AI-SPECIFIC SKILLS FOR INTEGRATION INTO EXISTING COMPETENCY FRAMEWORKS

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Abstract: *The rapid advancement of artificial intelligence (AI) is driving profound changes in workflows and business processes, demanding specific competencies from professionals and managers. This study aims to identify critical AI-specific competencies to expand existing competency models within corporate contexts. Through a comprehensive literature review and qualitative expert interviews, we identified essential technical, social, ethical, and organizational competencies for effective AI implementation and integration.*

Findings emphasize that, beyond technical expertise, ethical responsibility, change management, and social and communication skills are crucial for successful AI adoption. Continuous competency development is highlighted as necessary to meet digital transformation demands. Leaders play a pivotal role in fostering acceptance of AI through clear vision, strategic communication, and empathetic management.

The study concludes with actionable recommendations for embedding these competencies into current models, offering a practical foundation for equipping professionals and managers in an AI-driven work environment. This approach is vital for sustaining innovation potential and securing competitive advantage.

Keywords: artificial intelligence, competence models, digital transformation, ethical responsibility, change management, organizational competencies

INTRODUCTION

The accelerated technological advancement of artificial intelligence (AI) from isolated applications to a pivotal component in the contemporary business model is profoundly influencing work processes and organizational structures on a global scale. (Hasenbein, 2023: 3). Technologies such as machine learning, neural networks, and

algorithmic decision-making are becoming increasingly central to digitally supported work environments, both in large technology companies and in organizations of all sizes and industries. The pervasive adoption of AI is not only transforming the manner in which data is processed and decisions are made, but is also giving rise to a pressing need for the creation of new roles and the development of novel skillsets (Dukino et al. 2019: 32).

The World Economic Forum (2023: 24) forecasts that approximately 75% of all companies globally will implement AI solutions within the next five years. The introduction of AI in companies is associated with a number of challenges, including a lack of digital expertise, limited system compatibility, and regulatory uncertainties (Destatis 2023: 1).

The incorporation of AI into business processes is transforming the nature of human-machine interaction, with AI increasingly assuming a role as a collaborative partner in decision-making and process optimization. Powerful AI systems provide support for decision-making in companies, facilitate innovation processes, and enhance the efficiency of routine tasks (Bitkom 2017: 43; Fraunhofer IAO 2019: 59). Concurrently, it is imperative that organizations equip their personnel with the requisite competencies at the earliest possible juncture. It is anticipated that the demand for technology-related skills will increase by 55% and for social and emotional skills by 24% by 2030 (McKinsey 2018: 1-4). In this rapidly evolving context, professionals, particularly those in leadership roles, are confronted with the imperative of continually updating their skills to remain abreast of developments in AI technology. Competency models serve as pivotal frameworks for the strategic development and assessment of employee competencies essential for the implementation of data-driven and AI-supported processes. These models facilitate the integration of personnel development and HR instruments (Krumm et al. 2012: 6, 25, 65-66). Erpenbeck et al. (2013) place particular emphasis on the importance of such models, particularly in the context of developing a pool of competencies that is aligned with future requirements (Erpenbeck et al. 2013: 15, 27-29, 166).

The incorporation of these competencies into extant competency models represents a pivotal step in aligning with the demands of the contemporary workplace (Krumm et al., 2012, 6; North et al., 2018, 4).

Although there are already approaches and models that define the skills and knowledge required to work with AI (Papenkordt et al. 2022: 22-23), there is often a

lack of consistency and uniformity, partly due to the large number of actors and the novelty and dynamics of the topic. The use of disparate models by different organizations and actors complicates the process of comparison and the development of AI skills for individuals and organizations alike (see Dörr/Schmidt-Huber/Maier 2021: 334, acatech 2016: As Döbel et al. (2018) observe, 38. Franken et al. (2022: 2).

This study aims to identify and operationalize specific competence requirements for specialists and managers in the context of artificial intelligence (AI) on the basis of a systematic literature review and qualitative empirical studies. The result of the research work is, on the one hand, the determined current and anticipated competence requirements of the target group under investigation as well as an updated and generalized competence model for management tasks. In addition, avenues for further development and implementation of the reference model for training and personnel development in companies are identified. The findings of this study can be utilized by human resources departments and other training organizations to adapt and expand their offerings in order to prepare managers for future requirements and to provide suitable learning opportunities. Moreover, the findings can be utilized in the context of personnel marketing, personnel selection and development, as well as for career development and succession planning. The results of this study serve as a crucial foundation for the implementation of AI in organizational work processes, thereby facilitating the enhancement of innovation and competitiveness in companies. First, digital competencies and existing findings on AI-specific competencies are presented, followed by the results of the empirical study and recommendations for integrating them into competency models for specialists and managers.

MAIN PART

Digital competence and digital skills

Digital competencies are fundamental when examining AI-specific competencies, as the implementation of artificial intelligence is widely recognized as a pivotal element of digital transformation. In this context, proficiencies such as the ability to process large datasets, the effective and secure utilization of digital systems, and expertise in change management are indispensable for both specialists and managerial personnel. While technological competencies predominantly address operational requirements, managerial responsibilities extend to strategic decision-

making and the facilitation of social acceptance within the framework of digital transformation.

The term "digital competencies" encompasses a range of specialized skills, including the efficient utilization of digital resources, the facilitation of digital transformation processes, and the integration of digital tools to enhance operational efficiency. They facilitate the optimal utilization of digital resources to facilitate digital transformation. As posited by Friedrichsen et al. (2020), digital skills represent a novel set of abilities that empower employees across a range of organizational contexts, including private enterprises, governmental institutions, and academic settings, to integrate digital technologies into their workflows. This, in turn, enables them to spearhead the digital transformation of business processes (Friedrichsen et al., 2020: 3).

The Bavarian Research Institute for Digital Transformation (BIDT) defines digital competence as the knowledge and abilities necessary to utilize information and communication technologies and digital media. These skills facilitate the efficient completion of tasks, the resolution of complex issues, and the advancement of digital communication and collaboration within interdisciplinary teams. Furthermore, digital literacy encompasses a range of cognitive, practical, and social elements that enable individuals to act effectively and reflectively in a digital context (bidt, 2024).

In their 2016 study, Holdener et al. posit that digital literacy encompasses more than mere computer skills. It encompasses behaviors, strategies, and identities that are pivotal in a particular digital milieu. Furthermore, it incorporates media literacy, data literacy (the comprehension of methodologies for data collection, processing, and utilization) and artificial intelligence abilities (Holdener et al., 2016: 70).

The European Union has delineated eight key competencies for lifelong learning, one of which is digital literacy. This encompasses the secure, judicious, and accountable utilisation of digital technologies within the realms of education, employment, and social integration. Such skills include information and data literacy, communication and collaboration, digital content creation, cybersecurity, intellectual property management, and problem-solving abilities (Council of the European Union, 2022: 4-7).

In the context of digitalization, Thordsen et al. (2020) identify the key skills that are expected of employees. These include agility, proficiency in digital communication, affinity for technology, solution orientation, data literacy, data protection, and a customer-oriented approach (Thordsen et al., 2020: 38). These findings are consistent

with the results of Buschmeyer et al. (2024), who identified a set of skills that enable employees to constructively manage and actively shape digital change (Buschmeyer et al., 2024).

Additionally, the Stifterverband für die Deutsche Wissenschaft e.V. identifies transformative skills, such as mission orientation and the capacity for innovation, as indispensable. (Stifterverband für die Deutsche Wissenschaft e.V., 2021). These competencies, in conjunction with digital literacy, ethical considerations, collaboration, and agile working methods, are regarded as pivotal factors for adapting to the rapidly evolving digital landscape (Stifterverband für die Deutsche Wissenschaft e.V., 2021: 6).

Table 1: Illustrating key digital skills (Stifterverband für die Deutsche Wissenschaft e.V. 2021: 6).

Competency	**Description**
Digital Literacy	Mastering basic digital skills, e.g., careful handling of digital personal data, understanding basic security rules online, using common software
Digital Ethics	Digital ethics includes critically evaluating digital information and anticipating the effects of digital actions, supplemented by sound ethical decision-making in complex digital contexts
Digital Collaboration	Use of online channels for efficient interaction, collaboration and communication with others; effective and efficient collaboration regardless of physical proximity; appropriate etiquette in digital communication
Digital Learning	Understanding and categorizing digital information; interpreting information from different digital sources; building knowledge in selected subject areas; using learning software
Agile working	User-oriented, autonomous and iterative collaboration in teams using agile working methods

Table 1 illustrates that, in addition to the fundamental competencies for navigating digital technology, ethical conduct and agile working methodologies are also

integral to the skill set required for success in the digital transformation landscape (Stifterverband für die Deutsche Wissenschaft e.V. 2021: 6).

The objective of this study was to investigate relevant AI-specific competency models. To this end, various studies covering different roles and application areas in organizational contexts were analyzed. The following sources, which are summarized in Table 2, provide comprehensive insights and are considered to be of particular relevance to this study:

Table 2: Sources considered

Author	Year	Title
André, E., Aurich, J.C., Bauer, W., Bullinger-Hoffmann, A., Heister, M., Huchler, N., Neuburger, R., Peissner, M., Stich, A., Suchy, O., Ramin, P., Wächter, M.	2021	Kompetenzentwicklung für Künstliche Intelligenz – Veränderungen, Bedarfe und Handlungsoptionen.
Krumm, S., Mertin, I., Dries, C.	2012	Kompetenzmodelle. Göttingen: Hogrefe.
Daniels, U.-D., Lindner, M., Sommer, S., Rauch, E.	2023	AICOMP - Future Skills in a World Increasingly Shaped By AI. Ubiquity Proceedings, 3(1), S. 230–239.
Long, D., Magerko, B.	2020	What is AI Literacy? Competencies and Design Considerations.
Baumgartner, M., Horvat, D. und Kinkel, S.	2023	Künstliche Intelligenz in der Arbeitswelt – Eine Analyse der Kompetenzbedarfe auf Unternehmensebene.
Ng, D.T.K., Leung, J.K.L., Chu, S.K.W., Qiao, M.S.	2021	Conceptualizing AI literacy: An exploratory review. Computers and Education: Artificial Intelligence, 2, S. 100041.
Balbo di Vinadio, T., Van Noordt, C., Vargas Alvarez del Castillo, C., & Avila, R.	2022	Artificial Intelligence and Digital Transformation: Competencies for Civil Servants.

The successful implementation of artificial intelligence (AI) in business and organizational settings requires the development of a range of competencies specific to AI. André et al. (2021) categorize these competencies into three distinct categories: professional competence, competencies for developing and handling AI systems, and competencies for shaping the context of AI. These skills facilitate not only the comprehension of AI systems but also active interaction with them and the optimization of processes (André et al. 2021: 18-19). Furthermore, Baumgartner et al. (2023)

highlight the necessity for employees to be informed about the ethical and legal implications of AI usage in order to act responsibly (Baumgartner et al. 2023: 3-5).

Table 3 illustrates the AI-specific competencies as defined by André et al. (André et al. 2021: 18-19)

Technical and basic knowledge
Subject-specific knowledge and skills to cope with daily tasks
Confident handling of digital technologies and knowledge of security aspects
Understanding of the capabilities and limitations of AI systems and the type of data processed
Development and handling of AI systems
Effective use of interaction systems
Understanding of ML, deep learning and neural networks
Knowledge of programming languages such as Python and common platforms
Skills in dealing with large amounts of data and data ethics
Understanding and structuring of business processes
Problem-solving skills and resilience
Critical evaluation of the results of AI systems
Shaping the context of AI
Personal responsibility and willingness to learn new technologies
Collaboration in interdisciplinary teams and communication with customers
Coordination of teams and promotion of learning and further training opportunities
Adapting to new challenges posed by AI

Innovation and reflection are additional crucial competencies, as Daniels et al. (2023) assert. They identify three fundamental competency domains for AI-related work:

- Innovation and creative design
- Autonomous action
- Co-creation (Daniels et al. 2023: 234).

Table 4: Central AI competence areas according to Daniels et al. (Daniels et al. 2023: 234)

Area	Competency	Description
Innovation and creative design with and for AI	Digital competence	Use and development of AI tools and apps, reflective, critical understanding of the technical functioning of AI in relation to society and the individual
	Design thinking skills	Application of creative development processes and collaboration to solve problems in connection with AI
	Innovation competence	Willingness to promote AI innovations within organizations and in processes
	System compet	Understanding of AI systems in complex social and technical contexts and their integration into larger systems
Learning to act autonomously with and for AI	Decision-making skills	Analyzing and assessing decision-making situations in an AI-supported environment, with a particular focus on data-driven and ethically sound decisions
	Ethical competence	Perception and evaluation of ethical issues in connection with AI
	Learning competence	Willingness and ability to engage with AI topics and learn through AI applications
	Reflection competence	Critical examination of value systems and behavioral patterns in connection with AI
	Self-determination	Self-determined action despite the framework provided by data and AI algorithms
	Self-competence	Use of AI tools for personal and professional development, self-organization and time management
Co-creation with and through AI	Future and design skills	Promotion of interdisciplinary collaboration and innovation, which includes both technical expertise and creative development of new AI applications
	Cooperation skills	Ability for interdisciplinary and interorganizational collaboration in AI projects
	Communication skills	Ability to communicate and conduct dialog appropriate to the situation in an AI context

These skills are further augmented by the competencies delineated by Long et al. (2020) in the domain of artificial intelligence (AI) literacy. This encompasses a

fundamental grasp of the operational principles and applications of AI. It also necessitates a discerning examination of the consequences of AI systems (Long et al. 2020: 4-7).

Table 5: AI literacy competencies according to Long et al. (2020)

Competency	**Description**
Recognizing AI	The capacity to differentiate between technological entities that employ artificial intelligence (AI) and those that do not.
Understanding Intelligence	Critically analyze and discuss the characteristics that define an entity as intelligent, including the differences between human, animal, and machine intelligence.
Interdisciplinarity	It is important to recognise that there are numerous avenues for the development of "intelligent" machines, with AI technologies being utilised in a multitude of fields.
AI's Strengths & Weaknesses	It is important to be able to distinguish between the tasks that AI is able to perform well and those that it is not yet able to complete successfully.
Imagine Future AI	Formulate a hypothesis regarding potential future applications of AI and assess its projected impact on the world.
Representations	It is essential to comprehend the manner in which AI represents knowledge and to be able to identify instances of knowledge representation.
Decision-Making	Understand how computers make decisions and recognize examples of this.
Machine Learning Steps	Understand the steps in machine learning and the challenges at each stage..
Human Role in AI	Understand that humans play an important role in programming, selecting models and fine-tuning AI systems.
Data Literacy	Understand basic data literacy, especially as it relates to AI and machine learning.
Learning from Data	Recognize that computers learn from data, including one's own personal data.
Critically Interpreting Data	Critically interpret data and understand how training data can influence the results of algorithms.
Action & Reaction	Understand that some AI systems can physically react to the world.
Sensors	Recognize that computers perceive the world through sensors and understand how sensors work.
Ethics	Identify and describe ethical issues related to AI, such as privacy, employment, transparency, bias, and responsibility.

Another area of expertise pertains to the ethical and legal framework governing the deployment of AI in organizational settings. Baumgartner et al. (2023) underscore the necessity for employees to possess not only technical expertise but also the capacity to evaluate the ethical implications of AI systems and comply with data protection regulations (Baumgartner et al. 2023: 3-5).

Balbo di Vinadio et al. (2022) have developed a tripartite competency model for public administration. This comprises the areas of digital planning and design, data management and governance, and digital leadership (Balbo di Vinadio et al. 2022: 13-16).

Table 6 presents a list of AI-specific skills in public administration, as identified by Balbo di Vinadio et al. (Balbo di Vinadio et al. 2022: 13-16)

Competency Area	**Competency**
Digital Planning and Design	• Identification of problems where digital systems could contribute to the solution • System thinking • Strategic foresight • Agile planning
Data Use and Governance	• Digital Literacy • Data Driven decision making • Open data and open government (capacity to effectively create and use open data) • Privacy and security (knowledge of potential breaches and how they can affect government and society) • Legal, regulatory and ethical frameworks (capacity to adapt and change existing legislation to new technologies) • Basic understanding of AI systems
Digital Management and Execution	• People centricity • Iterative and agile project management • Digital Leadership

As Ng et al. (2021) argue, the development of specific skills for navigating the realm of AI is a crucial aspect of the educational process. These skills encompass a range of competencies, including technological expertise, data literacy, ethical awareness, and critical thinking (Ng et al. 2021: 3-9).

Table 7 presents a comprehensive overview of the AI literacy skills identified by Ng et al. (Ng et al. 2021: 3-9)

Competency Area	**Description**
Technological Knowledge	Understanding of fundamental AI concepts like automata, intelligent agents, graphs, and data structures.
Data Literacy	Ability to interpret, analyze, and use data effectively, particularly in AI-related contexts.
Ethical and Social Awareness	Knowledge of ethical considerations in AI, including transparency, fairness, and accountability.
Critical Thinking	Capability to critically evaluate AI technologies and their societal and ethical implications.
Pedagogical Competencies	Familiarity with educational strategies such as project-based learning to promote AI literacy.
Application of AI	Practical skills in applying AI in real-world settings, including fields like education, healthcare, and beyond.
Legal and Ethical Knowledge	Understanding the legal framework and ethical issues associated with AI usage.

The studies on AI-specific competencies demonstrate a convergence in the requisite competencies. The models examined exhibit similarities in the following areas of competence:

The ability to comprehend, analyze, and manage data is a recurring theme in numerous studies on digital and data literacy. This also encompasses the interpretation and utilization of data within the context of artificial intelligence. Furthermore, a fundamental prerequisite is the comprehension of the operational principles of AI systems.

In addition, the ability to demonstrate technical knowledge and proficiency in programming is essential. The ability to program, coupled with a grasp of machine learning and neural networks, is regarded as a crucial skillset for navigating the intricacies of AI in numerous models.

Ethical and Legal Framework Conditions: The ability to navigate ethical issues, such as data protection, transparency, and fairness, as well as to comprehend legal frameworks, is a crucial competency for the responsible and secure deployment of AI in organizational settings.

Problem Solving and Innovation: A significant number of models place emphasis on innovation and the capacity to develop creative solutions, particularly within the context of AI application and design.

Human-Machine Interaction and Reflection Skills: The capacity to interact effectively with AI systems and to reflect on the outcomes and impact of these systems is another frequently cited competency.

METHODOLOGY

The empirical study is qualitative in nature and is based on expert interviews conducted using the Mayring method of qualitative content analysis. The objective was to gain a comprehensive understanding of the skills required for the use of artificial intelligence (AI) in a corporate context. To this end, experts from both large and medium-sized companies were interviewed, with managers primarily offering a strategic perspective and specialists contributing an operational perspective. The evaluation was conducted in a systematic manner, based on category formation according to Mayring (2022), combining inductive and deductive approaches (Mayring 2022: 84-86). The selection process of the experts in this study was conducted in accordance with a rigorous set of criteria to ensure that the interviewees possessed the requisite professional qualifications and experience directly related to the research questions (Gläser et al., 2010: 11–15).

The interview guide, which served as a structuring element for the expert interviews, was developed on the basis of a comprehensive literature review. In the course of the interviews, the participants were invited to offer their subjective assessment of the following areas:

The following areas were explored in the expert interviews:

- Application scenarios for AI
- Challenges and risks associated with the introduction and use of AI
- Required skills
- Strategies and recommendations for overcoming the risks

The principal objective was to identify pivotal topics, including technical, social, and ethical competencies in navigating the realm of artificial intelligence (AI), as well as the concomitant risks, prospects, solutions, and anticipated skill sets for the deployment and application of AI.

RESULTS

Application scenarios for AI

The results of the study revealed that the respondents primarily viewed the application of AI as a means of automating tasks and optimizing processes. This was identified as a key area of focus in 13 segments across six documents. The application of AI for the purpose of enhancing efficiency and providing assistance to employees was regarded as a particularly significant area of interest. Additionally, some experts posited the potential for reducing the reliance on external services through the deployment of AI (two segments, one document).

Assistance is closely associated with process optimization, which suggests that AI-based support for employees is frequently viewed as a means of enhancing operational efficiency.

Challenges and Risks

In terms of challenges, the experts identified uncertainties and concerns about the future, particularly in relation to potential job losses (8 segments, 5 documents). The absence of communication during the implementation of AI initiatives was also identified as a potential risk factor. Uncertainty and apprehension about the future are strongly associated with adverse effects on the team and a lack of communication. These associations illustrate that uncertainty surrounding AI is often intensified by inadequate communication.

The lack of data protection is linked to technical competencies such as technical expertise and digital literacy. This indicates that privacy concerns are often associated with the technical skills required to utilize AI in a secure and responsible manner.

Competencies

The competencies required for the successful implementation of AI have been categorized into three main areas:

- Management and Leadership Skills
  - Change Management Competency
  - Future-oriented and Design Competency
  - Ethical Principles/Ethical Stance
- Technical Competencies
  - Technical Expertise
  - Digital Competency
  - Process Competency

- Social and Emotional Competencies
  - Social Competency/Empathy
  - Communication Skills

Among the most frequently mentioned management competencies were deep knowledge (13 segments, 7 documents), future-oriented and design competency, and ethical principles (15 segments, 7 documents). Technical expertise and digital competency were identified as crucial for the implementation of AI technologies (12 segments, 6 documents). Additionally, respondents highlighted the importance of social skills, particularly communication skills (7 segments, 6 documents), to foster acceptance of AI within the company.

Ethical principles and process competency show strong connections, indicating that companies particularly consider ethical issues when optimizing processes. Leaders and experts agree that it's not only about deploying AI efficiently but also in an ethically responsible manner.

Change management competencies are closely linked with future-oriented and design competency. This suggests that leaders actively shaping change are also capable of developing a clear vision for the future use of AI. Both skills are closely interrelated and critical for the long-term success of AI projects.

Technical expertise and digital competency are closely connected, indicating that technical know-how is a prerequisite for successful AI implementation. This underscores that companies need technical knowledge to integrate digital solutions effectively and meet data protection requirements.

Solution Strategies

A key solution strategy identified was competency development (25 segments, 8 documents) to prepare employees for handling AI. It was emphasized that companies should invest in the continuous training of their employees to address the challenges of AI implementation. Clear communication of visions and goals for using AI (12 segments, 4 documents) was also considered essential for the success of AI projects.

Competency development is closely linked to communication and vision. This connection indicates that companies recognize the need to train their employees while also developing a clear communication strategy to manage AI-driven change successfully. It is crucial that employees not only acquire the necessary skills but also understand the company's vision and goals to support AI deployment effectively.

Risk management and trust-building are also closely connected. This link suggests that companies aim not only to minimize risks but also to strengthen the trust of employees and stakeholders in AI systems. This is particularly important to foster acceptance of new technologies.

Communication skills are strongly connected with social skills and empathy. These connections highlight that leaders must be able to communicate the impacts of AI on their employees clearly while also empathizing with their concerns and anxieties. Emotional intelligence and effective communication skills are essential to successfully transition to AI-based work processes.

Insights from Expert Interviews

The expert interviews provided practical insights, complementing the theoretical findings from the literature review. Overall, the study demonstrates that the successful implementation of AI requires not only technical expertise but also social, ethical, and organizational competencies. Leaders play a pivotal role in conveying a clear vision and managing the transformation associated with AI. In addition to traditional management skills, such as communication and change management competencies, technical competencies, including digital literacy, data proficiency, as well as ethical and reflective skills, will become increasingly important for both specialists and leaders in the future.

The findings from the literature review and the expert interviews partially align regarding the competencies required for AI deployment. While the theoretical insights primarily emphasize technical and ethical competencies, the interviews add practical skills such as change management, emotional intelligence, and future-oriented thinking. The necessity for continuous competency development is particularly underscored to ensure that employees and leaders are well-prepared for the challenges of an AI-driven work environment.

SUMMARY AND CONCLUSION

In conclusion, this study demonstrates that the advent of digital transformation, particularly the application of artificial intelligence (AI), necessitates an expansion of existing competency models. Four core competency areas are particularly pertinent: digital literacy, ethical leadership, data-driven decision-making, and change management.

While digital and technical expertise enables interaction with AI systems, it is ethical and social competencies that play a crucial role in the responsible integration of AI into work processes. In the context of AI-accelerated digital transformation, the development of transformative competencies for specialists and leaders is of increasing significance. The studies conducted within this work have identified competency needs that can inform the expansion of existing models and the development of organization-wide competency pools. Table 6 provides an overview of key competency requirements critical for the successful implementation and application of AI, with the aim of supporting targeted competency development within companies. The table summarizes the core competencies and clarifies the specific skills that specialists and leaders should cultivate to meet the demands of an AI-driven work environment.

Table 8: Identified Competency Requirements

Competency (Area)	**Description**
Digital Competencies	Leaders and specialists require comprehensive digital competency, encompassing both foundational technological knowledge and specialized skills in AI-driven process automation. This includes the ability to systematically implement new technologies and analyze their effects on organizational structures and work culture.
Data Competency	Data competency demands that leaders possess the ability to evaluate and interpret large datasets to make evidence-based decisions, as well as an understanding of the data protection and ethical dimensions in the context of Big Data and AI.
Ethical Leadership	The use of AI necessitates a high degree of ethical decision-making competence to ensure adherence to principles such as transparency, fairness, and data privacy. Leaders must actively engage with ethical standards and guidelines to secure social acceptance and regulatory compliance of AI systems.
Change Management Competencies	The implementation of AI solutions requires advanced change management skills, particularly regarding the leadership of 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.
Technical Expertise	Specialists need advanced technical expertise in areas such as machine learning, data analysis, and neural networks to effectively configure and optimize AI systems. These skills are crucial for the secure implementation and performance optimization of AI applications in operational contexts.

Social and Emotional Competencies	In addition to technical and ethical skills, leaders must be able to address the fears and uncertainties of employees during AI implementation. Empathy, communication skills, and social interaction are key competencies in this regard.

The expanded competency models provide organizations with a structured framework for addressing the complex demands of digital transformation. By integrating technological, ethical, and social competencies, these models ensure that leaders and experts are adequately prepared to address not only the technical requirements but also the societal and organizational challenges inherent to a digitized work environment.

These measures facilitate the long-term adoption and acceptance of AI within organizations. Although this study offers valuable insights into AI-specific competencies, there remain empirical questions that require further investigation, particularly through quantitative studies.

Further research is required to examine in depth the industry-specific variations in competency needs and to investigate how certain competencies either diminish or grow in importance with automation and the deployment of AI. It would be particularly beneficial for future research to investigate the differences between technical and non-technical sectors in order to tailor competency models to specific industries. Initial indications suggest that particularly administrative and routine tasks are increasingly assumed by automation, which may reduce the relevance of operational competencies in these areas.

A further area of investigation is the growing influence of machine learning and big data on management and decision-making processes. The application of AI enables the analysis of vast quantities of data, the forecasting of trends and the formulation of well-informed decisions. In addition to technological developments, it is essential to examine the cultural and social impact of AI, including the question of how social trust in these technologies can be established.

REFERENCES

Abdelkafi, N., Döbel, I., Drzewiecki, J., Meironke, A., Niekler, A., & Ries, S. (2019). Künstliche Intelligenz (KI) im Unternehmenskontext. [Online] Available at: https://publica.fraunhofer.de/entities/publication/ce4d6c03-0e63-4709-9dcf-0ea25058442e (Accessed 27 February 2024).

acatech - Deutsche Akademie der Technikwissenschaften (2023). Digitale Transformation der Arbeit. [Online] Available at: https://www.acatech.de/allgemein/digitale-transformation-der-arbeit-wir-muessen-die-begeisterung-der-beschaeftigten-engineeren/ (Accessed 27 February 2024).

acatech - Deutsche Akademie der Technikwissenschaften (2016). Kompetenzentwicklungsstudie Industrie 4.0. [Online] Available at: https://www.acatech.de/publikation/kompetenzentwicklungsstudie-industrie-4-0-erste-ergebnisse-und-schlussfolgerungen/ (Accessed 27 February 2024).

André, E., Aurich, J.C., Bauer, W., Bullinger-Hoffmann, A., Heister, M., Huchler, N., Neuburger, R., Peissner, M., Stich, A., Suchy, O., Ramin, P., Wächter, M. (2021). Kompetenzentwicklung für Künstliche Intelligenz – Veränderungen, Bedarfe und Handlungsoptionen. [Online] Available at: https://doi.org/10.48669/pls_2021-2 (Accessed 27 February 2024).

Anton, E., Behne, A., & Teuteberg, F. (2020). The Humans Behind Artificial Intelligence – An Operationalisation of AI Competencies. [Online] Available at: https://www.researchgate.net/publication/342215868_The_Humans_Behind_Artificial_Intelligence-An_Operationalisation_of_AI_Competencies (Accessed 02 February 2024).

Atteslander, P. (2003). Methoden der empirischen Sozialforschung. 11. Auflage. Berlin: Erich Schmidt Verlag.

Balbo di Vinadio, T., Van Noordt, C., Vargas Alvarez del Castillo, C., & Avila, R. (2022). Artificial Intelligence and Digital Transformation: Competencies for Civil Servants. [Online] Available at: https://unesdoc.unesco.org/ark:/48223/pf0000383325 (Accessed 24 April 2024).

Baumgartner, H., Horvat, D., & Kinkel, S. (2023). Künstliche Intelligenz in der Arbeitswelt – Eine Analyse der Kompetenzbedarfe auf Unternehmensebene. [Online] Available at: https://kompetenzzentrum-karl.de/baumgartner-horvat-et-al-2023-kuenstliche-intelligenz-in-der-arbeitswelt/ (Accessed 24 April 2024).

Bitkom (2017). Künstliche Intelligenz. [Online] Available at: https://www.bitkom.org/Presse/Presseinformation/Kuenstliche-Intelligenz-kommt-in-Unternehmen-allmaehlich-voran (Accessed 15 March 2024).

Bogner, A., Littig, B., & Menz, W. (2002). Das Experteninterview: Theorie Methode Anwendung. Wiesbaden: Springer Fachmedien.

Daniels, U.-D., Lindner, M., Sommer, S., & Rauch, E. (2023). AICOMP - Future Skills in a World Increasingly Shaped by AI. Ubiquity Proceedings 3(1), S.230-239. DOI: https://doi.org/10.5334/uproc.91 (Accessed 24 April 2024).

Destatis (2023). Nutzung von Künstlicher Intelligenz in Unternehmen 2023. Wiesbaden: Statistisches Bundesamt. [Online] Available at: https://www.destatis.de/DE/Presse/Pressemitteilungen/2023/11/PD23_453_52911.html (Accessed 24 April 2024).

Döbel, I., Leis, M., Vogelsang, M.M., Neustroev, D., Petzka, H., Riemer, A., Rüping, S., Voss, A., Wegele, M. & Welz, J. (2018): Maschinelles Lernen. [Online] Available at: https://www.bigdata-ai.fraunhofer.de/de/publikationen/ml-studie.html (Accessed 24 April 2024).

Dörr, S., Schmidt-Huber, M., & Maier, G. (2021). Das LEaD-Kompetenzmodell – wirksam Führen im Kontext der digitalen Transformation. [Online] Available at: https://doi.org/10.1007/s11612-021-00582-w (Accessed 27 February 2024).

Dukino, C., Friedrich, M., Ganz, W., Hämmerle, M., Kötter, F., Meiren, T., Neuhüttler, J., Renner, T., Schuler, S., & Zaiser, H. (2019). Künstliche Intelligenz in der Unternehmenspraxis. Fraunhofer Verlag. [Online] Available at: https://publica.fraunhofer.de/bitstreams/0dd40c4f-9c68-4fbe-ba56-e4743834805d/download (Accessed 15 March 2024).

Erpenbeck, J., von Rosenstiel, L., & Grote, S. (2013). Kompetenzmodelle von Unternehmen. Stuttgart: Schäffer-Poeschel.

Franken, S., Mauritz, N. & Prädikow, L. (2022). Kompetenzen für KI-Anwendungen: Theoretisches Modell und partizipative Erfassung und Vermittlung in Unternehmen, GfA Frühjahrskongress 2022, Magdeburg. [Online] Available at: https://www.hsbi.de/multimedia/Fachbereiche/Wirtschaft/Forschung/Denkfabrik+Digitalisierte+Arbeitswelt/Beitrag+GFA2022+Kompetenzen+f%C3%BCr+KI_Anwendungen-p-157512.pdf?download=1 (Accessed 15 March 2024).

Fraunhofer IAO (2019). Szenario-Report: KI-basierte Arbeitswelten 2030. [Online] Available at:

https://www.digital.iao.fraunhofer.de/content/dam/iao/ikt/de/documents/1_Szenario-Report.pdf (Accessed 02 February 2024).

Gläser, J., & Laudel, G. (2010). Experteninterviews und qualitative Inhaltsanalyse: Als Instrumente rekonstruierender Untersuchungen. Wiesbaden: Springer.

Hasenbein, T. (2023). Mensch und KI in Organisationen. Berlin: Springer.

Heesen, J., Grunwald, A., Matzner, T., & Roßnagel, A. (2020). Ethik-Briefing. Leitfaden für eine verantwortungsvolle Entwicklung und Anwendung von KI-Systemen – Whitepaper aus der Plattform Lernende Systeme. [Online] Available at: https://www.acatech.de/publikation/ethik-briefing-leitfaden-fuer-eine-verantwortungsvolle-entwicklung-und-anwendung-von-kuenstlicher-intelligenz/download-pdf?lang=de (Accessed 27 February 2024).

Kauffeld, S., & Paulsen, H. (2018). Kompetenzmanagement in Unternehmen. Stuttgart: Kohlhammer.

Krumm, S., Mertin, I., & Dries, C. (2012). Kompetenzmodelle. Göttingen: Hogrefe.

Long, D., & Magerko, B. (2020). What is AI Literacy? Competencies and Design Considerations. AI Unplugged. [Online] Available at: https://aiunplugged.lmc.gatech.edu/wp-content/uploads/sites/36/2020/08/CHI-2020-AI-Literacy-Paper-Camera-Ready.pdf (Accessed 15 March 2024).

Mayring, P. (2022). Qualitative Inhaltsanalyse: Grundlagen und Techniken. Beltz.

McKinsey & Company (2018). Skill shift: Automation and the future of the workforce. [Online] Available at: https://www.mckinsey.com/featured-insights/future-of-work/skill-shift-automation-and-the-future-of-the-workforce (Accessed 02 February 2024).

Meißner, A. (2012). Lerntransfer in der betrieblichen Bildung. Köln: Eul.

Ng, D.T.K., Leung, J.K.L., Chu, S.K.W., & Qiao, M.S. (2021). Conceptualizing AI Literacy: An Exploratory Review. Computers and Education: Artificial Intelligence, 2, S.100041. DOI: https://doi.org/10.1016/j.caeai.2021.100041 (Accessed 24 April 2024).

North, K., Reinhardt, K., & Sieber-Suter, B. (2018). Kompetenzmanagement in der Praxis. Wiesbaden: Springer Gabler.

Papenkordt, J., Gabriel, S., Thommes, K. & Dumitrescu, R. (2022). Künstliche Intelligenz in der industriellen Arbeitswelt. [Online] Available at: https://arbeitswelt.plus/forschung/working-paper-reihe/working-paper-kuenstliche-intelligenz-in-der-industriellen-arbeitswelt/ (Accessed 24 April 2024).

Plattform Industrie 4.0 (2021). Technologieszenario „Künstliche Intelligenz in der Industrie 4.0“. [Online] Available at: https://www.plattform-i40.de/IP/Redaktion/DE/Downloads/Publikation/KI-industrie-40.html (Accessed 15 March 2024).

Stifterverband für die Deutsche Wissenschaft e.V. (2021). Future Skills 2021. [Online] Available at: https://www.stifterverband.org/medien/future-skills-2021 (Accessed 24 April 2024).

Stowasser, S., & Suchy, O. (2020). Einführung von KI-Systemen in Unternehmen. [Online] Available at: https://www.plattform-lernende-systeme.de/files/Downloads/Publikationen/Zusammenfassungen/AG2_Change_Management_Paper_Kurzfassung.pdf (Accessed 27 February 2024).

World Economic Forum (2023). The Future of Jobs Report 2023. [Online] Available at: https://www.weforum.org/publications/the-future-of-jobs-report-2023/ (Accessed 27 February 2024).