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Artificial Intelligence Engines and Smart Systems in Developing an Integrated Model for Contemporary Leadership Theories

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Abstract

The rapid evolution of Artificial Intelligence (AI) technologies and smart systems has fundamentally reshaped the organizational landscape, creating a knowledge and methodological gap between technological advancement and the current theoretical frameworks of contemporary leadership. This research addresses this gap by investigating how AI engines and smart systems can contribute to the development and crystallization of an integrated model for contemporary leadership theories, particularly within the emerging hybrid work environment. Adopting a Descriptive-Analytical Approach through an in-depth desk review and critical analysis of recent academic literature, the study analyzes the impact of AI on core leadership concepts and identifies the new competencies required for leaders.

The analysis reveals that AI significantly enhances dimensions of Transformational Leadership, such as Individualized Consideration and Intellectual Stimulation, but simultaneously challenges the maintenance of Idealized Influence and Inspirational Motivation. The study highlights that the primary challenge in integrating smart systems is not technical, but ethical, necessitating robust governance frameworks. Consequently, the research proposes an Integrated Model: Leadership as a Strategic and Ethical Mediator. This model shifts the leader's role from an administrative supervisor to a mediator who focuses on Formulating the Hybrid Vision, ensuring Ethical Governance of AI decisions, and Enhancing Cognitive Adaptation among employees. The model emphasizes the necessity of new Hybrid Competencies, including Digital Emotional Intelligence and Algorithmic Ethical Thinking, to ensure effective and ethical leadership in the digital age. The findings underscore that Transformational Leadership remains the most effective style for managing digital change, provided it is augmented by these new competencies and the proposed mediator role.

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Key words: Artificial Intelligence,Smart Systems,Contemporary Leadership Theories, Integrated Model, Hybrid Collaboration,Ethical Leadership, Transformational Leadership, Digital Emotional Intelligence

INTRODUCTION

The accelerating development of Artificial Intelligence (AI) technologies and smart systems represents a fundamental shift in the work environment, posing unprecedented challenges and opportunities for contemporary leadership. Consequently, AI is no longer merely an auxiliary tool; it has become an active partner in decision-making processes, data analysis, and team management. This necessitates a re-evaluation of the theoretical frameworks governing leadership practices.

Research problem:

The research problem centers on the knowledge and methodological gap between the rapid evolution of AI technologies and smart systems, on the one hand, and the current theoretical frameworks of contemporary leadership, on the other. Despite the increasing role of smart systems in supporting decision-making, traditional leadership theories remain inadequate in providing an integrated model that explains, describes, and guides leadership practices in the hybrid work environment.

Main Question: How can Artificial Intelligence engines and smart systems contribute to the development and crystallization of an integrated model for contemporary leadership theories?

Research objectives:

1. Analyze the impact of AI engines and smart systems on the core concepts of contemporary leadership theories.
2. Identify the new leadership competencies required for leaders in the hybrid (Human-AI) work environment.
3. Present a comprehensive and information-rich theoretical framework that links AI with the evolution of leadership theories.
4. Propose a conceptual integrated model for the development of contemporary leadership theories that accommodates the role of smart systems.

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Research Significance:

1. Theoretical Significance: Contributing to bridging the theoretical gap by presenting a conceptual framework that integrates AI as a fundamental variable in the study of leadership.
2. Practical Significance: Guiding organizations toward developing training programs targeting digital and adaptive leadership competencies, and helping leaders understand how to leverage smart systems to enhance the effectiveness of their decisions and performance.

RESEARCH METHODOLOGY:

The research adopted the Descriptive-Analytical Approach through an in-depth desk review of recent academic literature and studies, coupled with a critical analysis of existing concepts and models. This process leads to synthesis and conclusion to construct a proposed integrated model that represents a theoretical addition to the field of leadership.

LITERATURE REVIEW:

This section aims to review and analyze Literature review relevant to the research topic, which address the relationship between leadership, AI, and digital transformation. These studies were selected to include diversity in language (Arabic and foreign), publication year (between 2015 and 2025), and methodology (theoretical and applied), thereby enriching the theoretical framework of the research

Do not use further subdivision, for instance 2.1.1. is not allowed.

No	Study	Author (Year)	Study Objective	Main Finding
1.	Influence of leadership on human–artificial intelligence collaboration	Zarate-Torres et al. (2025)	To propose a conceptual model illustrating the influence of leadership on the relationship between Human Intelligence (HI) and Artificial Intelligence (AI) in the hybrid work environment.	Leadership plays an ethical and strategic mediating role in the HI-AI relationship, acting as a balancing mechanism for algorithmic efficiency through cognitive adaptation.

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2.	Leadership and transformation in the public sector in light of AI adoption	Valle-Cruz et al. (2024)	To understand the perceptions of public sector leaders and identify their prevalent traits and skills amidst the adoption of AI technologies.	Leaders need to develop new skills focusing on strategic vision, data handling, and cultural change management to ensure the successful integration of AI in public organizations.
3.	Leadership in the digital age: Challenges and skills	Wilson (2015)	To examine the facilitating conditions for enhancing organizational leadership through the adoption of Web 2.0 technologies, and to define the concept of "Leadership in the Digital Age."	Leadership in the digital age requires rapid adaptability, transparency, and collaboration across organizational boundaries, with an emphasis on building trust and credibility in a changing environment.
4.	The challenges of applying digital leadership in public bodies	Al-Batli (2024)	To identify the challenges of applying digital leadership in public bodies from the employees' perspective, and to measure the reality of its practice.	Significant challenges exist related to infrastructure, a lack of digital competencies among some leaders, and resistance to change from employees, which hinders effective digital transformation.
5.	Transformational leadership and its impact on job performance	Al-Aroud (2024)	To study the impact of transformational leadership on job performance in municipal organizations, and to determine its role in change management.	Transformational leadership is the foundation for bringing about change and institutional success, as it contributes to motivating employees and transcending their

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				personal interests toward achieving the organization's greater goals.

COMMENTARY ON LITERATURE REVIEW:

The Literature review show an increasing focus on the intersection of leadership and technology, ranging from the challenges of leadership in the digital age (Wilson, 2015) to conceptual models that directly integrate AI into the leader-follower relationship (Zárate-Torres et al., 2025). Foreign studies (Zárate-Torres et al., 2025; Valle-Cruz et al., 2024) emphasize the necessity for leadership to move beyond mere traditional management to become an ethical and strategic mediator in dealing with smart systems, with a focus on adaptive competencies. In contrast, Arabic studies (Al-Batli, 2024; Al-Aroud, 2024) highlight applied challenges related to infrastructure and resistance to change, and affirm the importance of transformational leadership as a mechanism for managing this change. It is clear that there is a need for an integrated model that combines these perspectives, defining how AI engines can contribute to the development of contemporary leadership theories, which is the aim of the current research.

THEORETICAL FRAMEWORK:

Section one: conceptual framework of artificial intelligence and smart systems:

AI and smart systems represent the driving force behind the digital transformation that is reshaping organizational structures and leadership practices (Zárate-Torres et al., 2025). AI can be defined as the science and engineering of making intelligent machines, especially intelligent computer programs. The concept has evolved from merely simulating human intelligence to systems capable of learning, reasoning, and making complex decisions in uncertain environments (Floridi, 2019). Similarly, smart systems are defined as fully integrated systems that use AI as one of their components to achieve a broader and more comprehensive goal. A smart system does not rely solely on AI but integrates it with other elements such as databases, sensors, human users, and interaction interfaces.

ARTIFICIAL INTELLIGENCE ENGINES AND SMART SYSTEMS:

Smart systems rely on a set of "engines" or core technologies that enable them to perform their tasks, which can be summarized in the following table:

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AI Engine	Concept	Applications in the Leadership Environment
Machine Learning (ML)	Algorithms that allow systems to learn from data and identify patterns without explicit programming (Gignac & Szodorai, 2024).	Analyzing job performance data, predicting market trends, identifying employee turnover risks.
Natural Language Processing (NLP)	The machine's ability to understand, interpret, and generate human language.	Analyzing employee sentiment through surveys and emails, drafting executive reports.
Computer Vision	Enabling machines to "see" and interpret visual information.	Monitoring operational processes, analyzing body language in virtual meetings to assess engagement.
Generative AI (GenAI)	Models capable of creating new content (text, images, code) based on input data.	Assisting in drafting strategic plans, creating customized training content for leaders and employees.

The integration of these engines into organizational processes poses a challenge to leaders, as their role shifts from mere managers to "system coordinators" (Adeniyi et al., 2024), requiring them to understand how these systems work and their impact on organizational culture.

SECTION TWO: CONTEMPORARY LEADERSHIP THEORIES AND THE CHALLENGES OF THE DIGITAL AGE:

Leadership theories have undergone significant evolution, moving from a focus on the leader's personal traits to behavioral and situational models, and finally to contemporary theories that focus on the mutual influence between the leader and followers. The most prominent of these theories affected by AI are:

TRANSFORMATIONAL LEADERSHIP:

Transformational leadership is one of the most influential models, focusing on inspiring followers and motivating them to transcend their self-interests for the sake of achieving the organization's greater goals (Tahir, 2015). It relies on four main dimensions: Idealized Influence, Inspirational Motivation, Individualized Consideration, and Intellectual Stimulation (Yahaya &

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Ebrahim, 2016).

•AI Challenge: AI can enhance the latter two dimensions (Individualized Consideration and Intellectual Stimulation) by providing accurate data on each employee's needs and performance, allowing the leader to offer personalized guidance and training. However, the leader faces the challenge of maintaining Idealized Influence and Inspirational Motivation amidst increasing interaction with machines, as excessive reliance on data may diminish the leader's human touch.

ETHICAL LEADERSHIP:

Ethical leadership is concerned with the leader's behavior that demonstrates high ethical standards and encourages followers to adhere to them (Kumari et al., 2024).

•AI Challenge: AI poses new ethical challenges related to algorithmic bias, transparency, and accountability in decision-making (Sheikh et al., 2023). The ethical leader must ensure that the smart systems used align with organizational and societal values, and must be able to interpret machine decisions and verify their fairness (Floridi, 2019).

ADAPTIVE LEADERSHIP:

Adaptive leadership focuses on helping individuals and organizations adapt and thrive in complex and changing environments (Sharif & Ghodoosi, 2022).

•AI Challenge: The pace of change imposed by AI requires continuous adaptation from leaders. Therefore, the adaptive leader must possess "Cognitive Plasticity" to deal with the massive flow of information and rapidly change strategies (L. Meng et al., 2024). They are also responsible for building an organizational culture that encourages experimentation and learning from failure in integrating new technologies (Grover et al., 2022).

SECTION THREE: TOWARDS AN INTEGRATED MODEL FOR AI-SUPPORTED LEADERSHIP:

The aforementioned challenges necessitate a move away from isolated leadership theories towards an integrated model that positions AI as a strategic partner, not just a tool. This model must focus on the new leadership competencies that enable the leader to work effectively in a hybrid collaboration environment.

NEW LEADERSHIP COMPETENCIES IN THE AGE OF AI

The integrated model must be based on developing the following competencies in leaders (Oesch, 2024; Elfighi, 2025):

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Leadership Competency	Description	Role of AI in Supporting It
Digital Emotional Intelligence	The ability to understand and manage human emotions in the context of interaction with digital and smart systems.	Analyzing digital communication patterns and identifying indicators of stress or satisfaction among employees.
Algorithmic Ethical Thinking	The ability to evaluate and guide AI-generated decisions to ensure fairness and transparency.	Providing dashboards for the transparency of algorithmic decisions and identifying potential sources of bias.
Rapid Adaptive Leadership	The ability to lead teams through rapid cycles of planning, execution, and adaptation to technological changes.	Simulating complex change scenarios and providing immediate strategic recommendations to the leader.
Hybrid Collaboration	The skill of integrating human intelligence (intuition, experience, value judgment) with AI (data, speed, accuracy) to achieve optimal results (Zárate-Torres et al., 2025).	Managing the tasks of hybrid teams (human and machine) and distributing roles based on the optimal efficiency of each party.

THE PROPOSED INTEGRATED MODEL: LEADERSHIP AS A STRATEGIC AND ETHICAL MEDIATOR:

The research proposes an integrated model that views leadership as the strategic and ethical mediator between human intelligence and artificial intelligence. In this model, the leader's role is not limited to using AI as a tool but extends to:

1.**Formulating the Hybrid Vision**: Defining how AI can serve the organization's human goals and values, and not the reverse.

2.**Ethical Governance**: Establishing mechanisms to ensure that AI decisions are subject to human oversight and continuous ethical evaluation (Sheikh et al., 2023).

3.**Enhancing Cognitive Adaptation**: Encouraging employees to develop their cognitive and adaptive skills to work effectively with smart systems, rather than resisting them.

This model ensures that AI develops leadership theories to become more comprehensive, adaptive, and ethical, leading to more effective leadership in the digital age.

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RESULTS AND RECOMMENDATIONS:

Based on the in-depth analysis of the theoretical framework, a set of key results were reached, from which a set of scientific and practical recommendations emerged.

FIRST: KEY RESULTS:

1. Shift from Administrative Leadership to Mediator Leadership: The research showed that the traditional role of the leader as a decision-maker or administrative supervisor has shifted to the role of a strategic and ethical mediator between human intelligence and artificial intelligence.
2. .AI's Impact on Transformational Leadership Dimensions: The results confirmed that AI significantly enhances the dimensions of Individualized Consideration and Intellectual Stimulation in transformational leadership, but faces a challenge in maintaining the dimensions of Idealized Influence and Inspirational Motivation amidst increasing interaction with machines.
3. Importance of Hybrid Competencies: The analysis revealed the necessity of developing new leadership competencies that go beyond basic digital skills, to include Digital Emotional Intelligence and Algorithmic Ethical Thinking.
4. The Ethical Gap in Digital Leadership: Studies indicated that the biggest challenge in integrating smart systems is not technical, but ethical, requiring the establishment of governance frameworks that ensure fairness and transparency.
5. Confirmation of Transformational Leadership's Role in Digital Change Management: Transformational leadership remains the most effective style in leading organizations through digital transformation phases, as it provides the inspiring vision and necessary motivation to overcome resistance to change.

SECOND: RECOMMENDATIONS:

1. **Recommendations for Institutions and Organizations:**
   - Redefining Leadership Competencies: Human Resources and Training departments must reformulate leadership competency frameworks to include the hybrid competencies mentioned in the integrated model.
   - Developing Specialized Training Programs: Creating training programs focused on "Data-Driven Leadership" and "AI Ethics."
   - Establishing Ethical AI Governance Committees: Large organizations should form specialized committees tasked with reviewing and auditing the decisions of smart systems

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to ensure they are free from bias and discrimination.

2. **Recommendations for Researchers and Academics:**
   - Focusing on Applied Studies: Encouraging field studies that test the effectiveness of the proposed integrated model for mediator leadership in different work environments.
   - Developing Measures for Digital Emotional Intelligence: Working on developing scientific tools and measures to assess the extent to which leaders and employees possess hybrid competencies.
   - Studying the Cultural Impact: Conducting more research addressing the cultural impact of integrating AI on leadership styles in the Arab region.
3. **Recommendations for Leaders:**
   - Adopting a Continuous Learning Mindset: Leaders must adopt a growth mindset and continuous learning to understand the rapid developments in AI technologies.
   - Practicing Ethical Role Model Leadership: In an age of increasing reliance on machines, the leader must be a role model in adhering to ethical standards to enhance trust and credibility among employees.
   - Investing in Human Intelligence: Leaders should focus on tasks that require pure human intelligence (creativity, empathy, value judgment), and leave routine tasks to smart systems.

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