones et al. (2022) identified skills that reduce the probability of automation, including communication, interpersonal relationship management, decision-making, and other soft skills. The emphasis on social expertise indicates that fostering soft skills could safeguard against the risk of automation. Improving technical skills among media workers is recommended by Ibrahim and Al-Hiti (2023) to address the limited technical capabilities of AI. According to Paśko et al. (2022), future industrial employees should possess enough knowledge of AI, programming languages, and techniques including API, data processing, and big data management. The focus is project-based learning, labs, and workshops to facilitate practical AI, IoT, and Edge computing learning.

Responding to RQ2, adopting AI requires a diverse skill set encompassing technical and soft skills. Technical proficiency includes expertise in AI technologies, such as machine learning, natural language processing, machine vision, big data, IoT, and programming, and a solid understanding of digital, scientific, technological, engineering, and mathematical domains. Additionally, domain-specific knowledge, such as AI applications in healthcare, law, and manufacturing, is crucial. Soft skills are equally important, emphasizing lifelong learning, adaptability, ethical decision-making, creativity, communication, and emotional intelligence. Combining technical and business process knowledge enhances the integration of automation, and experiential learning methods are recommended to bridge the skills gap in education and training. AI adoption necessitates a balanced approach to developing hard and soft skills, ensuring individuals can effectively collaborate with and leverage AI technologies.

4.4.3. RQ3: What Are the Skill Gaps or Challenges They Face in Adopting AI?

In the context of skill gaps or challenges in adopting AI, as per Kumar et al. (2023), AI's capabilities in automating routine tasks are constrained when solving unique problems and creating novel routines, necessitating human intervention. Faraj (2022) identified obstacles in education encompassing infrastructure, faculty training, and program adjustments. They include weak trust between universities and industry, a shortage of qualified AI-focused

faculty, reliance on traditional curricula, and financial constraints. He et al. (2023) highlight employees' perception of AI as challenging and stressful, with job insecurity being a prominent concern. In the accounting field, Lui and Shum (2022) explore differences in how students and experienced accounting managers perceive the impact of Robotic Process Automation on jobs. Entry-level accounting jobs may be replaced, requiring adaptation to technological changes in the industry.

Challenges faced by mine controllers, as outlined by Chirgwin (2021), encompass a lack of clarity about their role, deficiencies in training and career advancement, concerns about mental and physical well-being, task overload, and gaps in organizational understanding. Baral et al. (2022) indicate that small and fast-growing firms face a "skills paradox" with frequent job changes, lack of education and training, and communication problems. Additionally, digital technology and AI encounter limitations due to networking issues, lack of training, and infrastructure challenges affecting AI effectiveness. Filippi et al. (2023) point out that several factors impede the adoption of automation, such as labor costs, regulations, and societal preferences favoring human workers. Lower-skilled individuals exhibit resistance to automation, potentially resulting in a skills gap.

According to O'Donovan et al. (2023), navigating robotics systems introduces challenges such as ambiguity in user requirements, uncertainties regarding autonomy, and the necessity for clear decision-making in system design and operation. Concerns about the suitability of technical features may also indicate potential gaps in understanding and utilizing robotic functionality. Jurczuk and Florea (2022) highlight obstacles in digital transformation, encompassing a shortage of digital skills affecting the development of the Factory of the Future, demands for cognitive and domain-specific skills, and shifts in job requirements requiring new digital design competencies. These factors contribute to a gap in the education system. Skill gaps, particularly in critical thinking and self-management, create barriers to adopting advanced technologies. Bukartaite and Hooper (2023) also note the challenge of predicting expertise due to the rapidly evolving nature of careers. A lag in technology integration, especially in SMEs, is attributed to mindset, financial resources, lack of awareness, and a mismatch between graduate skills and job market demands.

The education-related challenges identified by Chen et al. (2022) encompass a grading burden for teachers, the demand for automated grading assistance, students' discomfort with oral presentations, particularly in engineering, and a call for additional training in delivery skills for teachers and students. Aljohani et al. (2022) emphasize the lack of strategic research and planning for skill-building in the young generation and aligning young professionals' skills with the job market. Beebeejaun and Gunputh (2023) outline obstacles to AI adoption within the legal sector, covering concerns about lawyers' autonomy, resistance to change, worries about data privacy, skepticism, and high acquisition costs. Additionally, challenges involve addressing cybersecurity risks and implementing safeguards against biased AI tools. As noted by Jones et al. (2022), companies are grappling with the challenge of finding skilled human capital, underscoring the necessity for skills resistant to automation to mitigate potential skill gaps.

Hurdles encountered by Ibrahim and Al-Hiti (2023) in media institutions involve weak technical capabilities, resistance to new roles, difficulties in verifying data sources, limited knowledge of AI capabilities, and difficulties in attracting talent. Organizational scenarios based on Farrow (2022) pose challenges, including considerations of time context, implications of human-to-AI ratio changes, potential biases, displacement of human workers, loss of natural decision-making and accountability issues, potential loss of human skills, potential social disruption, loss of empathy, and negative impacts on human well-being as well as concerns about AI becoming a "bully boss". Legal and ethical uncertainties in AI adoption are evident across various domains, as represented by Saukkonen et al. (2021), specifically in HRM, primary health care, and music composition. Based on Paśko et al. (2022), there is a gap between industry needs and academic knowledge and a shortage of experts in IoT, AI, and EC applications. This includes low awareness of EC technologies,

limited integration of cutting-edge technologies in academic curricula, and knowledge gaps among students in applying AI, IoT, and EC to industrial problems.

Responding to RQ3, adopting AI faces several skill gaps and challenges across different sectors. As highlighted by various studies, these challenges include the need for human intervention in complex problem-solving despite AI's capability to automate routine tasks, deficiencies in education infrastructure, lack of faculty training, and outdated curricula. Trust issues between academia and industry, financial constraints, and a shortage of qualified AI-focused educators exacerbate these problems. Employees often perceive AI adoption as stressful, fearing job insecurity and the demand for adapting to new technologies. Specific industries, such as accounting, face replacing entry-level jobs, necessitating a skill shift. Other sectors, like mining and small, fast-growing firms, struggle with role clarity, training, career advancement, and communication issues. Organizational challenges include resistance to change, cybersecurity concerns, and ethical and legal uncertainties. Additionally, gaps in digital skills, critical thinking, and self-management hinder AI adoption, with financial resources, mindset, and a mismatch between graduate skills and job market demands further complicating the integration of advanced technologies.

4.4.4. RQ4: What Are the Strategies Employed to Address These Challenges?

The first strategy in tackling the challenges of AI adoption, as proposed by Kumar et al. (2023), emphasizes software engineers' continuous adaptation of skill sets. This adaptation is essential for effectively incorporating AI tools into their practices. In AI adoption, businesses must select solutions tailored to their current and future needs, ensuring a satisfactory return on investment. Anagnoste et al. (2021) underscore the importance of aligning these solutions with employees' skills and workflows during the automation implementation process. This involves careful planning to integrate the automated workforce, manage its impact on human workers, and create pathways for new career opportunities. Ethical use of technology is crucial in this transformation.

In education, Faraj (2022) outlines various strategies, including enhancing infrastructure, reconsidering academic programs, training faculty members and students in various future skills, creating partnerships with relevant institutions, and incorporating AI technologies into education. Practical approaches from He et al. (2023) are recommended for adopting AI, including surveying employees' opinions on AI, encouraging a positive mindset towards obstacles, assisting employees in shaping their roles (job crafting), and customizing AI training for better performance. In addressing the challenges accountants face, Lui and Shum (2022) suggest that accounting professionals should adapt to technological changes, emphasizing the importance of evolving accounting education to prepare students for the changing profession and the requirement for lifelong learning. Acknowledging the crucial role of human factors in mine control, Chirgwin (2021) introduces a comprehensive Human Systems Integration (HSI) framework. This framework underscores a novel training approach considering hard and soft skills for mine controllers. Moreover, it sheds light on industry implications, underscoring the need for a stronger focus on skills development.

According to Baral et al. (2022), businesses can employ various strategies, utilizing models such as Strengths, Weaknesses, Opportunities, and Challenges (SWOC) analysis, Gap Analysis Tools, McKinsey 7s, the Nadler–Tushman Congruence Model, and the Burke–Litwin Causal Model. Additionally, Baral et al. (2022) recognizes the critical role of digital technology and AI in effectively addressing the skill gap. Filippi et al. (2023) suggest strategies, including restructuring work activities or providing training for workers. They underscore the significance of public policies encouraging firms to adopt automation technologies while ensuring worker protection. O'Donovan et al. (2023) present methods for tackling obstacles such as system-wide training for various staff, legal teams, procurement officers, safeguarding and risk officers, and regulatory gatekeepers. Additionally, training and considering features of technology design, infrastructure configuration, and organizational culture are underlined. Jurczuk and Florea (2022) indicates the requirement for a comprehensive digital skills framework tailored to the Factory of the Future's needs.

Bukartaite and Hooper (2023) examine effective recruitment strategies, including prioritizing candidates with positive attitudes and learning agility, utilizing remote work to access a broader talent pool, and creating an appealing employee value proposition. Additionally, the authors advocate for talent sharing across companies, fostering partnerships, encouraging a culture of intrapreneurship, and promoting lifelong learning. These practices collectively enhance collaboration and productivity within the work environment. In developing an AI-assisted platform, Chen et al. (2022) propose approaches that include designing an online AI-assisted presentation training platform, using AI tools for assessment, conducting beta tests to examine reliability, and exploring student responses to identify areas of improvement. In Aljohani et al. (2022), a significant emphasis is placed on the crucial role of digital technology and AI in addressing skill gaps.

In the legal industry, Beebeejaun and Gunputh (2023) explore approaches that involve educating and training employees to embrace changes, establishing ethical guidelines for AI developers, and implementing public policies to promote the adoption of AI. Jones et al. (2022) offer specific proposals for higher education, focusing on developing communication, social, and managerial expertise alongside technical expertise. Moreover, corporate leadership is advised to formulate strategies for skills development, and policymakers are encouraged to allocate resources to support workers at the risk of automation. In media institutions, Ibrahim and Al-Hiti (2023) introduce methods that involve harnessing AI for information gathering, fostering collaborations with experienced entities, allocating financial resources, and coordinating educational initiatives and training programs.

Farrow (2022) recommends analyzing macro themes through the Futures Wheel methodology to tackle challenges in AI adoption. This anticipatory approach to workforce design with a longer-term focus aligns workforce design with digital strategies, evaluating the ideal human-to-AI workforce ratio, addressing broader ethical concerns, developing models for anticipatory workforce design, investigating operational model changes needed for broader definitions of diversity, and supporting a scenario of *AI and human cooperation*. Regarding occupations in human-centric domains, there is an emphasis on customizing AI solutions to particular sectors rather than relying on generic approaches. Additionally, Saukkonen et al. (2021) advocate for integrating ethical and legislative components into a revised Technology Acceptance Model.

According to Paśko et al. (2022), courses of action to address challenges involve developing or adjusting educational content, training a new generation of AI, IoT, and EC experts, aligning educational curricula with industry needs, forming partnerships with industries, supporting practical learning through internships, and incorporating real-world case studies in education. Projects like Planet4 contribute to bridging the gap between academic knowledge and industry requirements. In robotics, Li et al. (2020) propose a two-tiered control strategy for human–robot teamwork. The upper level learns motor skills from human demonstrations using dynamic motion primitives and a Gaussian mixture model. At the lower level, the strategy ensures the robot's compliance during human interaction with admittance control and an adaptive neural controller. Experimental results demonstrate the strategy's success in cooperative tasks, showing effective learning and control for compliant robot-human interaction.

Responding to RQ4, the challenges of AI adoption have been addressed by several strategies. In business, adapting the skill sets of software engineers, aligning AI solutions with workforce capabilities, and ensuring ethical use is crucial. Education institutions focus on infrastructure enhancement, curriculum revision, faculty and student training, and industry partnerships. Practical approaches involve surveying employee opinions, fostering positive mindsets, and customizing AI training. In the legal sector, strategies include employee education, ethical guidelines for developers, and policy promotion. Recruitment strategies prioritize learning agility and positive attitudes while advocating for talent sharing and lifelong learning. A balance between technical and soft skills and policy support for skill development is emphasized in academia. Media institutions harness AI for information gathering and collaboration while supporting educational initiatives.

The Futures Wheel methodology aids workforce design, aligning human-to-AI ratios and addressing ethical concerns. Customized AI solutions for specific sectors and integration of ethics into technology acceptance models are advocated. Educational strategies involve curriculum alignment, industry partnerships, practical learning, and real-world case studies. A two-tiered control strategy in robotics facilitates human–robot teamwork, incorporating learning from human demonstrations and compliance during interaction.

5. Discussion

In this section, we discuss AI adoption across industries, including comparative analysis, the practical insights and implications of our findings, and a set of future potential skills (soft and hard) helpful at this moment. Finally, we present and discuss the limitations inherent to the methodology utilized in this work.

5.1. AI Adoption Across Industries

This section analyzes the adoption of AI in different sectors. From manufacturing to services, comprehending AI adoption yields invaluable foresight into these sectors.

5.1.1. Organizational and Manufacturing Industries

All articles acknowledge the transformative role of AI technologies in their respective domains. Chirgwin (2021) analyzes AI's impact on mine controllers, Baral et al. (2022) extend the scope to strategic planning in professional services, Jurczuk and Florea (2022) concentrate on challenges in the Factory of the Future, and Farrow (2022) alongside Saukkonen et al. (2021) explore future organizational scenarios and AI's effects on specific occupational fields, respectively. Adapting to AI technologies emerges as a common imperative across these diverse contexts. A versatile skill set is crucial in mine control, professional services, or the Factory of the Future. This involves technical proficiency coupled with soft skills, emphasizing system skills (Chirgwin 2021), innovative learning techniques (Baral et al. 2022), and a comprehensive digital skills framework (Jurczuk and Florea 2022). Baral et al. (2022) and Jurczuk and Florea (2022) stress the significance of continuous learning and adaptability to remain relevant in dynamic business environments.

Recognized challenges associated with AI adoption as each study discusses unique challenges. Chirgwin (2021) identifies challenges in training and career progression in mining control, and Baral et al. (2022) deal with the *skills paradox*, frequent job changes, education and training gaps, communication, infrastructure, and networking problems in professional services and businesses, and Jurczuk and Florea (2022) highlight the shortage of digital skills impacting the Factory of the Future. Farrow (2022) explores challenges in different organizational scenarios based on human-to-AI worker ratios, while Saukkonen et al. (2021) assess the legal and ethical uncertainties in specific occupational fields.

The strategic integration of AI technologies involves recognizing human factors in mine control (e.g., health effects, workload, cognitive tasks), holistic HSI framework, and training approach (Chirgwin 2021), utilizing models such as SWOC, Gap Analysis, McKinsey 7s, and digital technology in addressing skill gaps (Baral et al. 2022), and navigating the challenges through digital skills framework tailored to the specific needs of the Factory of the Future (Jurczuk and Florea 2022). Farrow (2022) and Saukkonen et al. (2021) highlight the importance of anticipatory workforce strategy, considering different organizational scenarios (Farrow 2022) and incorporating ethical and legal aspects to an updated Technology Acceptance Model (Saukkonen et al. 2021).

5.1.2. Education and Academic Industry

Faraj (2022) and Paśko et al. (2022) promote a comprehensive approach to AI adoption in education, emphasizing infrastructure enhancement, program updates, and faculty training. In contrast, the contribution of Chen et al. (2022) is more specific, focusing on enhancing presentation skills through an AI platform. Aljohani et al. (2022) contribute by providing insights into anticipating market requirements and harmonizing skills with

future job demands. Combining all these efforts can create a comprehensive framework for successful AI integration.

All articles underscore the importance of a diverse set of competencies for students to succeed in a future influenced by AI and emerging technologies to ensure that the students are well-rounded and adaptable, including soft skills—e.g., lifelong learning, digital culture, and oral presentation (Chen et al. 2022; Faraj 2022), and hard skills—e.g., programming, technological, engineering, mathematical, scientific, big data, data processing, machine learning, statistics, data visualization, web development, among others (Aljohani et al. 2022; Paśko et al. 2022).

Common challenges identified across the articles include the need for qualified AI-focused faculty (Faraj 2022), the discomfort of students with oral presentations (Chen et al. 2022), aligning expertise with market demands, and the gap between academia and industry (Paśko et al. 2022). Aljohani et al. (2022) indirectly highlight the young generation's lack of strategic research and planning for skill-building. Addressing these gaps emphasizes collaboration between educational institutions and industries.

Faraj (2022), Chen et al. (2022), and Paśko et al. (2022) propose common practical strategies, including creating partnerships, infrastructure enhancement, academic program updates, and faculty training (Faraj 2022), conducting beta tests, using AI tools (Chen et al. 2022), incorporating real-world case studies, and emphasizing industry collaboration (Paśko et al. 2022), which can form an effective AI integration in educational settings. And emphasizing practical learning through projects, labs, and workshops, ensuring students gain practical experience in AI, IoT, and Edge Computing (Paśko et al. 2022). While Aljohani et al. (2022) focus on predicting future market needs, indirectly suggesting the importance of staying ahead through proactive educational adjustments.

5.1.3. Automation and AI Technologies Industry

Kumar et al. (2023) and Bukartaite and Hooper (2023) both highlight the active adoption of AI in businesses, with their specific focus being on AI's role in software engineering (Kumar et al. 2023) and automation and Industry 4.0 (Bukartaite and Hooper 2023). In contrast, while not directly addressing business adoption, Jones et al. (2022) explore the probability of automation and technological advancements for various occupations.

All articles underscore the necessity of a dynamic skill set to navigate the challenges posed by AI technologies. Kumar et al. (2023) examine language processing, machine learning, and IoT technologies. In contrast, Filippi et al. (2023) and Bukartaite and Hooper (2023) highlight the importance of digital skills and a notable shift towards soft skills complementing technical skills. Additionally, Jones et al. (2022) pinpoint communication and interpersonal relationship management skills as particularly resistant to automation.

Regarding the challenges and limitations of AI, Kumar et al. (2023) point out that AI reaches its limits in solving unique problems, necessitating human intervention. Filippi et al. (2023) and Bukartaite and Hooper (2023) discuss challenges related to factors slowing down automation adoption, including labor costs and difficulty in predicting skills due to the rapidly evolving nature of careers. Automation has a significant impact on employment; Filippi et al. (2023) highlight the potential impact of automation on various levels, including industries and individual workers, while Bukartaite and Hooper (2023) and Jones et al. (2022) address the challenges related to skill gaps in critical thinking and the difficulties in identifying skilled human resources.

To implement essential strategies, Kumar et al. (2023) stress the ongoing adaptation of software engineers' skill sets to integrate AI tools. Meanwhile, Filippi et al. (2023) recommend restructuring work activities and encouraging employee training to mitigate the effects of automation on employment. Bukartaite and Hooper (2023) provide practical strategies such as utilizing remote work for a larger talent pool, building an attractive employee value proposition, and encouraging a culture of intrapreneurship and lifelong learning. In contrast, Jones et al. (2022) focus on strategies such as higher education for fostering communication, social, and managerial skills alongside technical expertise,

corporate leadership for developing skill enhancement plans, and policymakers to allocate resources for workers at risk of automation.

5.1.4. Robotics Industry

All articles recognize the adoption of AI technologies, particularly in the field of robotics, showcasing its impact on different sectors such as accounting (Lui and Shum 2022), healthcare (O'Donovan et al. 2023), and human–robot cooperative manipulation (Li et al. 2020). Lui and Shum (2022) emphasize the integration of Robotic Process Automation in accounting, highlighting efficiency and cost-cutting. O'Donovan et al. (2023) and Li et al. (2020) discuss the themes of efficiency and improved capabilities. O'Donovan et al. (2023) analyze the capabilities needed for healthcare professionals to work effectively with assistive robotics. In contrast, Li et al. (2020) focus on human–robot cooperation, specifically in using exoskeleton robots that learn and replicate human skills for safe collaboration.

Concerning skills for AI adoption, Lui and Shum (2022) stress that accountants need to acquire new expertise for collaboration with automated systems. In contrast, O'Donovan et al. (2023) outline six human capabilities essential for working with assistive robotics in health and care, including physical, sensory, cognitive, social, emotional, adaptability, systems thinking, and ethical decision-making proficiency.

Lui and Shum (2022) highlight the expectation gap between students and experienced accounting managers regarding the impact of RPA on jobs. Additionally, entry-level accounting jobs may be replaced, requiring adaptation to technological changes, while O'Donovan et al. (2023) address challenges such as ambiguity of user requirements, uncertainties about autonomy for robotics systems, and concerns about the adequacy of technical features, indicating potential skill gaps in understanding and utilizing robotic functionality.

Lui and Shum (2022) propose strategies emphasizing the importance of evolving accounting education to prepare students for the changing profession, underscoring the need for lifelong learning. Meanwhile, O'Donovan et al. (2023) suggest strategies involving system-wide training for various staff and consideration of technology design, infrastructure configuration, and organizational culture to address challenges. Ultimately, Li et al. (2020) introduce a skill-learning strategy based on dynamic motion primitives for human–robot cooperative manipulation, providing a framework for industries seeking to integrate AI technologies into their workforce.

5.1.5. Legal and Media Industries

Both articles recognize the gradual integration of AI technologies in their respective sectors, with Beebeejaun and Gunputh (2023) focusing on a paradigm shift towards adopting new technologies based on algorithmic developments in the legal sector and Ibrahim and Al-Hiti (2023) delving into the impact of AI on media institutions, exploring its effects on information collection, content production, and audience interaction, which underscore the evolving role of AI in shaping the contemporary media landscape.

Both articles highlight the need to adapt skill sets to the growing demands of AI, although in distinct professional domains. Beebeejaun and Gunputh (2023) emphasize the importance of shaping law students with a foundational knowledge of AI, proposing incorporating AI-related modules into legal education curricula. Conversely, Ibrahim and Al-Hiti (2023) recommend enhancing technical skills among media workers to overcome AI's limited technical capabilities, stressing the necessity for media workers to embrace new technical roles.

While Beebeejaun and Gunputh (2023) identify barriers to AI adoption in the legal sector, encompassing concerns about job obsolescence, resistance to change, data privacy issues, skepticism, high acquisition expenses, cybersecurity risks, and the need for protection against biased AI tools, Ibrahim and Al-Hiti (2023) shed light on challenges in the media sector. These challenges include weak technical capabilities, resistance to new roles, difficulty verifying data sources, lack of knowledge and understanding of AI capabilities, and difficulties attracting talent.

Beebeejaun and Gunputh (2023) and Ibrahim and Al-Hiti (2023) present proactive strategies in addressing challenges. Beebeejaun and Gunputh (2023) propose education and training projects for employees to overcome resistance to change. Additionally, it advocates for establishing ethical guidelines (or code of conduct) for AI program developers and recommends public policy projects to encourage AI integration in the legal industry. Similarly, Ibrahim and Al-Hiti (2023) emphasize collaboration with experienced entities, providing financial resources, organizing educational projects, and implementing training programs for media workers. Both articles underscore the importance of strategic approaches tailored to the specific requirements of their respective industries in embracing AI technologies.

5.1.6. Services Industry

AI adoption is multifaceted, as showcased by Anagnoste et al. (2021), and companies leverage automation across platforms. This transformative shift involves the migration of workloads to software robots, leading to a reshaping of operating models. The outcome is a reduction in routine tasks and the creation of job roles that are more aligned with human strengths. In parallel, He et al. (2023) explores the realm of employee appraisals of AI, particularly within the service industry, with a specialized focus on the hospitality sector (He et al. 2023). The analysis focuses on comprehending how AI impacts service performance. These articles provide a comprehensive view of AI implementation's diverse dimensions and impacts.

Anagnoste et al. (2021) highlights the importance of a comprehensive skill set, emphasizing the integration of technical skills, including AI and chatbot development expertise, with an understanding of business processes for effective automation. To complement this, He et al. (2023) underscore the significance of AI knowledge as a moderator, shaping the outcomes of AI appraisals on job crafting and job insecurity. This indicates the critical role of AI-related expertise for employees.

In the context of challenges, He et al. (2023) reveal that employees find AI challenging and stressful, expressing concerns about job insecurity. This highlights human workforce doubts regarding AI.

In formulating effective strategies for AI adoption, Anagnoste et al. (2021) advocate a careful selection of solutions aligned with present and future needs, emphasizing the importance of considering employees' skills and workflows during implementation. In contrast, He et al. (2023) propose strategic approaches, including surveying employee appraisals, fostering challenge appraisals, facilitating job crafting, and tailoring AI-related training for optimal performance. Furthermore, Anagnoste et al. (2021) underscore the ethical dimension, encouraging businesses to manage the impact of automation on human workers, create new career opportunities, and integrate automated workflows responsibly.

5.1.7. Comparative Analysis by Industry

AI's transformative role in the organizational and manufacturing sectors necessitates versatile skill sets that blend technical proficiency with soft skills like communication and adaptability. Key challenges include training gaps, skill shortages, and ethical concerns. Strategies often involve models and frameworks to address these gaps, such as digital skills frameworks tailored to specific organizational needs and anticipatory workforce strategies considering different organizational scenarios.

In contrast, the education and academic industry focuses on infrastructure enhancement, program updates, and faculty training to ensure students acquire balanced competencies. Challenges include aligning educational expertise with market demands and bridging the gap between academia and industry. Effective strategies involve forming partnerships, emphasizing practical learning through projects and labs, and anticipating future market needs to prepare students for AI-driven job markets. This sector uniquely stresses the importance of integrating AI-related education early on to ensure students are equipped with both soft and hard skills.

The automation and AI technologies sector requires a dynamic skill set to navigate the rapidly evolving landscape. Challenges include AI's limitations in solving unique problems, labor costs, and the unpredictability of skill demands. Strategies focus on continuous skill adaptation, restructuring work activities, and fostering a culture of lifelong learning. This sector uniquely emphasizes the critical need for digital skills complemented by soft skills to adapt to automation and Industry 4.0 technologies.

The robotics industry focuses on adaptability, systems thinking, and ethical decision-making. Specific challenges include expectation gaps in job impacts and skill gaps in understanding robotic functionalities. Strategies involve evolving educational programs to prepare students for technological changes, system-wide training for staff, and developing frameworks for human–robot cooperation. This industry uniquely addresses integrating human capabilities with robotic systems, particularly in sectors like healthcare and accounting.

The media and legal industries highlight distinct challenges, such as job obsolescence, resistance to change, and data privacy issues. Strategies include incorporating AI-related modules into educational curricula, establishing training programs for existing employees, and developing ethical guidelines for AI use. Public policy initiatives are also emphasized to facilitate AI adoption. These sectors uniquely stress the importance of overcoming resistance to change and ensuring ethical AI implementation to maintain trust and effectiveness.

Finally, the service industry aligns AI solutions with employee skills and workflows, addresses job insecurity, and manages ethical implications. Challenges include employees' stress and concerns about job insecurity due to AI. Strategies advocate for carefully selecting AI solutions, fostering challenge appraisals, and providing tailored AI-related training. This industry uniquely highlights the importance of considering employees' perspectives and ensuring AI enhances rather than disrupts service delivery.

5.2. Practical Insights and Implications

Practical insights and implications derived from the research conducted for the future of work across various industries are presented. Our conclusions were drawn from the analysis, first extracting insights from the results and then exploring the implications for achievable measures that should be taken to improve AI adoption.

The practical insights gathered from the results, shown in Table 4, highlight the growing significance of AI in reshaping work dynamics. Educational institutions should integrate AI applications to better prepare students for evolving job markets. Companies must focus on data analysis and automation to boost productivity. Balancing technical and soft skills is crucial for effective AI integration, emphasizing attitudes and learning agility. Communication skills are vital in resisting automation. Organizations need to anticipate challenges associated with AI adoption and invest in employee training tailored to AI competencies to navigate the AI-driven future successfully.

The practical implications in Table 5 explore the actionable steps to facilitate smoother AI adoption. Integrating AI tools into educational settings can enhance soft skills like presentation, focusing on improving student abilities. Implementing online AI-assisted platforms, conducting beta tests for reliability, and encouraging student responses ensure effective and seamless AI integration in university settings. Moreover, addressing employee concerns, particularly job insecurity, through positive appraisals of AI, job crafting assistance, and tailored AI-related training is essential. Continuous adaptation of skills for software engineers and workers affected by automation, promoting project-based learning, and aligning educational programs with market needs are integral steps. Collaborating with industries, customizing AI solutions to individual sectors, and investing in skill development strategies are crucial for ensuring responsible AI adoption and workforce readiness.

Table 4. List of practical insights.

#	Practical Insight
1	Educational institutions should focus on AI applications to enhance learning environments, faculty skills, course structures, and student experiences for the evolving job market.
2	Companies should focus on systematic data evaluation, structured big data analysis, and the automation of routine tasks to enhance development cycles and productivity.
3	Emphasize the importance of a balanced skill set, integrating technical and soft skills for effective AI integration.
4	Shift towards valuing attitude, learning agility, and generalist skills over specific technical skills, and maintaining a balance between soft and hard skills.
5	Highlight communication and interpersonal skills as crucial in resisting automation.
6	Recognize and address challenges associated with AI adoption, involving anticipatory workforce planning, skill development projects, strategic integration, technology design, infrastructure configuration, and organizational culture for successful AI adoption.
7	Health organizations should invest in comprehensive frameworks and tools to enable healthcare providers to work with assistive robotics, leading to faster availability of life-saving treatments.
8	Law practitioners should focus on foundational AI knowledge, integrating AI modules into curricula, and offering continuous professional development courses.

Table 5. List of practical implications.

#	Practical Implication
1	Integrate AI tools strategically into educational settings to enhance soft skills like presentation, focusing on improving student abilities. Implement online AI-assisted platforms, conduct beta tests for reliability, and encourage student responses to ensure effective and seamless AI integration in university settings.
2	The Factory of the Future requires a comprehensive digital skills framework to drive successful digital transformation.
3	Address employee concerns, particularly job insecurity, through strategies promoting positive appraisals of AI, job crafting assistance, and tailored AI-related training.
4	Foster continuous adaptation of skills for software engineers and workers affected by automation.
5	Advocate for incorporating project-based learning into educational programs to enhance practical skills and abilities.
6	Offer collective recommendations indicating the need for a multi-level approach, with corporate leaders and policymakers playing integral roles in shaping the future of work.
7	Emphasize the importance of collaboration with the industry to ensure the relevance of educational programs.
8	Proactively align educational programs with predicted market needs to better prepare students for emerging job opportunities.
9	Customize AI solutions to individual sectors, ensuring their relevance and effectiveness across diverse industries.
10	Promote the development of technical skills such as AI, machine learning, and big data, complemented by a focus on soft skills like adaptability, communication, positive attitudes, and a commitment to lifelong learning. Prioritizing these skills fosters a technically proficient, agile, collaborative workforce that is well-equipped for remote work and continuous learning.
11	Encourage proactive education and training strategies to bridge the expectation gap, prepare professionals for collaborative work with AI, and address obstacles related to ambiguity and technical features.
12	Establish strong connections with industries through internships, collaborative projects, and industry-driven curriculum development. develop or adjust educational content, train a new generation of experts, align curricula with industry needs, and support practical learning through internships to comprehensively bridge the gap between industry needs and academic knowledge.
13	Integrate chatbots with messaging platforms, leveraging natural language processing and intent recognition technologies to enhance human-to-robot interactions and foster communication and task automation.
14	Implement a skill-learning-based hierarchical control strategy for industries aiming to integrate AI technologies into their workforce, particularly in human–robot cooperation tasks.

Table 5. *Cont.*

#	Practical Implication
15	Invest in skill development strategies to adapt to RPA, addressing challenges in perception and ensuring ongoing expertise development.
16	Businesses should continuously adapt skill sets, align AI solutions with workforce skills, and address challenges through education, training, and a strong emphasis on ethical considerations to ensure responsible use.

5.3. Future Potential Skills

This section categorizes the future potential skills and competencies in the literature into hard (technical) and soft skills. Technical or hard skills encompass a range of competencies necessary for navigating the increasingly technology-driven landscape. These include proficiency in language processing, machine learning, machine vision, big data analysis, IoT-related technologies, programming, data analytics, cybersecurity, messaging platforms, chatbot development, natural language processing, intent recognition, robotic process automation, assistive robotics skills, human–robot cooperation, exoskeleton robotics, and various scientific and technological proficiency. These technical skills form the backbone of AI integration and technological advancement across industries, driving innovation and efficiency.

On the other hand, soft skills are equally crucial for success in the future workforce, complementing technical expertise and enabling effective collaboration, communication, and problem-solving. These soft skills include lifelong learning, adaptability, creativity, communication, emotional intelligence, decision-making, interpersonal, critical thinking, leadership, cognitive, social, emotional intelligence, and physical and sensory abilities. Soft skills are pivotal in navigating complex work environments, fostering innovation, and building resilient and adaptable teams capable of thriving amidst technological disruption and change. Table 6 illustrates the potential skills for the future.

Table 6. Future potential skills.

Technical/Hard Skills	Soft Skills
Language processing	Lifelong learning
Machine learning	Adaptability
Machine vision	Creativity
Big Data	Communication
IoT-related technologies	Emotional intelligence
Programming skills	Decision-making
Data analytics	Interpersonal skills
Cybersecurity	Critical thinking
Data visualization	Leadership skills
Chatbot development	Cognitive skills
Natural Language Processing	Social and emotional skills
Intent recognition	Physical and sensory skills
Robotic process automation	
Assistive robotics skills	
Human–robot cooperation	
Data verification skills	
Scientific and technological proficiency	
Engineering and mathematical skills	
Statistics	
IT management	

5.4. Methodological Limitations

A Rapid Review, while beneficial for providing timely evidence to inform decision-making, has several limitations. Firstly, the abbreviated timeframe often necessitates a narrower scope and less comprehensive search strategy, potentially leading to the exclu-

sion of relevant studies. This can result in a less thorough understanding of the topic. Additionally, Rapid Reviews may employ simplified appraisal and synthesis methods, which can compromise the rigor and reliability of the findings. The reliance on existing summaries and secondary sources, rather than conducting detailed primary data analysis, may also limit the depth of the review. Furthermore, the urgency to produce quick results might introduce bias and reduce the replicability of the review process. These limitations highlight the trade-off between speed and thoroughness, making it essential to consider the context and purpose when opting for a Rapid Review (Khangura et al. 2012).

6. Conclusions

The dynamic realm of technology, driven by the transformative impact of Artificial Intelligence, has brought about a paradigm shift in global industries. This work has explored the intricate relationship between technological advancement and the changing demands of the job market, underscoring the essential adaptations needed for individuals and organizations to flourish in this transformative era. As AI applications continue to optimize workflows and automate routine tasks, there are growing concerns about job displacement and the evolving skill demands of the workforce. The increasing gap between the skill sets required by industries that rely on AI and the current capabilities of employees presents a significant challenge. This could lead to inefficiencies in the workforce and make integrating AI smoothly across different sectors difficult.

This work conducted a comprehensive analysis within each article group using the Rapid Review methodology, and a deep comparative analysis was performed. The articles were categorized into six distinct groups based on their focus on investigating the integration of AI technologies into businesses within various domains. Our work aimed to understand how AI is being adopted by organizations, the crucial skill sets necessary for successful integration, the challenges that hinder this process, and strategies companies employ to address these challenges. The findings reveal varied perspectives on AI adoption across sectors: organizational, educational, automation, robotics, media, and services. Although the articles offer thorough insights, they frequently lack specific details on how businesses implement AI in their workforces and workflows.

However, this research shows that companies are changing industries by using automation and software robots to reshape operations more efficiently, especially by reducing routine tasks. Modern chatbots have become an increasingly popular tool that facilitates interaction between humans and robots across diverse sectors. In software engineering, AI is being used extensively throughout the development process, with the potential to replace human programming for more efficiency and cost savings. In education, AI is used to develop future skills, while companies invest in expertise development strategies to stay ahead of the curve. The media industry has also started using AI to provide information and content, addressing expertise shortages and keeping up with the latest trends. In the legal field, AI identifies biases and predicts legal case outcomes. AI improves human–robot cooperation in robotics, particularly exoskeleton robots, to replicate human skills for safer collaboration. In healthcare, AI technology is aiding healthcare providers to improve care outcomes. Identifying skill sets, challenges, and strategies for AI adoption varies among the papers, with some explicitly detailing these aspects and others providing a more contextual focus.

The key findings highlight the significant impact of AI in both organizational and manufacturing contexts, emphasizing the need for versatile skill sets. The strategic integration of AI involves recognizing human factors and domain-specific expertise and applying tailored models to each sector, such as Human Systems Integration and SWOC analysis. The essential skill sets required for successful adoption include technical proficiency, system skills, innovative learning techniques, and a comprehensive digital skills framework. Improving infrastructure, training faculty members, and prioritizing practical learning for successfully implementing AI is crucial in education. Students need to develop a diverse range of competencies, including digital culture, programming, engineering proficiency,

and the ability to continuous learning. Businesses that adopt AI face challenges that require a dynamic skill set, with strategies focusing on developing soft skills, ongoing adaptation, and lifelong learning. The automation and AI technology industry requires expertise in various technologies such as language processing, machine learning, and IoT. However, there are certain challenges, such as the inability of AI to solve complex problems and its impact on employment. To address the obstacles, it is essential to have skills like digital proficiency, critical thinking, and adaptability. The robotics industry emphasizes the need for collaboration with automated systems. Challenges involve expectation gaps, while skills encompass understanding robotic functionality, adaptability, and continuous learning. The media and legal sectors have challenges, such as job obsolescence and resistance. Strategies to address these challenges involve education, collaboration, ethical guidelines, and industry-tailored approaches. The required skill sets include technical proficiency, legal knowledge, and adaptability. The services industry is undergoing a transformation requiring a comprehensive set of skills. One of the challenges the sector faces is employee concerns about job security. These concerns can be addressed by carefully selecting solutions and responsibly integrating automation. Essential skills for success in this field encompass expertise in AI and chatbot development, understanding of business processes, and knowledge of ethical considerations. This work highlights the significance of adaptable skills and strategic approaches for successfully implementing AI across diverse industries.

This work contributes to understanding AI adoption and its impact on workforce dynamics. From the results obtained, key insights have been identified that can guide businesses and policymakers in navigating the challenges posed by AI technologies. It also highlights the importance of identifying versatile skill sets, the role of Human Systems Integration frameworks, SWOC analysis, sector-specific strategies for anticipating employee needs, ethical considerations, and the significance of lifelong learning strategies. These findings provide actionable points for organizations that aim to foster a workforce adaptable to AI advancements. Additionally, our findings emphasize the necessity of aligning educational programs with industry needs, fostering partnerships between academia and industry, and integrating soft skills into technical education to bridge the skills gap. These contributions provide a roadmap for educational institutions seeking to prepare students for the evolving job market influenced by AI.

While this work provides valuable insights into AI adoption in the workforce, it is important to acknowledge its limitations. One limitation arises from the dynamic nature of technology and its continuous evolution. The findings are based on the existing literature up to the cutoff date of this research, and the rapidly changing realm of AI may introduce new developments that were not covered. Furthermore, the generalizability of our results could be affected by the diversity in the literature across various industries and regions. Moreover, the Rapid Review conducted by a single individual might introduce bias into the selection process of articles.

Future research in this domain should address these limitations by regularly updating the literature review, ensuring that the insights reflect the latest advancements in AI. In addition, longitudinal studies can offer a more in-depth understanding of how AI integration evolves and impacts workforce dynamics. While this work provides valuable contributions to the current understanding of AI adoption and its effects on the workforce, recognizing these constraints opens avenues for future research that can build upon our findings and provide more nuanced insights into the multifaceted challenges and opportunities associated with the integration of AI technologies.

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