The Perceptions of Educational Administrators towards Digital Leadership in the Age of Artificial Intelligence: A Qualitative Study

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Abstract

Artificial intelligence technologies are used in many fields and have become a part of our lives. The field of artificial intelligence, which has an important place, especially in the field of education and digital leadership, is constantly developing and is expected to create even greater impacts in the future. The main purpose of this research is to examine the perception of educational administrators towards digital leadership in the age of artificial intelligence. In the research, phenomenological design, one of the qualitative research methods, was used. The study group was comprised of 15 educational administrators. These participants were selected using maximum sampling method, derived from purposive sampling methods. In the study, a semi-structured interview form created by the researchers by analyzing the literature in detail and taking expert opinions was used as a data collection tool. Descriptive and content analysis was used to analyze the data. According to the results of the research, the themes of general perceptions of educational administrators towards artificial intelligence, perceptions on the use of artificial intelligence in education, general perceptions of digital leadership, and suggestions for educational administrators towards artificial intelligence and digital leadership emerged.

Keywords: Artificial ıntelligence, Digital leadership, Education managers, Education.

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Introduction

Edward Fredkin posits three pivotal events in history: the creation of the universe, the advent of life, and the rise of artificial intelligence (AI). This assertion underscores the vast potential and scope of AI, hinting at its potential advancement beyond current imaginings. It is evident that this swiftly progressing technology significantly augments education across various dimensions and holds the promise of greatly accelerating the resolution of challenges encountered in the teaching process (Arslan, 2020).

Intelligence represents the computational facet of achieving objectives. Across humans, animals, and specific machines, varying levels and forms of intelligence manifest. AI constitutes a scientific and engineering domain dedicated to crafting intelligent machines, particularly sophisticated computer programs. While comprehending human intelligence remains intertwined with computer utilization, AI possesses the capacity to evolve beyond biological constraints (McCarthy, 2004).

The initial strides into AI were made in 1943 by McCullotch and Pitts (1943) through the 'Brain Boolean Circuit Model.' This model aimed to mathematically elucidate the functioning of neurons in the brain based on certain postulations. In contemporary times, AI has become notably pervasive, finding effective applications across various domains such as banking, technology, and entertainment (Elmas, 2007). Presently, numerous AI systems, encompassing personal assistants like 'Siri,' game theories, language translations, intelligent education management systems, virtual classrooms, hand-face-image recognition systems, automation, and robotic tracking systems, have become integrated into our daily lives (Arslan, 2020). The developmental trajectory of AI is outlined in Figure 1.
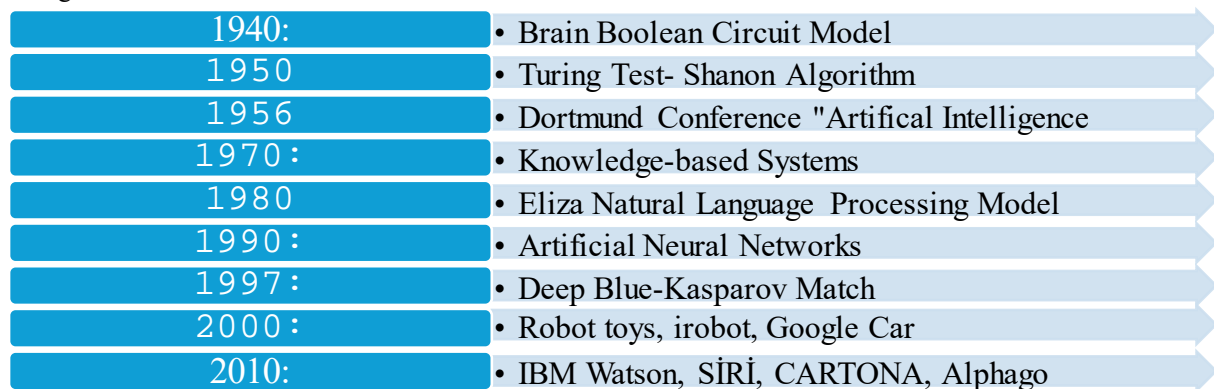
Year	Development
1940:	• Brain Boolean Circuit Model
1950	• Turing Test- Shanon Algorithm
1956	• Dortmund Conference "Artifical Intelligence
1970:	• Knowledge-based Systems
1980	• Eliza Natural Language Processing Model
1990:	• Artificial Neural Networks
1997:	• Deep Blue-Kasparov Match
2000:	• Robot toys, irobot, Google Car
2010:	• IBM Watson, SİRİ, CARTONA, Alphago

Figure 1. Development Process of AI (Source: Tigre et al., 2022)

According to Baker and Smith (2019), AI serves as a comprehensive term encompassing various technologies and methodologies, including machine learning, natural language processing, data mining, neural networks, or algorithms. These elements execute cognitive tasks typically associated with human cognition, particularly in learning and problem-solving contexts. Regarding the replication of human intelligence in computers, while experts posit its feasibility, it is widely acknowledged as notably challenging to encompass the entirety of human cognitive abilities. This challenge arises due to the multitude of intricate features inherent in the human brain, posing significant complexities in adaptation (McCarthy, 2004).

From these perspectives, AI can be delineated as the utilization of high-level human cognitive abilities by computers, encompassing skills like inference, reasoning, problem-solving, and generalization. Moreover, AI can be perceived as intelligent programming prompting humanoid reactions (Arslan, 2020). According to Nilsson (1990), a prominent figure in AI literature, AI is conceived as an emulation of natural intelligence.

AI's adaptability and extensive range of applications are positioning it as a general-purpose technology, poised to exert significant influence across diverse sectors, fundamentally reshaping value chains and business models (McKinsey Global Institute, 2017). Presently, AI is predominantly characterized as narrow AI, focusing on systems adept at performing specific and specialized intelligent tasks, while the feasibility of achieving general AI remains uncertain. Despite the general AI takeover being considered an outlier or a distant prospect by most AI experts, the integration of narrow AI into business and society raises substantial social and ethical considerations. The proliferation of narrow AI systems, capable of autonomous action and broader utilization, has brought critical issues to the forefront of AI policy agendas. Concerns regarding flawed decision-making, biases leading to discrimination, job displacement, and the potential for malicious AI applications (cyber-conflicts) are increasingly prominent. These considerations highlight the pressing need for ethical frameworks and regulations to guide the responsible development and deployment of AI Technologies (European Group on Ethics in Science and New Technologies, 2017).

AI is anticipated to catalyze the onset of the 'Fourth Industrial Revolution,' placing AI advancements at the forefront of the global policy discourse. Policymakers worldwide are progressively acknowledging that securing leadership in AI confers technological, economic, and security advantages to the leading nation. Consequently, there is a burgeoning competition between China and the US to assert dominance in the realm of Big Data, recognized as the foundational resource driving AI innovations (Delponte and Tamburrini, 2018).

In recent years, there has been a burgeoning interest in the realm of AI, notably concerning the role of managers amidst this transformative technological landscape (Brock and Von Wangenheim, 2019). AI stands as a concept wielding transformative potential for humanity heralded as an unparalleled technology. Noteworthy investments from private enterprises, such as Google's acquisition of the European AI startup DeepMind for $400 million, alongside collaborative initiatives like the German Artificial Intelligence Research Center (DFKI), portend a forthcoming significant impact on higher education institutions (Popenici and Kerr, 2017). Illustratively, the Technical University of Eindhoven in the Netherlands recently unveiled plans to inaugurate an Institute for Artificial Intelligence Systems, earmarking 50 new professorships dedicated to AI-focused teaching and research (Roll and Wylie, 2016). This circumstance underscores the increasing significance of education, emphasizing its heightened importance in the evolving landscape.

The inception of AI in education is traced back to the ideas proposed by Sidney L. Pressey in the early 20th century, around 1920, during his tenure at Ohio University. Pressey posited that leveraging multiple-choice tests could serve not only as an assessment tool but also as a means to enhance student achievement by employing the principle of immediate feedback, aligned with Edward Thorndike's law of influence (Thorndike, 1927), to reinforce learning. Pressey (1950) envisioned machines capable of facilitating learning by providing students with instant test results and guiding them toward correct answers. Moreover, Pressey (1950) contended that such systems would not only support student learning but also alleviate the workload of educators. Consequently, teachers would be able to create an environment conducive to spending more quality time with their students.

The integration of 21st-century skills (Trilling and Fadel, 2009) and the implementation of the Next Generation Science Standards (NGSS, 2013) have underscored the significance of broader learning skills and competencies, such as metacognition, critical thinking, and collaboration. Consequently, contemporary educational frameworks and theories endeavor to integrate authentic practices involving complex challenges within collaborative environments. The realm of AI in education must adapt to these shifts to sustain its current efficacy and augment its impact. These evolutions in education also present an opportunity for growth (Collins and Halverson, 2010). Nonetheless, numerous traditional classroom structures prove inadequate in engaging students with significant challenges (Kirschner et al., 2006; Tobias and Duffy, 2009) or allowing for student autonomy (Collins and Halverson, 2010). Both students and educators require enhanced, tailored support. In traditional educational paradigms, teachers were not expected to possess all-encompassing knowledge and simply transfer it to students. Conversely, in AI-integrated education, teachers are tasked with facilitating students' abilities to search, acquire, and synthesize information independently while fostering collaborative and critical thinking skills (Roll and Wylie, 2016).

AI within various fields is commonly evaluated through three distinct paradigms: data-based, logic-based, and knowledge-based approaches. Between 1980 and 2000, the emphasis on AI, specifically in the realm of education, was predominantly on a knowledge-based framework (Sleeman and Brown, 1982). In this period, the primary focus revolved around the development of intelligent teaching systems comprising modules that encompassed the domain, which denotes the specific area of learning, the student's knowledge and learning context, and pedagogical elements aiming for an adaptive and interactive interface (Woolf, 2009). Examining contemporary AI studies in education reveals a notable shift encompassing not only knowledge-based methodologies but also data and logic-based approaches. These contemporary applications extend beyond mere support for learning processes, encompassing diverse functionalities such as child-robot interactions, article analysis, and AI-driven evaluation systems. Additionally, these applications transcend the realm of learning support to encompass management-related aspects within schools and universities, including curriculum development, personnel programs, and cyber security measures (Holmes et al., 2019).

The utilization of AI in education has emerged as a focal point not only for educators but also for the leadership and digital strategists within educational institutions. In the contemporary era, digital transformation stands as a crucial imperative for organizations (Inel, 2019). Technological advancements have brought about profound shifts, prompting organizations to reconsider their operational methodologies and leadership paradigms (Schwarzmüller et al., 2018). The ascendancy of digital technologies has accentuated the necessity to explore the role of leadership, complicating the landscape further with the integration of digital technologies into leadership studies (Inel, 2019). Vial (2019) articulates digital transformation as "a process aimed at enhancing an entity by instigating substantial changes in its attributes through the amalgamation of information, information processing, communication, and connectivity technologies". Nonetheless, the linchpin of this digital revolution remains skilled human resources (Hanna, 2018). Simultaneously, recent scholarly investigations have delved into scrutinizing the impact of digital transformation on organizational dynamics (Peter et al., 2020).
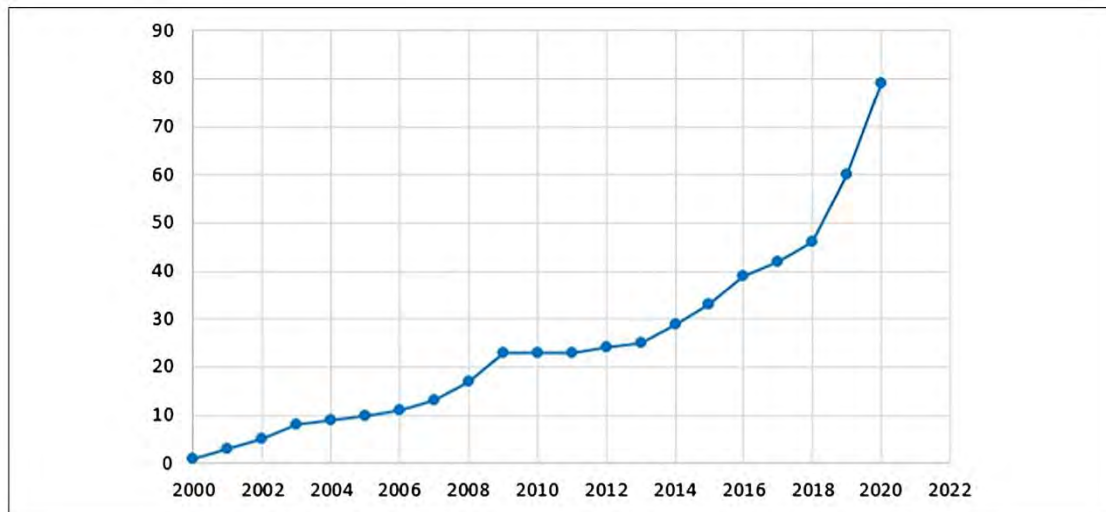
Figure 2. Cumulative Increase in Research (Tigre et al.)

The surge in virtual environments within technological organizations has underscored the pivotal role of leadership skills in shaping the efficacy of virtual entities (Ziek and Smulowitz, 2014). Within the literature, a delineation of ten essential traits characterizes successful digital leaders amidst the landscape of digital transformation. These attributes encompass vision, digital literacy, customer-centricity, agility, collaboration, risk-taking, fostering trust, motivation, innovation, and personalized assessment. Central to the dynamics of digital transformation is the imperative for top-tier management to provide a clear vision (Fitzgerald et al., 2014; Eberl and Drews, 2021). Digital leaders, leveraging their acumen in digital knowledge and literacy, play a crucial role in cultivating a digital mindset across the entire organization. This mindset equips the organization to adeptly respond to disruptive technologies (Hansen et al., 2011). The evolution of the digital landscape has significantly altered customer behavior and expectations, indirectly compelling organizations to reinvent themselves in order to attract and retain customers (von Leipzig et al., 2017).

The advent of the digital revolution has notably enhanced the agility of businesses. In assessing prosperous technology enterprises, the prevailing competitive landscape has necessitated greater flexibility and adaptability in company strategies (Akkaya and Tabak, 2020). While possessing digital skills is imperative, leadership in driving digital transformation demands a fusion of soft skills among digital leaders to effectively align with transformative initiatives (Promsri, 2019). The presence of diversity among employees places added responsibility on leaders to bridge various teams and operational systems. This encompasses fostering digital collaboration across borders, a crucial facet in steering a successful digital transformation journey (Promsri, 2019). Within this landscape, every decision undertaken by digital leaders carries inherent risk, making adept risk management pivotal to circumvent failures during digital transformation processes (Temelkova, 2018). Strategic decision-making in digital transformation requires leaders to calculate risks judiciously, acknowledging the inevitability of errors. Nevertheless, these risks remain instrumental in propelling digital transformation strategies forward (Promsri, 2019).

Trust emerges as a cornerstone of effective digital leadership. Leaders are expected not only to set an exemplary precedent but also to embody moral and ethical behaviors, pivotal in cultivating trust within their teams and organizations (Qian and Papadonikolaki, 2020). The imperative for leaders to inspire, motivate, and instill a sense of vision and purpose has long been acknowledged as fundamental to effective leadership. In the realm of digital leadership, this facet has arguably become increasingly crucial, given the accelerated pace of business growth amid heightened strategic uncertainty. Consequently, leaders are challenged to furnish their teams with a clear vision, robust strategy, and foresight (Morgan and Papadonikolaki, 2022).

Innovation stands as a pivotal pillar within the domain of digital leadership. The inception, management, and scaling of digital innovations constitute indispensable strides toward realizing their inherent value. Risk, an intrinsic element of any innovation endeavor, whether digital or otherwise, requires adept leadership support. This support is instrumental in fostering an environment conducive to innovation, particularly in establishing the psychological safety necessary for teams and individuals to embrace risk-taking and experimentation (Edmondson, 1999).

Leaders leverage individualized assessments as a strategic tool to coach, facilitate, instruct, mentor, and foster knowledge transfer while actively engaging with the developmental needs and untapped potential of their colleagues. In the expansive landscape of digitalization, which transcends geographical borders and is dispersed

across diverse disciplines (Nambisan et al., 2017), the necessity for robust two-way communication and feedback mechanisms becomes pivotal. In this context, digital leaders assume the role of boundary spanners, traversing knowledge boundaries and actively supporting the transfer of knowledge (Levina et al., 2006).

The utilization of individualized assessments enables leaders to tailor their approaches, offering personalized guidance and support to team members. This multifaceted engagement encompasses coaching individuals toward skill enhancement, facilitating seamless knowledge dissemination, and fostering a culture conducive to continual learning and development. Additionally, in the realm of digital leadership, the landscape's inherent dynamism demands leaders to adeptly navigate knowledge silos, facilitating the exchange of expertise and insights across diverse domains to drive innovation and organizational growth. this study aims to delve into the general perceptions of educational administrators concerning AI, their views on its application in education, their understanding of digital leadership, and their suggestions for effective digital leadership within the context of AI.

Digital Leadership in the Age of Artificial Intelligence

Effective leadership, irrespective of historical context, demands a distinct set of competencies and behaviors aligned with the prevailing demands of the era. Diverse economic landscapes, technological advancements, cultural nuances, and shifting societal values necessitate adaptive leadership approaches. The current surge of industry disruption finds its impetus in digital tools, technologies, and evolving business models, encompassing analytics, virtual reality, blockchain, cloud environments, mobile solutions, machine learning, interconnected devices, the sharing economy, and digital ecosystems. These digital innovations serve as catalysts, accelerating the pace of change and presenting formidable challenges for leaders in establishing and maintaining competitive advantage (Neubauer et al., 2017).

The landscape of leadership, in light of these rapid digital transformations, demands a keen understanding of the dynamic interplay between technological advancements and business strategies. Leaders are tasked not only with navigating the complexities introduced by these innovations but also with fostering an organizational culture that embraces agility, continual learning, and adaptability. This dynamic environment calls for leaders capable of orchestrating change, harnessing the potential of digital tools, and steering their organizations toward sustained relevance and success amidst evolving industry paradigms. In an era marked by rapid change, acknowledging one's limitations and recognizing the value of understanding what is unknown can hold as much significance as grasping what is known. Regrettably, leaders often encounter barriers to learning about new developments due to the sheer volume and diverse array of information within an organization's ecosystem. The imperative for leaders lies in fostering an openness to learning, actively seeking input from both internal and external sources, and acknowledging that others may possess insights beyond their own. The research underscores the crucial role of leadership humility, showcasing its significance not only within start-ups but also among well-established corporations (Neubauer et al., 2017).

AI stands at the forefront of pivotal tools driving the digitalization journey, wielding the potential to profoundly shape the future by directly influencing the developmental trajectories of nations. Positioned among the forefront technologies driving digitalization, AI holds transformative capabilities, impacting not just states but also societies and various organizational structures. Complementing AI, an array of other tools—such as 3D printers, the internet of things, big data, smart mobile devices, cloud computing, robotics, and blockchain—further accentuate the digitalization landscape (Turkey Artificial Intelligence Initiative, 2019).

The evolution of AI technologies portends a potential shift in the roles of states concerning the transformational trajectory. Within this unfolding paradigm, the role of education administrators assumes a critical juncture. Consequently, this study endeavors to delve into the perspectives of administrators regarding digital leadership in the era dominated by AI. Aligned with the overarching aim, the study delineates sub-objectives as follows.

Sub Objectives:
1. What are the perceptions of education administrators towards AI in the changing world conditions?
2. What are the perceptions of educational administrators on the use of AI in education?
3. What are the perceptions of educational administrators towards digital leadership?
4. What are the general perceptions of managers towards digital leadership in the context of AI?
5. What are the suggestions of educational administrators for digital leadership in the age of AI?

Method

This section contains detailed information about the research model, study group, data collection tool, and data analysis.

Research Design

The study was designed in accordance with the phenomenology design, one of the qualitative research methods. A phenomenological study, in which a detailed examination of a subject is made, offers the researcher the opportunity to examine the subject in depth (Yıldırım and Şimşek, 2013).

Participants
The study group of the research consisted of 15 educational administrators working in the 2022-2023 academic year. The participants were determined by maximum sampling design, one of the purposeful sampling methods. Purposive sampling is one of the sampling techniques used in qualitative research and is defined as the selection of units (individuals, groups, etc.) related to answering research questions based on certain purposes (Teddlie and Yu, 2007). Table 1 shows demographic information of participants (gender, institution, teaching seniority, management seniority).

Table 1. Demographic Information of Participants

Participant Code	Gender	Branch	Institution	Teaching Seniority	Management Seniority
P1	Male	Literature	Middle School	3	8
P2	Male	PCG	Science and Art Centers	21	4
P3	Male	Social Science	Middle School	4	21
P4	Female	PCG	Guidance and Research Center	20	1
P5	Male	English	Primary School	11	1
P6	Male	Primary School	Primary School	6	14
P7	Male	Primary School	Ministry of National Education	16	9
P8	Female	Science	Middle School	5	3
P9	Male	Maths	High School	5	20
P10	Male	Classroom	Ministry of National Education	4	19
P11	Female	Maths	Middle School	12	1
P12	Female	English	Primary School	9	9
P13	Male	Classroom	Primary School	7	9
P14	Male	Classroom	Middle School	14	7
P15	Male	Classroom	Science and Art Centers	3	20

Data Collection and Analysis
Data were collected through a semi-structured interview form. In the semi-structured interview technique, the researcher prepares the interview protocol including the questions s/he plans to ask (Türnüklü, 2000). In this method, the interviewer has the freedom to ask additional questions in order to obtain more detailed information as well as asking pre-prepared questions based on the topics or areas prepared in advance (Yıldırım and Şimşek, 2013). In qualitative research, the aim is to make specific explanations rather than generalizing information (Creswell and Poth, 2016). In this context, semi-structured interviews were conducted with 15 educational administrators who constituted the study group. After the necessary explanations were made to the participants, the interviews were conducted on a voluntary basis via Zoom. The interviews were conducted online by the researchers after making appointments and lasted approximately 35-45 minutes.

Descriptive analysis and content analysis were used to analyze the data obtained from the interviews. In descriptive analysis, the data are summarized and interpreted according to predetermined themes, and direct quotations are used to reflect the views of individuals in a striking way (Yıldırım and Şimşek, 2013). In content analysis, which is a widely used technique in qualitative research (Stemler, 2001), the researcher needs to decide what will form a pattern, what will constitute a theme, and how this structure will be named (Patton, 2014). Content analysis is carried out in four stages: analyzing the data and dividing them into meaningful sections and conceptualizing these sections "coding the data", explaining the data at a general level by using codes and bringing the codes together in certain categories "finding themes", organizing the data according to codes and themes in a way that the reader can understand "organizing and defining the data according to codes and themes" and explaining the relationships between the collected data "presenting and interpreting the findings" (Creswell and Poth, 2016; Yıldırım and Şimşek, 2013).

Accordingly, in the first stage, raw data texts were created by transferring the data in the audio recordings and interview forms to the computer environment. In determining the codes, the concepts used in the literature and the data obtained from the interviews were taken into consideration. Thematic coding was performed by taking into account the similarities, and commonalities between the concepts and themes were created. During thematic coding, efforts were taken to ensure that the concepts in the themes formed a meaningful whole with each other.

In this context, themes and codes were organized in a way to be related to each other, and comments and thoughts were included in line with the purpose of the study. Expressions that exemplify the views of the participants were carefully included in the analysis. The administrators were coded as P1: Participant 1, P2: Participant 2.

Role of the Researcher

The pivotal role of the researcher in qualitative research is paramount across critical stages of the process. Central to this role is active engagement in data collection, analysis, and interpretation. During the data collection phase, the researcher engages with participants, crafting interview questions, making observations, and overseeing the collection process. Subsequently, organizing data, coding, and identifying themes form essential steps. Building upon the analysis outcomes, researchers delve into interpretation, facilitating a deeper comprehension of participants' thoughts and experiences, ultimately serving as the primary objective of the research. Furthermore, upholding ethical standards, including adherence to ethical guidelines and safeguarding participants' rights, falls within the purview of the researcher's responsibilities.

Moreover, the researcher's influence extends into the research's design phase, encompassing the identification of research questions, participant selection, methodological choices in data collection, and the formulation of analysis strategies. As such, the researcher's role in qualitative research spans a spectrum, ranging from data collection and analysis to ethical compliance and research design (Creswell and Poth, 2016; Denzin and Lincoln, 2011; Morse et al., 2002).

Validity and Reliability

Unlike quantitative research, qualitative research is not evaluated within the framework of validity and reliability concepts, but within the framework of credibility instead of internal validity, transferability instead of external validity, consistency instead of internal reliability, and confirmability instead of external reliability in accordance with the nature of qualitative research (Lincoln and Guba, 1985). In the context of credibility, long-term communication with participants, deep-focused data collection, triangulation, expert review, and participant confirmation methods were used. In the context of transferability, detailed description and purposive sampling methods were used. Depending on the nature of qualitative research, the variability of events and phenomena was consistently reflected in the research. In addition, within the scope of confirmability, the results were compared with the raw data to see whether the confirmation mechanism was working (Erlandson et al., 1993).

Ethical Approval

Ethical permission (18.07.2023/07-41) was obtained from the Marmara University Ethics Committee for this research.

Findings

As a result of the content analysis, four themes were explored as follows: General Perceptions of Educational Administrators towards AI, Educational Administrators' Perceptions on the Use of AI in Education, Educational Administrators' Perceptions of Digital Leadership, Educational Administrators' Suggestions for Digital Leadership, and AI. In this section, the findings are presented separately within the framework of the themes, and the categories and codes forming the themes are given.

Table 2. General Perceptions of Educational Administrators towards AI

Theme	Category	Code	Participants
General Perceptions Towards AI	Advantages	Making things easier	K1, K2, K3, K4, K5, K6, K8, K9, K10, K11, K12, K13, K14, K15
		It's an exciting technology	K1, K2, K3, K4, K5, K6, K8, K9, K10, K11, K12, K13, K14, K15
		Facilitating knowledge management	K1, K2, K3, K4, K5, K6, K7, K8, K9, K10, K11, K12, K13
		Improving the thought system	K4, K7, K10, K14, K15,
		Saving time	K1, K7, K8, K14
		Indispensable for technology	K6, K10, K14, K15
		Ability to make decisions on behalf of people	K8, K11, K14, K15
		Neutral and transparent	K10, K11, K12,
		Increasing productivity	K8, K11
		An effective system in every field	K15

	Code	Participants
Limitations and Disadvantages	Posing a threat	K1, K2, K3, K4, K5, K7, K8, K10, K12, K13, K14
	The impossibility of replacing the human being	K1, K3, K5, K6, K12, K13 K6, K11, K14, K15,
	Inability to meet social and psychological needs	K1, K2, K3, K5, K6, K11, K12, K13, K14, K15
	Risk of abuse	K3, K4, K5, K6, K9, K10, K12, K13, K15
	Partial ability to substitute for humans	K1, K3, K5, K13 K6, K12
	Inability to foresee the ending	K4, K8, K13, K14, K15
	Lack of readiness in society	K1, K2, K6, K7, K10
	Ignoring human emotions	K3, K5, K6, K14
	Risk of protection of personal data	K2, K5, K8, K15
	Ethical problems	K5, K7, K11, K15
	In the process of imposing access limitations	K1, K8
	Worries about replacing humans	K7, K10
	Ignoring cultural, religious, and philosophical values	K15
	A cloud-based data system	K15
	Damaging human productivity	K14
	Causing information pollution	K15
	Blunting problem-solving skills	K13
	Inhibiting creative thinking	K13

In Table 2, participant opinions are segmented into two categories: advantages and limitations/disadvantages. Within the advantages category, a prevailing trend among most participants was the recognition of AI's facilitative role across educational domains. They highlighted its dynamic nature as a technology continually evolving, adding excitement and contributing to enhanced knowledge management. Notably, consensus surrounded its potential to revolutionize education across diverse fronts. Conversely, within the limitations/disadvantages category, a predominant concern voiced by the majority was the substantial threat posed by AI. Participants converged on the belief that, regardless of its sophistication, AI will never entirely supplant human capabilities. Moreover, a significant obstacle identified was its perceived inability to cater to the intricate social and psychological needs of individuals. In the advantages segment, a prevalent viewpoint underscored AI's promise in addressing issues related to impartiality and transparency—areas where human interventions have historically fallen short. Conversely, within the limitations and disadvantages section, a singular participant articulated the notion that AI, being a universal system, might inherently struggle to align with diverse cultural, religious, and philosophical values specific to each nation. Additionally, an emerging concern emphasized the imminent role of AI in defining societal boundaries. Some of the participants' views are presented as follows:

P11: *There will always be a need for people to use AI. In the social and psychological context, there will be a need for human guidance, sociability, smiling faces, understanding, and empathy.*

P3: *Machines, applications, and programs that can think and decide like humans are very exciting. Especially those based on visualization are impressive to me. But I see that it is not yet in a position to do anything for us.*

P15: *We all have a culture and identity. Our national spiritual values, social arguments we have developed, traditions, customs, traditions. Being a global citizen is important, of course, but we should protect our identities by preserving our culture. AI should serve a structure that can make us feel at peace, democracy, and tranquility.*

Administrators' perceptions on the use of AI in education are given below:
Table 3. Educational Administrators' Perceptions on the Use of AI in Education

Theme	Category	Code	Participants
Perception of the Use of AI in Education	**Management**	The interpretation and the final part still need to be done by human beings	K1, K2, K3, K6, K7, K9, K10, K11, K12, K13, K14, K15
		Difficult to implement in decisions involving social relations in management	K1, K2, K3, K4, K6, K7, K8, K10, K11, K13, K14, K15
		Easily doing paperwork and bureaucratic work	K1, K7, K10, K11, K13
		Consultation tool at the initial stage of decisions	K6, K7, K10, K11, K14

		Difficult to implement	K2, K5, K6
		Possibility of decreasing efficiency in education	K3, K5
		Suitable for the first stage of school principal assignments	K2, K6
		Incapable of making significant decisions	K5, K6
		Its use depends on the type of decision	K13
		Unavailability in case of crisis	K4
		Facilitating the teacher's work	K1, K2, K3, K4, K5, K6, K7, K9, K11
	Teacher Support Services	Faster and more systematic assessment	K1, K2, K3, K4, K5, K6, K7, K8, K10, K11, K12, K13
		Identification of missing subjects from exam results	K1, K2, K3, K11, K12, K13, K14, K15
		Reducing the rate of human errors	K3, K8, K5, K14, K15
		Supporting learning to learn	K7, K8, K11, K13, K14, K15
		More time is needed for the integration into education	K1, K5, K6, K11, K15
		Providing material and activity support	K13
		Increasing specialization	K15
		Having student recognition systems	K15
		Reducing working hours	K15
		Use in educational and preventive guidance	K2

In Table 3, the participants shared their opinions on the use of AI in education within the categories of management and teacher support and services. Under the management category, a majority of participants emphasized recurring opinions. They highlighted that the interpretative aspect of management remains within the realm of human capability and should not be altered. Furthermore, they expressed difficulty in applying AI to decisions concerning social relations in management. Regarding teacher services and support, the participants frequently emphasized several key opinions. They highlighted AI as a crucial system that streamlines a teacher's tasks, expedites measurement and evaluation processes, and provides a systematic approach to identifying gaps in subjects based on exam results. Some of the participants' views are indicated as follows:

> **P12:** *I think it will facilitate the teacher's work in many issues such as processing, evaluating, archiving, adapting data above human capacity, especially in measurement and evaluation processes, and making suggestions by analyzing needs when necessary.*
>
> **P5:** *We work with people, it is difficult for us to communicate with students, teachers, parents, and other support staff without eye contact. Since we are administrators with a heart, we need to share our teacher's distress at that moment and make the right decision. Therefore, the final decision in these situations should be with the human being.*

Educational administrators' perceptions of the digital leadership theme are given below:

Table 4. Educational Administrators' Perceptions of Digital Leadership

Theme	Category	Code	Participants
Educational Administrators' Perceptions of Digital Leadership	**Digital Leader Features**	Digitally literate	K1, K2, K3, K4, K5, K6, K7, K8, K10, K11, K12, K13, K14
		Ability to use technological tools	K1, K2, K3, K4, K5, K7, K8, K12, K13, K14, K15
		Having a vision	K6, K7, K9, K10, K11, K12, K13, K14, K15
		Capturing the speed of transformation	K1, K2, K3, K4, K5, K6, K7, K8, K9, K10, K11, K13
		Aiming to increase digital literacy	K7, K8, K10, K11, K12, K13, K14
		Active in management	K6, K8, K10, K11, K12, K13
		A motivating person	K1, K2, K3, K4, K6, K13, K14
		Role model	K1, K2, K3, K4, K6,
		Following technological innovations	K8, K10, K11, K13
		Embodying all kinds of leadership qualities	K4, K7
		Having high communication skills	K9, K15
		Collaboration in digital environments	K14

Advantages	Capable of captivating audiences in the digital world	K6
	Faster decision making	K1, K3, K7, K12, K13, K14, K15
	Removing borders in cooperation	K1, K2, K3, K4, K5, K6, K7, K8, K10, K11, K12K13
	Ability to communicate faster	K1, K3, K4, K5, K6, K11, K12
	Facilitating meetings	K3, K5
	A rich and diverse collaboration	K7, K8
	Virtual collaboration	K13, K15
	Communication channels are always open in digital leadership	K14, K15
	Responsibility is easier to follow	K12
	Digital leaders are more advantageous in terms of time and space	K14
Limitations	Resistance to digital transformation	K1, K2, K3, K4, K5, K6, K8, K10, K11, K12, K13, K14
	Lack of in-depth communication	K1, K3, K5, K8, K9, K10, K11, K12, K13, K14, K15
	People's prejudices in digital communication	K1, K2, K3, K4, K5, K6, K7, K8, K10, K11
	Difficulty in collaboration	K3, K5
	Existence of Those Who Can't Keep Up	K6, K8
	Obstacle to success	K5

Table 4 presents the insights shared by the participants across three categories regarding their perceptions of digital leadership: characteristics of the digital leader, advantages of digital leadership, and limitations of digital leadership. According to educational administrators, the predominant characteristics defining a digital leader revolved around proficient digital literacy, adeptness in utilizing technological tools and possessing a visionary approach capable of adapting to the pace of digital transformation. Within the category of advantages, a prevailing sentiment among the majority of participants highlighted the superiority of digital leaders in making swift decisions and breaking down barriers to collaboration compared to their non-digital counterparts. Conversely, in the limitations category, the participants expressed several concerns. They noted resistance toward digital transformation, a lack of deep interpersonal communication, and prevalent biases in digital interactions—particularly among individuals who have adopted digital practices later. Some of the participants' views are presented as follows:

P14: *I think it would not be possible to separate digital leadership from digital literacy because I think that digital leaders are also digital literate in terms of integrating technological applications into their work, using, managing, and applying technological data in the business environment.*

P6: *If your pace of transformation is much slower than the pace outside, the end is inevitable. So, we have to keep up with the pace of transformation and change outside. If our internal institutional speed is much less than that, I think it is a matter of time before we disappear, so we have to cooperate.*

P8: *I think there is no in-depth communication because there is no face-to-face communication and I think this is a big problem.*

Educational administrators' suggestions for digital leadership and AI theme is given below:

Table 5. Educational Administrators' Suggestions for Digital Leadership and AI

Theme	Code	Participants
Recommendations for AI and Digital Leadership	Establishing digital culture	K1, K2,K3,K4,K5,K6, K7,K8, K9,K10,K11, K12,K13,K14,K15
	Digital literacy training	K1, K2, K3,K4,K5, K6, K7, K8, K9, K11, K14, K15,
	Theoretical and practical training	K1, K2, K3,K4,K5, K6, K7, K8, K9, K11, K14, K15,
	Basic level AI training	K1, K2, K3,K4,K5,K6,K7, K9, K13,K15
	Basic computer usage training	K5, K9, K14
	Idea workshops	K5, K6, K7, K8
	Data management, data analysis, data privacy training	K9, K12, K13

Encouraging competitions	K1, K9
Awareness	K3, K11
Innovation and entrepreneurship training	K9, K13
Foreign language training	K9, K15

In Table 5, educational administrators articulated their suggestions within the realm of recommendations for AI and digital leadership. Their insights revealed a series of prominent suggestions for digital leaders navigating the landscape of AI and digital leadership. Foremost among the suggestions provided by the participants was the emphasis on evaluating digital leadership and AI within the context of digital transformation. Central to this suggestion was the imperative to cultivate a digital culture within educational organizations, establishing a foundation for their integration. Secondly, the participants strongly advocated for widespread digital literacy training, extending beyond educational administrators to encompass every individual involved in the educational ecosystem. The proposal underscores the importance of equipping all stakeholders with the necessary skills to navigate the digital landscape effectively. Another critical issue, ranked third and echoed by multiple participants, was the call for enhanced training initiatives in both theoretical and practical aspects. This suggestion might stem from the perceived deficiency in comprehensive training programs, highlighting the need to address this gap for effective utilization of AI and digital leadership in education. Some of the participants' views are depicted as follows:

> **P7:** *In order to ensure digital transformation, we need to spread digital culture, make serious collaborations and protocols with stakeholders, unite employees in a common vision, and act in line with this vision.*
>
> **P12:** *Training on using relevant tools with the right methods and techniques, ethical principles, personal data protection, digital literacy, digital awareness, and limitations can be provided.*

Discussion

The education sector is currently undergoing a rapid and profound transformation, heavily influenced by AI and digital technologies. This evolution underscores the critical significance of digital leadership within education. Teachers, students, and educational administrators must adapt to the demands of this new era, effectively utilize technology, and enhance the learning experience. Digital leadership is now recognized as a pivotal factor in unlocking the full potential of both students and educators. Leaders in this field must successfully implement this new paradigm while upholding ethical values. To explore this, this study aims to delve into the general perceptions of educational administrators concerning AI, their views on its application in education, their understanding of digital leadership, and their suggestions for effective digital leadership within the context of AI. The goal is to comprehensively investigate their opinions and insights in these areas.

The study's findings revealed that educational administrators generally perceived AI as a highly beneficial system that streamlines life processes. They acknowledged its substantial impact, particularly as its development pace accelerates, emphasizing its crucial role in simplifying information management. Presently, numerous AI applications, such as personal assistants like "Siri," game theories, language translations, intelligent education management systems, virtual classrooms, hand-face-image recognition systems, automation, and robotic tracking systems, have become integral parts of our lives (Arslan, 2020). However, while acknowledging its considerable advantages, administrators also expressed concerns about the potential dangers and constant risk of misuse associated with AI. This sentiment aligns with corroborating studies (Wang, 2021).

Within its limitations, educational administrators held the view that ignoring the stage AI reaches will never entirely replace human beings. Participants emphasized that artificial intelligence cannot make multidimensional evaluations as effectively as humans can. They recognized that despite current advancements, AI falls short in addressing social and psychological human needs. Although experts suggest the potential for human intelligence to adapt to computers, the complexity of the human brain presents significant challenges in achieving this feat (McCarthy, 2004).

A prominent viewpoint within this context highlights the evolving constraints of AI. Exploiting AI applications may lead to the misuse of private data or raise moral concerns. Consequently, the necessity of imposing limitations on AI access becomes increasingly crucial to delineate and oversee the ethical and societal dimensions of this technology. The determination of how stringent or flexible these limitations should become an area requiring collaboration between societies, governments, and technology companies.

Another significant finding of the research revolved around concerns that AI might disregard our cultural, religious, and philosophical values. Such disregard not only poses ethical dilemmas but also raises issues regarding social acceptance and usability. AI applications that overlook the needs stemming from diverse cultures and religious beliefs might face challenges in gaining acceptance within societies. Wang (2021) highlighted in their study that moral values like justice, equality, and honesty are likely to clash with the increasing use of AI, as indicated by the study's outcomes. Roll and Wylie have also addressed the moral and cultural dimensions of AI in

their study (Roll and Wylie, 2016). There's a risk that AI algorithms may inadequately represent cultural diversity and various belief systems. Consequently, both AI developers and users must endeavor to devise more ethical and equitable solutions by actively considering cultural diversity and values in the application of technology.

The research findings concerning the utilization of AI in education reveal that educational administrators emphasize the critical role of human interpretation and decision-making in management contexts. Particularly in decisions involving social relationships within management, the study underscores the importance of human intervention. AI systems may struggle to effectively assess emotional responses, social intricacies, and personal connections as these elements often entail complexities that cannot be distilled into quantifiable data.

In the realm of teacher support and services, the integration of AI proves immensely beneficial by streamlining teachers' tasks, expediting assessment and evaluation processes, and systematically identifying areas of improvement based on examination results. This support significantly benefits both educators and students. Studies by Arslan (2020) and Ahlquist (2020) corroborate these research findings, validating the impact of AI in both management contexts and enhancing teacher support and services. Contemporary learning technologies manifest in diverse forms, ranging from multimedia documents to virtual reality experiences, all aimed at enhancing learning environments. These technological advancements play a pivotal role in assisting educators by providing content aligned with specific design principles (Cojean and Martin, 2021), thereby fostering enriched learning experiences. The ASSISTments platform exemplifies this shift by initially evaluating students on standardized test-related knowledge and subsequently offering personalized support when needed (Heffernan and Heffernan, 2014). These studies corroborate and fortify the conclusions drawn from this study.

As technology and digital business models progress, the foundational assumptions of digitalization are undergoing a profound reevaluation. This phenomenon bears a resemblance to the observations made in management theories, which experienced a similar pivotal shift earlier (Uhl-Bien et al., 2007). The transformative force of digitalization extends beyond businesses, reshaping not only operational conditions but also the landscape of leadership. Remarkably, the concept of digital leadership has remained relatively underexplored in scholarly discourse (Hesse, 2018).

This study aimed to delve deeply into the perceptions of educational administrators regarding digital leadership. The research findings illuminate the educational administrators' viewpoint, defining a digital leader as one who possesses digital literacy, adeptness in utilizing technological tools, and a visionary outlook. Moreover, several studies concur with and reinforce these identified attributes (Antonopoulou et al., 2021; Ömer, 2020; Zhong, 2017; Sağbaş and Erdoğan, 2022). Persson and Manas's research (2021) accentuated the significance of digital leadership by revealing that leaders exhibiting elevated levels of digital leadership across management, customer, digital, and organizational domains wield a positive influence in crafting strategies for digital transformation.

Digital leaders wield a pivotal role in steering the integration and adaptation of digital technology within their organizational frameworks. Consequently, a profound understanding of the evolving digital ecosystem becomes imperative for these leaders to instigate transformative changes within businesses (Promsri, 2019). Beyond technological prowess, digital leadership necessitates an adeptness in harnessing the advantages offered by digital technologies and embedding them within the organizational fabric (Sainger, 2018). Multiple studies have underscored the indispensable role of leadership in fostering the adoption of technologies, nurturing digital innovations, and thereby fostering a competitive edge (Cameron, 2012).

These referenced studies provide further corroboration for the conclusions drawn within this study. In agreement with the study's findings, Fitzgerald et al. (2014) asserted that the success of digital transformation hinges upon the complete alignment of the entire organization towards a shared vision. They posited that digital leaders hold the responsibility of crafting a vision that can be effectively communicated to employees. This involves the formulation of a coherent roadmap and adherence to its trajectory, complemented by the provision of tangible and measurable goals along with incentives to drive their attainment (Promsri, 2019; Fitzgerald et al., 2014). Furthermore, supporting another key finding of this research, additional studies reinforce the notion that digital leaders must adeptly match the velocity of digital transformation (Antonopoulou et al., 2021).

The realm of advantages stemming from digital leadership encompasses swift decision-making and the dissolution of barriers to collaboration within organizations. The amalgamation of data analytics and AI, facilitated by technology, empowers leaders with the capacity for expedited and precise evaluation and decision-making processes.

Traditionally, collaboration has been impeded by physical constraints such as location, time disparities, and geographical boundaries. However, the advent of virtual platforms, cloud technology, and collaborative tools have dismantled these barriers, enabling seamless interaction between teams and stakeholders. Collaboration stands as a pivotal pillar within the domain of digitalization, as indicated by recent research emphasizing its centrality within digitally mature organizations (Kane et al., 2019).

A significant revelation within the confines of the limitations associated with digital leadership, as highlighted in this research, delineates the challenges encountered by educational administrators. These challenges stem from

impediments such as resistance among organizational members towards collaborative efforts, deficient depth in communication, and prevalent biases held by stakeholders concerning digital communication. The resistance exhibited by organizational members hampers cooperative endeavors, posing a substantial hurdle for educational administrators navigating the realm of digital leadership. Furthermore, a notable deficiency in the depth of communication adds to the complexities faced, hindering effective interaction and understanding.

Within the realm of suggestions provided by educational administrators concerning digital leadership and AI, the study reveals a series of recommendations. Administrators advocate for the initiation of studies aimed at fostering a digital culture within organizations, offering digital literacy training programs, and providing comprehensive theoretical and practical training concurrently. Corroborating these findings, Cortellazzo et al. (2019) asserted in their study on leadership in the digitalized landscape that fostering a digital culture holds paramount importance for leaders. This digital culture facilitates collaborative processes within intricate scenarios, addressing ethical concerns that often accompany complex digital environments.

The culmination of this study underscored the pivotal role of AI in our era, notably transforming organizations to a significant degree. Concurrently, it revealed a distinct perception among digital leaders who, despite focusing on aspects that enhance education, harbor a heightened awareness of encountering substantial threats within this transformative landscape. Moreover, the findings distinctly highlighted the imperative for educational administrators to acquire training within the realms of AI and digital leadership. This necessity emerges from the recognition of the substantial impact these domains exert on educational frameworks, demanding a proactive approach to equip administrators with essential skills and insights.

Recommendations

1. Specific training programs should be created to develop digital leadership skills. These programs should provide education managers with practical knowledge and skills on topics such as AI, data analytics, and digital strategies.
2. Educational administrators should be offered training focusing on effective change management strategies for AI integration and digital transformation processes in schools. This can help manage technological changes smoothly and effectively.
3. There is a need to develop innovative approaches to education policy that focus on AI and digital leadership. Policymakers should collaborate with education administrators and create policy frameworks that ensure the effective and equitable use of technology.
4. Educational administrators should encourage the participation of teachers and other school staff in decision-making processes related to AI applications. This can lead to more effective use of technology and evaluation of innovative ideas.
5. Education administrators should develop guidelines that address ethical issues and data security issues related to the use of AI. This is important to protect student data and uphold ethical standards.

Author (s) Contribution Rate
The Authors equally contributed to this research.

Conflicts of Interest
There are any potential conflicts of interest.

Ethical Approval
Ethical permission (18.07.2023/07-41) was obtained from the Marmara University Ethics Committee for this research.

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