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ORIGINAL ARTICLE

Requirements for Developing Leaders' AI Competencies: A Systematic Review

Fatemeh Narenji Thani[1]*, Seyyed Hossein Mousavi[2], Mahsa Azizi[3]

1. Associate Prof., Department of Educational Administration and Planning, Faculty of Psychology and Educational Science, University of Tehran, Tehran, Iran
2. Ph.D., Planning Higher Education Development, Farhangian University, Zanjan, Iran.
3. Ph.D. student in Educational Management, Department of Educational Administration and Planning, Faculty of Psychology and Educational Science, University of Tehran, Tehran, Iran

Correspondence:
Fatemeh Narenji Thani
Email:
fnarenji@ut.ac.ir

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ABSTRACT

The study aimed to identify the Requirements for Developing Leaders' AI Competencies. This systematic literature review, spanning from January 2017 to March 2025, analyzes 26 articles retrieved from Google Scholar, Sage, Emerald, Springer, ScienceDirect, and PubMed. Building from the systematic review, the findings were synthesized and integrated to derive a clear and parsimonious AI competency requirements framework for leaders. To this end, the PRISMA framework was applied to establish a high-quality and transparent process. Naeem et al.'s (2023) thematic analysis framework was employed to analyze and interpret the findings from the included studies. The reliability of the final results was assessed using Cohen's Kappa method. This coefficient was found to be 0.73, indicating a high level of agreement between the coders. The findings elucidate the essential requirements for cultivating artificial intelligence competencies among leaders through three primary dimensions: organizational, technological, and individual requirements. This research contributes to the existing literature by identifying and categorizing the effective requirements for developing leaders' AI competencies in the era of AI

KEYWORDS

AI Competencies; Leadership; Systematic Review

EXTENDED ABSTRACT

INTRODUCTION

The world has become incredibly uncertain and turbulent due to the progressive changes that are constantly occurring (Pourkarimi & Azizi, 2025). This situation can lead to uncertainty and unpredictability, but also create new markets, foster innovation, and stimulate growth. In such an environment, organizations must identify emerging trends and threats while taking action to mitigate risks and capitalize on opportunities (Çakmak, 2023). According to Titareva (2021), the Fourth Industrial Revolution is characterized by advancements in AI, the Internet of Things (IoT), 3d printing, robotics, and other technologies. Artificial intelligence (AI) refers to the ability of a system to understand and learn from external data, perform specific tasks, and achieve goals through flexibility in ways that are similar to humans' abilities in areas such as cognition, perception, and action (Kaplan & Haenlein, 2019; Malik et al., 2020; Akerkar, 2019). There are three types of artificial intelligence systems based on their capabilities: narrow AI, general AI, and super AI (Khan, 2021). Artificial intelligence refers to systems that demonstrate intelligent behavior by analyzing their environment and taking actions, with varying degrees of autonomy, to achieve specific goals (Sheikh et al., 2023). Longoni and colleagues (2019) define artificial intelligence as algorithms that perform perceptual, cognitive, and conversational functions characteristic of the human mind. Similarly, Berente and colleagues (2019) describe artificial intelligence as machines that execute cognitive functions typically associated with humans, including comprehension, reasoning, learning, and interaction. According to Grzybowski and colleagues (2024), three influential figures in the early development of computing were Charles Babbage (1791–1871), Augusta Ada King, Countess of Lovelace née Byron) (Ada Lovelace) (1815–1852), and Alan Mathison Turing (1912–1954). According to Hand's model (2024), in the complex and challenging field of artificial intelligence (AI), machine learning (ML) is a process that utilizes data and algorithms to make predictions. Deep learning, a branch of machine learning, employs mathematical models to simulate the way neurons process information (Hirani et al., 2024).

More than thirty years ago, Morgan (1988) proposed that leaders must address chaotic and ambiguous situations with innovative strategies and solutions, as he astutely forecasted the management environment of the twenty-first century, characterized by tension, uncertainty, and paradox. In such circumstances, leaders must frequently employ competencies they have not previously utilized (Nowacka, Rzemieniak, 2022).

Islam et al. (2023) highlighted that environmental turbulence can foster the relationship between AI adoption and organizations. Younis et al. (2024) found that AI can explain 46.5% of organizational behavior, emphasizing the importance of AI use in organizations and its potential impact on contemporary organizational environments. The rise of AI has redefined the competencies required of modern leaders (Shwetha, 2024). AI enhances decision-making through data analysis and tailored leadership development, recognizing and evaluating high-potential employees, providing insights for succession planning, and assessing real-time data (Madanchian et al., 2023). As noted by Arqawi (2022), the rise of digital technologies has shifted the focus from traditional hierarchical management to more flexible and adaptive leadership, and tech-savvy, innovative, and effective leaders are required to manage both technological and human resources. AI-based solutions provide leaders with feedback dashboards that offer high-frequency insights into team challenges, along with data-driven recommendations for addressing those challenges (Quaquebeke & Gerpott, 2023). As AI technology becomes more widespread, the skills and abilities required of employees are undergoing fundamental changes, leading to a redefinition of their roles (Chen et al., 2024). AI can transform leaders' decisions and impact team dynamics (Zaidi et al., 2025). AI technologies can simulate various scenarios and model potential outcomes, enabling leaders to explore different strategies and evaluate their potential impacts; this capability fosters more agile and adaptable leadership, allowing organizations to respond quickly to changing market conditions and emerging trends (Mudunuri et al., 2025). Leaders must be competent to lead employees in a modern digital workplace (Roodt et al., 2025).

Competency-based frameworks (CBF) are

recognized as practical tools for identifying, developing, and managing work performance efficiently (Benayoune, 2024), especially in the era of Artificial intelligence. Four competency categories—the challenger (Technology scouting for market innovation & Stimulating alternate business futures), the bricoleur (Promoting an entrepreneurial spirit, Managing process-technology alignment, Coordinating stakeholder engagement & Ensuring technology-culture fit), the organizer (Utilizing (digital) communication tools, Encouraging team collaboration, Building trust in digital technologies), and the competitor (Analyzing for competitive positioning, Cultivating competitive capabilities, Stimulating product co-creation)—are proposed by Müller et al. (2024) as digital transformation leadership competencies.

Managerial AI skills encompass planning projects, managing schedules, and collaborating with teams to ensure that AI projects are completed on time, with high quality, and deliver the expected business value (An et al., 2024). Hiremath and Kenchakkanavar (2025) have identified challenges such as ethical and Bias Issues, Data Quality and Availability, Security and Cyber Threats, and Computational Power and Energy Consumption. There will be a significant rise in the need for highly skilled personnel; Digital competencies will become increasingly essential, along with the capability to manage complexity and harness human creativity (Bauer & Vocke, 2020).

The process of managing the implications of AI has three continuously repeating steps:

1. Recognizing current and future challenges and identifying opportunities for effectiveness and efficiency within the company involves searching for solutions to systematize, digitalize, and automate processes.

2. Introducing AI solutions that create a sustainable impact on work design and improve the flow of business processes.

3. Fostering the ongoing development of employees and the organization using AI within the company (Claus & Szupories, 2023).

Aziz et al. (2024) identified several significant challenges in AI-powered leadership, including ethical dilemmas, issues in human-AI interactions, obstacles to implementing AI in leadership contexts, and long-term risks associated with AI integration. Qwaider et al. (2024) report that 55% of business leaders identified a lack of AI-related skills as a significant challenge. Leadership is crucial for implementing and utilizing AI successfully (Peifer et al., 2021). Reez (2021) states that fostering forward-looking skills, capabilities, and competencies is a significant challenge. Competency refers to an individual's abilities, which include essential traits such as motivation, character, skills, self-awareness, social roles, and knowledge (Sengsri & Khunratchasana, 2024).

The concept of AI competence goes beyond merely developing AI technologies (Imjai et al., 2024); it also encompasses their design and implementation within organizational contexts to enhance value generation (Mikalef et al., 2023). AI competence encompasses three essential features. First, it must demonstrate the technical ability to utilize technology effectively and the potential for competitive differentiation. Second, it must extend beyond a single business unit, covering many operations and processes. Third, it should be difficult for competitors to replicate, which necessitates a focus on continuous experimentation and proactive strategies. These three aspects contribute to the development of robust AI competence (Mikalef et al., 2023). Sengsri et al. (2024) proposed a model highlighting the need to close the skills gap and foster a culture of lifelong learning. The framework encompasses both technical and non-technical skills, fostering the development of well-rounded AI specialists capable of addressing real-world challenges. Chee et al. (2024) developed a competency framework for AI literacy that encompasses AI device and software/ application/platform operations (Building an optimal environment for AI process/ Knowing how to operate AI software/application/platform); Data and algorithm literacy (Understanding data and information/ Knowing and applying knowledge about AI/ algorithms); Problem solving (Identifying and defining problems that should be solved using AI technology/Applying problem-solving processes using AI technology/ Data-based decision making); Communication and collaboration (Human-to-tool (AI) collaboration through AI technology/ Human-to-human communication with AI technology); AI ethics (Being aware of the opportunities and threats of AI/ Knowing and being concerned about AI ethics/ Knowing and being concerned

about AI ethics); Career-related competences (Operating specialized AI technologies for a particular field/ Interpreting and manipulating data, information, and AI content for a particular field/ Verifying AI results for accuracy and making rational decisions based on validated data); Operating specialized AI technologies for a particular field/ Interpreting and manipulating data, information, and AI content for a particular field/ Verifying AI results for accuracy and making rational decisions based on validated data); AI content creation (Creating AI content using AI tools/ Programming) and Affective competencies (Confidence and self-efficacy in using AI/ Self-reflective mindset towards AI).

Cultivating AI competency improves competitiveness and adaptability in the digital age (Imjai et al., 2024). Florea and Croitoru (2025) underscore the transformative role of AI in communication processes, optimizing message flow, positively influencing employee behavior, and enhancing productivity and organizational efficiency. Daradkah et al. (2024) demonstrated that digital competencies and artificial intelligence have a statistically significant impact on organizational excellence in the selected sample. According to Chen et al. (2024), job skill demands under AI embeddedness will increase employees' competency needs, promote their well-being in organizations and job performance, and decrease employees' job embeddedness, inhibiting their well-being in organizations and job performance. An et al. (2024) found that technical and managerial AI skills have a positive impact on organizational innovation, with managerial AI skills having a more significant effect than technical AI skills. AI capabilities are crucial in shaping organizational decision-making processes and performance, significantly improving decision-making speed, quality, and overall organizational outcomes. (Neiroukh et al., 2024).

Qwaider et al, in their 2024 study titled "Harnessing Artificial Intelligence for Effective Leadership: Opportunities and Challenges," employed a mixed-methods approach to highlight several implications for leadership practice. These include the strategic implementation of AI, the importance of skill development and training, and the need for ethical and transparent AI practices.

Cetindamar et al. (2024), in their research titled "Explicating AI Literacy of Employees at Digital Workplaces," used bibliometrics analysis to highlight four sets of capabilities associated with AI literacy: technology-related, work-related, human-machine-related, and learning-related capabilities. They also pointed to the importance of operationalizing AI literacy for non-AI professionals.

Deepa et al. (2024), in their study "Impact of AI-focussed Technologies on Social and Technical Competencies for HR Managers—A Systematic Review and Research Agenda," used a systematic review to show that managerial cognitive capability, managerial human capital, and managerial social capital of Dynamic Capabilities View were considered managerial competencies required for the adoption of AI in HRM.

Despite the flourishing literature on digital transformation, research focusing on key requirements for developing leaders' AI competencies in the age of AI remains limited. Identifying and categorizing these requirements is necessary for effective leadership in the age of AI. Therefore, the investigation is guided by the following research question: "What are the requirements for developing leaders' AI competencies?"

The findings of this study will contribute to existing knowledge in the field of effective leadership, addressing the paucity of research in this area and clarifying the importance and necessity of developing these requirements to guide managers, stakeholders, and practitioners in planning for their professional development in the current digital world.

Materials & Methods

The present study, categorized as applied research, was conducted to systematically identify the dimensions and components of AI competency for leaders. To this end, the systematic review method was employed (Figure 1). A systematic review synthesizes and critically appraises evidence to gain a comprehensive understanding of a specific topic (Randles & Finnegan, 2023). Narrative review, Descriptive or mapping review, Scoping review, Systematic review, Umbrella review, Realist review and Critical review are different types of literature reviews (Paré et al., 2015). Systematic reviews involve synthesizing evidence, where researchers establish clear eligibility criteria, gather all relevant studies that meet these criteria, and

present findings using transparent methods that minimize biases and inaccuracies (Brignardello-Petersen et al., 2025). The study combined an applied purpose with a systematic review strategy and a qualitative synthesis method to ensure rigor, transparency, and practical relevance. The systematic review used in this study adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Veroniki et al., 2025). This guideline clearly defines the studies to be included, outlines the search strategy, describes the method for assessing study quality, and details the data synthesis process (Bangdiwala, 2024).

Figure 1. Systematic review steps (Tawfik, 2019)

Review Question

What are the requirements for developing leaders' AI competencies?

Inclusion and Exclusion Criteria

This review will consider studies that explore one of the following in the field of leadership:

- Exploring the factors of leaders' AI competencies
- English-language published and unpublished studies
- The article was written in English and published in a peer-reviewed journal from 2017 to March 2025
- Excluding books, chapters, series, and conference proceedings.

Search Strategy

The PRESS (Peer Review of Electronic Search Strategies) checklist was used. We searched multiple electronic databases, including Google Scholar, Sage, Emerald, Springer, ScienceDirect, and PubMed, using combinations of the following search keywords: (Requirements) AND (AI or Artificial Intelligence) AND (competency or capability or capacity or ability) AND (leadership or management).

Study selection

The initial search yielded 1406 studies. After excluding 949 duplicates, 457 titles and abstracts were screened, and 394 were excluded due to irrelevance. The remaining 63 full texts were further assessed for eligibility, and 26 qualitative studies were selected and included in the final synthesis. The screening process is displayed in Figure 2. The selected articles are presented in Table 1. The quality of these selected documents was evaluated using the Critical Appraisal Skills Programme (CASP) tool to ensure robust and credible insights.

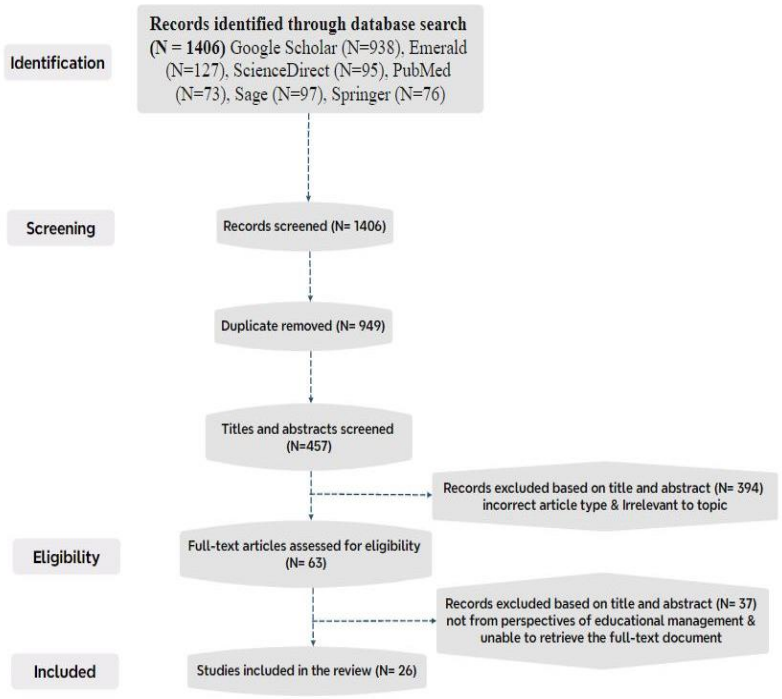

Figure 2. PRISMA flow chart

Table1. selected articles

code	Author(s)	Topic	Journal	Design
01	Hossain et al. (2025)	Digital Leadership: Towards a Dynamic Managerial Capability Perspective of Artificial Intelligence-Driven Leader Capabilities	*Journal of Leadership & Organisational Studies*	Qualitative
02	Jorzik et al. (2023)	Artificial intelligence-enabled business model innovation: Competencies and roles of top management	*IEEE transactions on engineering management*	Qualitative
03	Psyché et al. (2024)	A Competency Framework for Training of AI Project Managers in the Digital and AI Era	*Journal of Social Sciences*	Qualitative
04	Oyekunle et al. (2024)	Project Management Competencies in AI-Driven Environments: A Qualitative Assessment	*International Journal of Innovative Science and Research Technology (IJISRT)*	Qualitative
05	Gupta & Jaiswal (2024)	How can we improve AI competencies for tomorrow's leaders: Insights from multi-stakeholder interaction.	*The International Journal of Management Education*	Mixed Method
06	Pawar & Dhumal (2024)	The role of technology in transforming leadership management practices	*Multidisciplinary Reviews*	Qualitative
07	Matli (2024)	Integration of warrior artificial intelligence and leadership reflexivity to enhance decision-making	*Applied Artificial Intelligence*	Qualitative
08	Quaquebeke & Gerpott (2023)	The Now, New, and Next of Digital Leadership: How Artificial Intelligence (AI) Will Take Over and Change Leadership as We Know It.	*Journal of Leadership & Organizational Studies*	Qualitative
09	Bevilacqua et al. (2025)	Enhancing top managers' leadership with artificial intelligence: insights from a systematic literature review	*Rev Manag Sci*	Qualitative
10	Sriharan et al. (2024)	Leadership for AI Transformation in Health Care Organizations: Scoping Review	*Journal of medical Internet research*	Qualitative
11	Shakilla et al. (2024)	Revolutionizing Management: The Role of AI and Technology in Modern Leadership Practices	*Solo International Collaboration and Publication of Social Sciences and Humanities*	Qualitative
12	Vargas Portillo (2025)	The transformative role of artificial intelligence in leadership and management development: an academic insight	*Development and Learning in Organizations*	Qualitative
13	Durgarani (2025)	A study on artificial intelligence and its influence on leadership	*Cuestiones de Fisioterapia*	Qualitative
14	Ejjami (2024)	AI-powered leadership in Moroccan organizations: An integrative literature review.	*International Journal for Multidisciplinary Research*	Qualitative
15	Santana et al (2023)	Competencies for the artificial intelligence age: Visualization of the state of the art and future perspectives	*Review of Managerial Science*	Qualitative
16	Frimpong et al (2024)	Predictive Effect of AI on Leadership: Insights from Public Case Studies on Organizational Dynamics	*International Journal of Business Administration*	Qualitative
17	Harisanty et al	Leaders, practitioners, and scientists' awareness of	*Library Hi Tech*	Qualitative

code	Author(s)	Topic	Journal	Design
	(2024)	artificial intelligence in libraries: a pilot study		
18	Onnen (2024)	AI-Specific Skills for Integration into Existing Competency Frameworks	*E-Journal VFU*	Qualitative
19	Daniels et al. (2023).	Future Skills in a World Increasingly Shaped by AI	*Ubiquity Proceedings*	Qualitative
20	Long et al. (2020).	What is AI Literacy? Competencies and Design Considerations	*AI Unplugged*	Qualitative
21	Watson et al. (2021).	Will AI ever sit at the C-suite table? The future of senior leadership	*Business Horizons*	Qualitative
22	Reez (2021)	Foresight-Based Leadership. Decision-Making in a Growing AI Environment	*Advanced Sciences and Technologies for Security Applications.*	Qualitative
23	Alsheibani et al. (2020)	Reimagining the strategic management of artificial intelligence: Five recommendations for business leaders.	*AMCIS 2020 Proceedings*	Qualitative
24	Tabassum & Ghosh (2018)	Future of performance management in artificial intelligence ERA	*International Journal of Arts, Science and Humanities,*	Qualitative
25	Smith & Green (2018)	Artificial intelligence and the role of leadership	*Journal of Leadership Studies*	Qualitative
26	Naqvi (2017)	Responding to the will of the machine: Leadership in the age of artificial intelligence	*Journal of Economics Bibliography*	Qualitative

Data Analysis & Quality Assessment

Naeem et al.'s (2023) thematic analysis was used to analyze and interpret findings from the included studies. The reliability of the final results was assessed using Cohen's Kappa method, yielding a coefficient of 0.73, indicating a high level of agreement among the coders. Due to space constraints, the initial coding of findings is presented in three of the reviewed documents. (Table 2). The final framework was assessed during a focus group discussion with five leadership competencies and AI technology experts.

Table 2. Initial coding of findings

Reference codes	Main text	Concepts
02	Have a flexible mindset, a desire to experiment, and an enthusiasm for gathering data-driven insights.	Flexible mindset/ desire to experiment/ enthusiasm for gathering data-driven insights
16	This involves ensuring that AI operates within ethical boundaries, minimizing bias, protecting data privacy, and maintaining transparency in AI-driven decisions. Development: Leaders will require training in AI ethics, encompassing an understanding of the potential biases in AI systems, the implications of AI on employment, and the societal impact of AI technologies.	Ensuring that AI operates within ethical boundaries/minimizing bias/ protecting data privacy/ maintaining transparency in AI-driven decisions/ understanding the potential biases in AI systems, the implications of AI on employment, and the societal impact of AI technologies
18	Implementing AI solutions requires advanced change management skills, particularly in leading complex transformation processes. Leaders should possess competencies in change communication, vision development, and cultural evolution to promote employee acceptance and reduce resistance to AI-driven transformations.	Advanced change management skills/ change communication, vision development, and cultural evolution/to promote employee acceptance and reduce resistance to AI-driven transformations

Results

The categorized requirements for developing leaders' AI competencies are displayed in Table 3. Organizational Requirements refer to data-driven decision-making, investment in AI-based technology infrastructure, utilizing AI-driven processes and evaluating the results, remaining updated on real-time situations, maintaining stakeholders' safety and security, developing an AI-driven environment, implementing organization-wide AI-driven changes, managing uncertainties through AI-driven technologies, identifying customers' needs and preferences, seizing new opportunities, developing an adaptive learning system, steering Artificial Intelligence culture, enlarging the company's network, ensuring transparent and trustworthy communication, mobilization of both internal and external resources, risk management, fostering a culture of innovation, developing robust ethical standards, establishing clear policies for AI usage and limitations, talent management, and enhancing Organizational Agility. Technological requirements encompass remaining updated on emerging AI technologies, coordinating and controlling AI initiatives,

sharing AI-related knowledge, leveraging Data-driven insights, identifying the various data sources, managing the data processing workflow, ensuring data quality, addressing AI ethics and potential biases, supporting and committing to AI adoption, enhancing AI literacy, and ensuring cybersecurity monitoring. Individual requirements involve creativity and Innovation, agility, analytical and computational thinking, emotional and social intelligence, flexible mindset, self-awareness, problem solving, transparency, integrity, openness to learning and change, resilience, and accountability.

Table 3. Categorizing Requirements for Developing Leaders' AI Competencies

References	Main Components	Primary Components
[1], [2], [3], [4], [5], [6], [7], [8], [9], [10], [11], [12], [13], [14], [15], [16], [17], [18], [19], [21], [23], [24], [25], [26]	***Organizational Requirements for Developing AI Competencies***	Data-driven decision-making
		Investment in AI-based technology infrastructure
		Utilizing AI-driven processes and evaluating the results
		Remaining updated on real-time situations
		Maintaining stakeholders' safety and security
		Developing an AI-driven environment
		Implementing organization-wide AI-driven changes
		Managing uncertainties through AI-driven technologies
		Identifying customers' needs and preferences
		Seizing new opportunities
		Developing an adaptive learning system
		Steering Artificial Intelligence Culture
		Enlarging the company's network
		Ensuring Transparent and Trustworthy Communication
		Mobilization of both internal and external resources
		Risk management
		Fostering a Culture of Innovation
		Developing robust ethical standards
		Establishing clear policies for AI usage and limitations
		Talent management
		Enhancing Organizational Agility
[2], [7], [16], [21] [4], [3], [16], [14], [9], [10], [23] [13], [17], [18], [1], [20] [15], [19]	***Technological Requirements for Developing AI Competencies***	Remaining updated on emerging AI technologies
		Coordinating and controlling AI initiatives
		Sharing AI-related knowledge
		Leveraging Data-driven insights
		Identifying the various data sources
		Managing the data processing workflow
		Ensuring data quality
		Addressing AI ethics and potential biases
		Supporting and committing to AI adoption
		Enhancing AI literacy
		Ensuring cybersecurity monitoring
[1], [3], [4], [9], [10], [11], [17], [21], [25], [2], [8], [19], [15], [7], [12], [26], [14], [16], [18], [6], [20]	***Individual Requirements for Developing AI Competencies***	Creativity and Innovation
		Agility
		Analytical and Computational Thinking
		Emotional and social intelligence
		Flexible mindset
		Self-awareness
		Problem solving
		Transparency
		Integrity
		Openness to learning and change
		Resilience
		Accountability

This study contributes to the existing literature by identifying and categorizing the requirements for fostering artificial intelligence competencies that underpin effective leadership in an AI-driven era. The requirements for developing leaders' AI competencies are shown

in Figure 3.

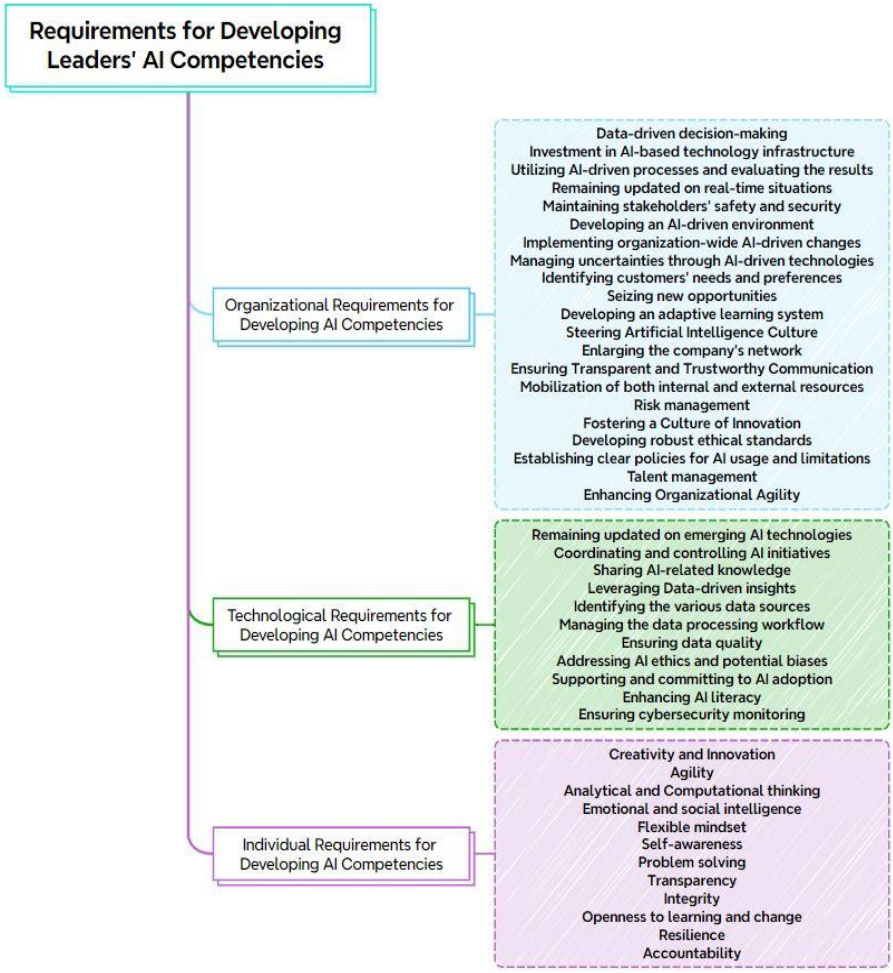

Figure 3. Requirements for Developing Leaders' AI Competencies Framework

Discussion

Incorporating artificial intelligence (AI) tools in the workplace has attracted considerable attention recently (Zaoui et al., 2025). In an AI-driven era, human leaders continue to be the primary initiators of task-oriented, relationship-oriented, and change-oriented leadership functions, even when these functions are conducted through digital channels (Quaquebeke & Gerpott, 2023). The findings of this study are aligned with those of Bock and von der Oelsnitz (2025), Sagnières (2022), Murire (2024), and Bronkhorst and Becker (2024). Based on the Systematic review, the final framework consists of organizational, Technological, and Individual Requirements for Developing Leaders' AI Competencies.

Artificial Intelligence (AI) transforms organizational dynamics by redefining structures and processes (Elkahlout et al., 2024). The organizational requirements for developing AI competencies include data-driven decision-making, investment in AI-based technology infrastructure, utilization of AI-driven processes and evaluation of results, staying updated on real-time situations, maintaining stakeholders' safety and security, creating an AI-driven environment, implementing organization-wide AI-driven changes, managing uncertainties through AI-driven technologies, identifying customer needs and preferences, seizing new opportunities, developing an adaptive learning system, steering an artificial intelligence culture, expanding the company's network, ensuring transparent and trustworthy communication, mobilizing both internal and external resources, risk management, fostering a culture of innovation, developing robust ethical standards, establishing clear policies for AI usage and limitations, talent management, and enhancing

organizational agility. A robust positive connection exists among organizational culture, AI capabilities, and organizational effectiveness performance (Bley et al., 2022). Although artificial intelligence can transform a business's values, norms, and operations, it may hinder efforts to maintain a human-centered approach (Yaroğlu, 2024). Nevertheless, by fostering a culture that prioritizes continuous learning, adaptability, and flexibility in response to technological advancements, along with encouraging open communication and providing essential training and resources, leaders can cultivate an environment where employees feel both supported and empowered to embrace change, ultimately leading to successful AI implementation and improved organizational effectiveness transformation (Ogunbukola, 2025). A key focus in risk management is the application of artificial intelligence to analyze large amounts of financial data and effectively identify anomalies, thereby enhancing risk assessment and fostering better decision-making outcomes (Țîrcovnicu & Hațegan, 2023). Alabi and Holmes (2024) highlight the pressing need for robust frameworks that guide the ethical development and implementation of AI systems, emphasizing the importance of safety, fairness, and transparency. Moore and Lookadoo (2024) suggest that policies should prioritize the audience, be explicitly stated, and be grounded in strategies that promote ethical AI usage. AI's capability to handle vast amounts of data and evaluate various scenarios allows for a deeper understanding of customers, markets, and internal business functions, ultimately enhancing talent management practices such as recruitment, selection, and performance reviews (Bennett & Martin, 2025). The key characteristics of organizational agility that empower organizations to adapt to rapidly changing conditions, thereby gaining a competitive advantage, include customer-centric, collaborative, adaptive, empowered, learning-oriented, technology-enabled, and transparent (Çakmak, 2023). Ștefan et al. (2024) indicate that organizations with superior digital capabilities become more agile in responding to internal processes and external environmental changes.

The technological requirements for developing AI competencies include remaining updated on emerging AI technologies, coordinating and controlling AI initiatives, sharing AI-related knowledge, leveraging data-driven insights, identifying various data sources, managing the data processing workflow, ensuring data quality, addressing AI ethics and potential biases, supporting and committing to AI adoption, enhancing AI literacy, and ensuring cybersecurity monitoring. While AI technologies can enhance efficiency, drive innovation, and promote scalability, they raise concerns about privacy, autonomy, and job displacement, highlighting the need to balance technological advancements with ethical considerations (Murugan et al., 2025). According to Funa & Gabay (2024), the ethical use of AI encompasses several essential aspects, including integrity, transparency in AI utilization, human oversight, data privacy, and effective regulation and monitoring. Díaz-Rodríguez and colleagues (2023) outlined seven key requirements for AI systems: human agency and oversight, robustness and safety, privacy and data governance, transparency, diversity, non-discrimination, and fairness, as well as societal and environmental well-being, and accountability. Schwaeke and colleagues (2025) emphasize the necessity for comprehensive data management, systematic integration, and continuous performance monitoring to mitigate resistance to adopting artificial intelligence, thereby enabling the full potential of AI to be realized in the endeavor of sustainability.

The requirements for developing AI competencies include creativity and innovation, agility, analytical and computational thinking, emotional and social intelligence, a flexible mindset, self-awareness, problem-solving, transparency, integrity, openness to learning and change, resilience, and accountability. Dwivedi (2025) examines the integration of Emotional Intelligence (EI) and Artificial Intelligence (AI) as complementary tools to enhance leadership decision-making, effectiveness, and organizational performance.

Conclusion

This study provides a comprehensive framework for understanding the AI competencies required for leaders in digital environments. This research fills a significant gap in the literature with a systematic review that involves synthesizing evidence. Researchers

establish clear eligibility criteria, gather all relevant studies that meet these criteria, and present findings using the PRISMA method, which helps reduce biases and inaccuracies. The study's findings challenge existing assumptions that existing competencies alone are sufficient for leadership in these contexts, highlighting the need for a nuanced set of skills that enable effective leadership in digital environments. The findings of this study reveal that organizational, Individual, analytical, and relational AI competencies are essential for leaders operating in the era of AI. The findings underscore that successful leadership in AI-integrated environments depends on a combination of technical expertise, organizational infrastructure, and individual adaptability.

Key Practical Implications:

For Organizations:

Invest in AI infrastructure and adaptive learning systems.

Foster an ethical AI culture and promote transparent communication.

Embed AI leadership competencies into HR, risk management, and innovation strategies.

For Technology Enablement:

Provide ongoing AI literacy training.

Ensure robust data governance, ethics protocols, and cybersecurity practices.

Encourage cross-departmental collaboration and knowledge sharing.

For Leadership Development:

Train leaders in analytical thinking, emotional intelligence, and resilience.

Foster self-awareness, accountability, and a culture of continuous learning.

Design competency-based development programs aligned with the 44 identified components.

This framework fills a critical gap in current leadership research by offering a structured, actionable model that supports AI readiness at the leadership level. It provides a valuable tool for organizations, educators, and policymakers to future-proof leadership capabilities and ensure responsible, agile, and effective use of AI in organizational settings.

Conflict of interest / Financial support:

The results of the present study are not in conflict with the interests of any organization and were obtained without financial support.

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