

VIRTUAL LEADER: CAN AI TAKE OVER THE LEADERSHIP ROLE IN MODERN ORGANIZATIONS?

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Purpose: The purpose of the study is to assess the potential for artificial intelligence (AI) to replace human leaders in organizations. The study focuses on analyzing employee confidence in AI leaders and identifying areas where AI can be most effective, as well as those where it faces limitations.

Design/methodology/approach: The survey was conducted using a survey questionnaire based on a five-point Likert scale, targeting employees from different levels in 168 organizations, mainly in the manufacturing sector. The organizations were divided into four groups according to the number of employees, which allowed for a differentiated analysis of the results. The questionnaire consisted of two parts: a metric and an actual part, in which employees assessed the potential for replacing leadership with artificial Intelligence.

Findings: The survey results indicate that AI is increasingly seen as an effective leadership support tool, especially in areas that require quick decision-making and data analysis. Small and medium-sized organizations show greater willingness to entrust AI with leadership roles in operational tasks, while larger companies show skepticism, especially in the context of human relationship management and long-term leadership. AI is valued for its objectivity and elimination of human bias in decision-making processes, but faces limitations in areas requiring empathy and interpersonal skills.

Research limitations/implications: The main limitation of the study stems from the fact that the sample consisted mainly of organizations in the manufacturing sector, which may affect the generalizability of the results to other sectors of the economy. In addition, the study was based on a survey method, which may not fully reflect the complexity and dynamics of leadership interactions in practice. Research implications point to the need for further studies on the replacement of leadership with artificial intelligence, particularly in the areas of managing teams and building long-term trust.

Originality/value: The original value of this study is the in-depth analysis of trust in AI as a leader and its potential for leadership roles. The study provides unique insights into the varying perceptions of AI by organizations of all sizes, and opens up new avenues of research on the integration of AI in leadership roles.

Keywords: Industry 4.0, Leadership, Organizational leadership, Management, Artificial Intelligence, Virtual Leadership.

Category of the paper: Research paper.

1. Introduction

Dynamic technological development, particularly in the area of artificial intelligence (AI), has led to significant changes in the way organizations are managed. The concept of Leadership 4.0, emerging in the context of the fourth industrial revolution, has introduced a new perspective on the role of technology in leadership (Venkatesh, 2020; Molino et al., 2021). Increasingly, organizational leaders are being supported by digital tools that help them make better, data-driven decisions, increase employee engagement, and foster innovation (Wolański, Węglińska, 2016; Korzyński, 2018).

With the growing presence of AI in organizational structures, questions are being raised about the future of traditional leadership. AI not only supports operational decision-making processes, but also influences human resource management strategies, improves the efficiency of recruitment processes, and supports employee development through personalized recommendations (Nalepka, Bąk, 2017; Walusiak-Skorupa et al., 2023; Chodkowski et al., 2024). However, the full replacement of human leadership by AI raises serious challenges, especially in areas that require interpersonal skills, such as motivating employees and building trust in teams (Jagielska, 2017).

Despite the rapid development of AI and its increasing use in management processes, there are still significant doubts about whether artificial intelligence can completely take over the leadership function, especially in the long-term context of managing teams (Cox et al., 2019; De Cremer, Kasparov, 2021). The traditional leader not only makes operational decisions, but also plays a key role in building relationships with employees, developing their skills, and shaping the organizational culture (Sułkowski, 2001; Żukowski, 2022). AI although a powerful analytical tool, may face limitations in those aspects that rely on intuition, empathy and understanding of human emotions (Strzelecki, 2023; Skorupka, 2024).

Against the backdrop of these challenges, the purpose of this paper is to analyze whether and to what extent AI can actually replace the human leader in organizations. The research conducted aims to examine employees' level of trust in AI leaders, their willingness to work under artificial intelligence leadership, and assess where AI can prove most effective as a leader. In addition, the study identifies potential gaps and limitations in AI's ability to serve as a leader, especially in the context of managing interpersonal relationships in organizations of different sizes and structures.

The research gap that this study attempts to fill relates to the paucity of studies assessing AI's ability to fully replace traditional leadership. While many works focus on AI's supportive role in operational and strategic management, there is a lack of in-depth research on its ability to take over the entirety of a leader's responsibilities, particularly in areas requiring interpersonal competence. This thesis seeks to fill this gap by offering a unique perspective on AI's potential as a future leader of an organization, including the challenges of its large-scale implementation.

2. Leadership concepts in the age of artificial intelligence

Dynamic technological changes have led to the concept of Leadership 4.0, which emerged in the context of the fourth industrial revolution, characterized by the intensive development of digital technologies, automation and sustainable development (Oberer, Erkollar, 2018). Modern leadership requires leaders not only to have management skills, but also to be adaptable in a dynamically changing environment. A key aspect of leadership 4.0 is sustainable leadership, which integrates economic goals with social and environmental responsibility (Grzesik, 2023; Pietrzak, 2024).

With the rapid development of technology, artificial intelligence has begun to be increasingly recognized as a transformative force in leadership across sectors, improving decision-making processes, increasing employee engagement and fostering a culture of innovation (Weiland, Wierzbowski, 2021; Juchnowicz, Wolińska-Skuza, 2021; Chodkowski et al., 2024). Integrating artificial intelligence into leadership practices not only streamlines operations, but also enables leaders to make more informed, data-driven decisions, thereby increasing organizational effectiveness (Karakose, Tulubas, 2024; Pawar, Dhupal, 2024). The shift toward data-driven decision-making is critical in today's fast-changing business environment, where the ability to respond quickly to changing conditions is paramount (Brock, Wangenheim, 2019). Moreover, the use of artificial intelligence based on relevant data can help leaders identify potential threats and opportunities, improving strategic planning (Dey et al., 2024).

Artificial intelligence is also being used to increase employee engagement and productivity, supporting talent management by streamlining recruitment processes, providing personalized training recommendations and facilitating employee development (Wolniak, 2016; Rozman et al., 2022; Bankins et al., 2022). For example, artificial intelligence systems can analyze employee performance data to identify skills gaps and suggest targeted training programs, thus supporting a culture of continuous learning (Rozman et al., 2022). This not only improves individual performance, but also contributes to higher overall organizational efficiency (Sposato, 2024). In addition, by reducing repetitive tasks through automation, artificial intelligence allows employees to focus on more meaningful work, which can lead to increased job satisfaction and engagement (Huang, Rust, 2018; Tyson, Zysman, 2022).

The leadership style adopted by executives significantly affects the successful implementation of artificial intelligence initiatives (Gracel, Makowiec, 2017; Rudnicka, 2020). Effective leaders must cultivate a supportive organizational culture that embraces technological change and encourages collaboration between people and AI agents (Bankin et al., 2023; Effendi, Pribadi, 2021). This includes not only providing the necessary resources and training for employees to adapt to artificial intelligence technology, but also fostering an environment where ethical considerations are prioritized in the implementation of artificial intelligence

(Douglas, 2024). Leaders who adopt a coaching approach can alleviate the stress of technological transformation, thereby improving employee well-being and productivity (Jeong et al., 2024).

Fostering leadership through the use of artificial intelligence presents both significant challenges and opportunities.

One of the main challenges of artificial intelligence in leadership is the ethical implications of its use (Sempryk, 2023). Ethical leadership is crucial in guiding an organization through artificial intelligence dilemmas, such as algorithm bias and privacy concerns (Palacz, 2023; Hutson et al., 2023). Leaders must establish ethical standards and foster a culture of accountability around artificial intelligence technology to mitigate these problems (Uddin, 2023). The potential for artificial intelligence to replace traditional leadership roles raises questions about the future of human leadership. While artificial intelligence can improve decision-making with data-driven insights, the essence of leadership in the form of motivation remains a matter of debate (Quaquebeke, Gerpott, 2023).

3. Methods

Despite the many benefits of integrating artificial intelligence with leadership, it remains an open question whether AI can fully replace the traditional leader in an organization. While AI improves decision-making and operational processes, its ability to motivate, inspire and build trust within teams remains a challenge. Thus, in the context of AI's growing role in management, there is a research gap regarding the possibility of creating the concept of a virtual leader, where AI, rather than a human, would fully perform the function of an organizational leader.

Based on the research gap, the main research objective was defined, which is to assess whether artificial intelligence (AI) can fully replace traditional leaders in organizations. In order to deeply analyze and verify the stated research objective, the research question “Do employees show trust in AI-based leaders in the context of long-term team management?” was formulated. The article defines the hypothesis: Artificial intelligence can replace the leader in organizations.

In order to find an answer to the research question, a survey was conducted using a questionnaire based on a five-point Likert scale on a sample of 8147 employees from the manufacturing sector. The questionnaire was aimed at purposively selected employees who are at different job levels in the organization, which enabled the deliberate selection of respondents who met the relevant criteria, such as:

- Minimum length of service - 3 months.
- Affiliation with organizations in the manufacturing sector.
- The age of majority of respondents.

Based on the established criteria and the return of completed questionnaires, this made it possible to collect 168 correctly completed questionnaires.

The survey questionnaire consists of two parts: a metric to collect basic information about the respondents, and the actual part, which includes closed questions based on a five-point Likert scale. These questions are designed to explore how respondents perceive the possibility of artificial intelligence performing leadership functions in organizations.

The survey has some limitations that should be taken into account when interpreting the results. The sample is limited to Polish employees in the manufacturing sector, which may affect the possibility of generalizing the results to other countries and industries.

4. Results

The survey included an analysis of responses from 168 respondents from four groups of organizations, varying in size (Mościbrodzka, 2018):

- Micro - employing up to 10 people.
- Small - employing 11-50 people.
- Medium - employing 51-249 people.
- Large - employing more than 250 people.

The survey was designed to assess the potential for artificial intelligence (AI) to replace human leadership in various organizations, broken down by staff size. Respondents rated AI's potential competencies in key leadership areas, such as decision-making, team management and trust-building. A five-point Likert scale was used, with a score of 1 indicating complete disagreement with a statement, and 5 indicating full confidence in AI's capabilities in these aspects. Table 1 shows the distribution of respondents' answers by organization size.

Table 1.

Distribution of respondents' answers by organization size.

Attribute	Variable	Up to 10 people	11-50 people	51-250 people	More than 250 people
AI is capable of making effective strategic decisions without human input.	1	1	2	8	1
	2	0	2	2	10
	3	4	4	13	10
	4	2	10	21	30
	5	1	5	11	31
AI is able to build trust and commitment in a team at a level comparable to a human leader.	1	0	2	3	5
	2	2	0	4	7
	3	1	5	10	19
	4	5	9	16	26
	5	0	7	22	25

Cont. table 1.

AI could effectively manage interpersonal relationships within an organization.	1	1	0	4	7
	2	0	4	3	10
	3	3	4	16	20
	4	3	10	18	23
	5	1	5	14	22
AI could fully assume a leadership role in the organization.	1	0	2	0	6
	2	0	2	3	12
	3	2	5	12	20
	4	1	8	22	23
	5	5	6	18	21
AI could replace human leaders in making key decisions in the organization.	1	0	0	2	6
	2	0	5	11	9
	3	3	2	8	16
	4	2	8	21	31
	5	3	8	13	20
AI can successfully manage a team, motivating employees and ensuring their development.	1	1	1	0	4
	2	0	0	3	8
	3	0	6	12	22
	4	2	11	27	30
	5	5	5	13	18
AI can effectively replace the human leader in situations that require quick decision-making.	1	0	3	0	4
	2	0	3	6	7
	3	0	7	16	18
	4	5	6	21	35
	5	3	4	12	18
Decisions made by AI would be more objective than those made by human leaders.	1	0	1	2	4
	2	1	1	5	11
	3	3	6	15	20
	4	2	7	21	27
	5	2	8	12	20
In the future, AI may completely replace human leaders in managing the organization.	1	1	1	2	10
	2	1	2	10	7
	3	0	6	14	21
	4	3	10	21	21
	5	3	4	8	23
Replacing the human leader with AI would increase the efficiency of the organization's operations.	1	1	2	1	4
	2	0	4	5	12
	3	4	7	12	21
	4	1	6	25	28
	5	2	4	12	17

Source: Own elaboration.

Analyzing the average responses of respondents, a radar chart was developed (Figure 1), which shows the averaged ratings of respondents in the context of assessing the possibility of artificial intelligence replacing the human leader.

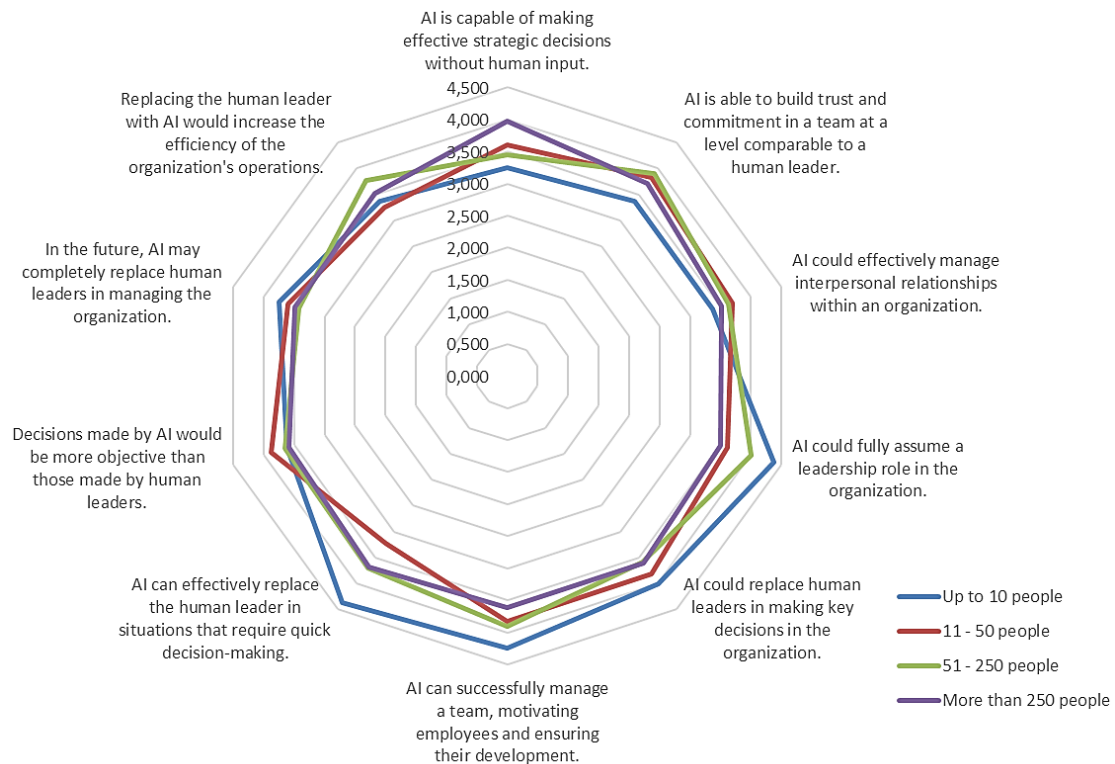


Figure 1. Assessing the feasibility of replacing human leadership with artificial intelligence.

Source: Own elaboration.

The results presented in the table show the varying attitudes of organizations with different numbers of employees toward the role of artificial intelligence (AI) as a potential leader. The data, based on a Likert scale, show significant differences in perceptions of AI's ability to take on leadership roles depending on the size of the organization.

Organizations employing up to 10 people

For the smallest organizations (up to 10 employees), the highest score was given to the statement AI can effectively replace the human leader in situations that require quick decision-making, which received a score of 4.375. This suggests that in small organizations AI is particularly valued for its ability to make quick decisions, which may be due to the more dynamic and less complex organizational structure. A similarly high score was given to the statement AI could fully assume a leadership role in the organization (4.375), further confirming the willingness of small teams to give AI a leadership role. On the other hand, the lowest score of 3.250 was given to the statement AI is capable of making effective strategic decisions without human input. This result suggests that small organizations are more skeptical of AI's ability to autonomously make strategic decisions, which may require more complex analysis and long-term thinking.

Organizations with 11 to 50 employees

In mid-sized organizations (11-50 employees), the highest score of 3.870 was given to the statement Decisions made by AI would be more objective than those made by human leaders. This score indicates that in this group, AI's ability to make decisions objectively is particularly valued, which can be seen as an advantage over human leaders.

The lowest score in this group was given to the statement AI can effectively replace the human leader in situations that require quick decision-making, with a score of 3.217. This may indicate that organizations of this size are concerned that AI will not be agile enough in dynamic situations where immediate reactions and decisions are required.

Organizations with 51 to 250 employees

In organizations with 51 to 250 employees, the highest ratings were given to the statement AI could fully assume a leadership role in the organization (4,000), suggesting that companies of this size are open to the possibility that AI will fully assume a leadership role. Similarly high ratings were given to the statements AI is able to build trust and commitment in a team and AI can successfully manage a team (3.909 each), indicating that AI is seen as effective in managing teams and building trust.

The lowest rating (3.418) was given to the statement In the future, AI may completely replace human leaders in managing the organization, indicating some skepticism about AI fully replacing human leadership. However, AI is rated positively in the context of quick decision-making (AI can effectively replace the human leader in situations that require quick decision-making - 3.709) and increasing the operational efficiency of the organization (Replacing the human leader with AI would increase the efficiency of the organization's operations - 3.764).

Organizations employing more than 250 people

The results for organizations with more than 250 employees show that AI is seen as very effective in making strategic decisions without human input, as reflected in the highest rating for the statement AI is capable of making effective strategic decisions without human input (3.976). These organizations appear to see AI's potential in more analytical and objective tasks, such as quick decision-making (AI can effectively replace the human leader in situations that require quick decision-making - 3.683) and in replacing human leaders in making key decisions (AI could replace human leaders in making key decisions in the organization - 3.610). High scores in these areas suggest that AI can play an important role in decision-making at higher organizational levels.

On the other hand, the lowest ratings refer to the full replacement of human leaders in the future. The statement In the future, AI may completely replace human leaders in managing the organization received a score of 3.488, suggesting that despite the acceptance of AI in decision-making issues, there is still skepticism about its role in managing people and fully taking over leadership functions. The relatively low scores for the statement AI could effectively manage interpersonal relationships within an organization (3.524) confirm that AI is still perceived as limited in managing interpersonal relationships, which can be crucial in larger organizations.

5. Conclusion

A study was conducted to assess whether artificial intelligence (AI) can completely replace the human leader in organizations, taking into account such key aspects as decision-making, team management and trust building. The results show a clear increase in the acceptance of AI as a tool to support leaders, especially in tasks that require rapid response and data analysis. In small and medium-sized organizations, AI was seen as capable of taking over some of the leader's responsibilities, especially for operational and tactical decisions that can be made based on available data.

Studies have shown that AI is particularly valued for its ability to make decisions objectively and eliminate human bias and emotional influences. In organizations that rely on a fast-paced environment, AI can support leaders by reducing reaction times and improving the accuracy of decisions. Small organizations with less complex structures were more likely to accept AI in a leadership role, due to the simplicity of decision-making processes and greater flexibility.

The research also highlighted AI's serious limitations in terms of replacing human leadership to its full extent. The biggest challenge remains AI's ability to manage interpersonal relationships, build trust in teams and inspire employees. These aspects are key to effective leadership, and currently AI-based technologies are unable to fully reflect the empathy, intuition and emotional understanding that characterize human leaders. In areas where interpersonal communication and motivating teams are required, AI still has significant shortcomings.

In larger organizations that operate in more complex structures and require long-term strategy and advanced personnel management, AI is seen as a support tool rather than an autonomous leader. Although AI can significantly improve operational efficiency by supporting decision-making processes, employees in these organizations express some skepticism about its ability to fully replace traditional leaders. This is primarily due to the fact that leadership in large companies requires not only technical skills, but also the ability to manage emotions, motivate teams and build organizational culture - all of which remain major challenges for artificial intelligence.

The study's findings show that despite technological advances and the increasing use of AI in organizations, its ability to fully assume leadership roles is still limited. The survey also revealed differences in perceptions of AI depending on the size of the organization. Smaller companies are more open to the idea of AI-based autonomous leadership, while larger organizations, due to their complexity, still see AI more as a support for leaders than a full-fledged leader.

6. Summary

The goal of the study was to understand whether artificial intelligence (AI) is capable of replacing human leadership in organizations, as well as what employees' perspectives are on trusting AI leaders to manage teams over the long term. The analysis included 168 organizations of varying sizes to compare perceptions of AI's ability to take on key leadership roles, such as decision-making, team management and trust-building.

In small organizations with up to 10 employees, AI was highly rated in terms of rapid decision-making. Employees at these companies saw AI's potential to fully assume leadership roles, which may be due to the lower complexity of decision-making and the more dynamic nature of management. AI was particularly valued for its effectiveness in making immediate decisions in situations that required quick responses. However, these organizations were skeptical of AI's ability to make strategic decisions on its own, which require more complex thinking and long-term vision.

Medium-sized organizations (11-50 employees) valued AI for its objectivity in decision-making, which was considered an advantage over human leaders. Especially in the areas of eliminating bias and making fair decisions, AI was seen as a tool to improve management processes. However, organizations of this size were more critical of AI's ability to effectively manage dynamic situations, which may be related to the greater complexity of internal structures and the need to quickly adapt to changing conditions.

In larger organizations with 51 to 250 employees, AI was rated positively in terms of its ability to manage teams and build trust within a group of employees. Employees in these organizations expressed the belief that AI could effectively support management processes by making more objective decisions and eliminating emotional factors affecting leadership. AI was also regarded as a tool that could increase operational efficiency, which is crucial for organizations with larger workforces. However, despite the positive assessment of AI's role in tactical decisions, respondents expressed some skepticism about AI's ability to completely replace human leadership, especially in the context of long-term management and relationship building.

The largest organizations, those with more than 250 employees, saw great potential for AI in making strategic decisions without human involvement. AI was particularly highly regarded in the context of analysis and data-driven decisions that require precision and objectivity. In larger organizational structures, where decision-making processes are more complex, AI could effectively support leaders in making faster and more accurate decisions. However, even in these organizations, respondents expressed doubts about AI's ability to completely replace human leaders, especially in areas that require managing interpersonal relationships, building commitment and motivating teams.

The survey results show that AI is seen as a valuable tool to support decision-making and operational processes, especially in areas that require rapid data analysis and decision-making. However, its role as a full-fledged organizational leader, especially in the context of human relationship management, remains under discussion. Skepticism among employees, especially in larger organizations, indicates that despite technological advances, fully autonomous AI leadership still raises questions and challenges, especially in areas related to motivating employees and building trust.

The results largely confirmed the hypothesis - AI can replace leadership in organizations, but it has serious limitations in performing leadership functions in areas requiring complex interpersonal skills. In particular, there is still skepticism in larger organizations about AI fully replacing human leaders.

The original value of this study is the analysis of trust in AI as a leader in the context of diverse organizations, which brings a new perspective to the discussion of integrating artificial intelligence into management structures. The research has provided new insights into the potential of artificial intelligence (AI) to play a leadership role in organizations. The findings show that AI is most effective in tasks that require quick decision-making and data analysis. Small and medium-sized organizations show more openness to entrusting AI with leadership roles in operational tasks, while larger organizations are more skeptical, especially in the context of managing interpersonal relationships and building trust. Nevertheless, the study encountered some limitations, such as focusing mainly on organizations in the manufacturing sector, which may limit the generalizability of the results to other economic sectors. In addition, the study relied on surveys, which may not fully capture the dynamics of leadership relationships in practice.

Future research assumes a focus on organizations across sectors to explore how AI can play a leadership role in more diverse contexts, as well as a deeper analysis of AI's impact on long-term team management and organizational culture building. This article can inspire future research in the context of replacing human leadership with AI and its ability to effectively motivate and manage teams long-term in the context of different industries and organizational structures.

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