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Transforming Leadership for the Digital Age: A Conceptual Model of Algorithmic Leadership and Human Capital Management

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ABSTRACT

Digital transformation is reshaping the foundations of organizational decision making, work design, and leadership. Traditional leadership models, grounded in interpersonal influence and intuition, offer limited guidance in environments where artificial intelligence, automation, and data driven systems increasingly shape strategic and operational outcomes. This conceptual paper develops a comprehensive model of algorithmic leadership, a leadership capability that integrates human judgment with algorithmic intelligence to enhance decision quality, learning processes, and organizational adaptability. Drawing on the resource-based view, dynamic capabilities theory, socio technical systems theory, and human capital theory, the paper explains how algorithmic leadership reconfigures human capital, supports hybrid intelligence, and strengthens performance in technology intensive contexts. The proposed framework advances leadership theory and highlights essential implications for governance, workforce development, and responsible AI adoption. Future research directions are outlined to guide empirical validation and further conceptual refinement.
Keywords: Algorithmic leadership; Digital transformation; Human capital management; Data driven decision making; Technology intensive organizations

INTRODUCTION

Organizations are experiencing rapid and profound transformation driven by digital technologies, automation, and the exponential growth of data (Kabra et al., 2025). These shifts affect not only how firms operate but also how they design roles, coordinate work, evaluate performance, and make strategic choices (Park et al., 2011; Paşcalău et al., 2024; Permana et al., 2019). Traditional leadership models rooted in interpersonal influence, intuition, and human judgments were developed in an era when human cognition served as the primary basis for organizational decision making (Abourokbah et al., 2023). While still relevant, these models increasingly struggle to meet the demands of environments defined by algorithmic processing, predictive analytics, and intelligent automation. Leaders now face a fundamental challenge: guiding organizations where algorithms routinely generate insights, shape workflows, and influence key human capital decisions. Understanding how leadership must evolve under these conditions has become an essential theoretical and practical priority (Ambrogio et al., 2022).

Despite the scale of digital transformation, leadership research has not yet fully captured the deeper structural and cognitive shifts occurring in technology intensive organizations (Mackey & Cuomo, 2020). Concepts such as e-leadership and digital leadership provide valuable foundations but mainly describe technology enabled communication and digital competence. They do not address the growing reality that algorithms actively participate in decision making, resource allocation, and performance assessment. This emerging environment requires a form of leadership that integrates human judgment with algorithmic intelligence. The term *algorithmic leadership* reflects this need by describing leadership processes that intentionally combine human insight, data driven evidence, and AI generated recommendations. This paper argues that algorithmic leadership represents a qualitatively distinct leadership capability essential for navigating digital complexity (Blichfeldt & Faullant, 2021; Caliskan et al., 2021).

At the same time, organizations are fundamentally rethinking how they develop and deploy human capital. Digital transformation demands employees who can collaborate with algorithms, interpret analytical outputs, adapt to technological change, and engage in continuous learning. Human capital development is no longer limited to traditional training or competency building; it now involves cultivating hybrid intelligence where human capabilities are enhanced by algorithmic tools (Cheng et al., 2024). Leadership plays a central role in orchestrating this evolution, shaping learning environments, establishing expectations for digital engagement, and ensuring responsible use of intelligent systems. Thus, understanding how algorithmic leadership influences human capital development is critical for building technologically resilient and adaptable workforces (Chen & Xing, 2025).

This paper develops a high-level conceptual model explaining how algorithmic leadership transforms human capital management and strengthens organizational capabilities in technology intensive environments. Drawing on the resource-based view, dynamic capabilities theory, socio technical systems theory, and human capital theory, the model clarifies the mechanisms through which algorithmic leadership reshapes decision processes, learning systems, and performance outcomes. By integrating these perspectives, the paper provides a foundation for understanding leadership in a digital era where algorithms increasingly influence organizational life. This introduction sets the stage for a deeper theoretical examination of how algorithmic leadership emerges, operates, and contributes to sustainable competitive advantage.

THEORETICAL FOUNDATIONS

Understanding algorithmic leadership requires grounding it in several core theoretical perspectives that explain how organizations create value in environments shaped by technological complexity (Danaeefard, 2025). The resource-based view (RBV) provides a starting point by highlighting the strategic importance of unique and hard to imitate resources. Traditionally, these included leadership competencies (Corsaro & D'Amico, 2022), organizational culture, and employee knowledge. However, digital transformation broadens the resource landscape to include data assets, algorithmic systems, and advanced analytics capabilities (Mackey & Cuomo, 2020). These digital resources enhance organizational decision making and shape dynamic interactions between humans and technology. As shown in Table 1, RBV positions algorithmic leadership as a strategic capability that mobilizes both human and digital assets to create a competitive advantage that is difficult for rivals to replicate (Blichfeldt & Faullant, 2021; Caliskan et al., 2021).

Dynamic capabilities theory further deepens our understanding of algorithmic leadership by explaining how organizations adapt in rapidly changing environments. Digital transformation demands continuous sensing of new opportunities, rapid seizing of technological innovations, and ongoing reconfiguration of organizational capabilities. Algorithms support these processes by providing predictive insights, automating complex evaluations, and enabling faster experimentation (Dobrovnik et al., 2025). Algorithmic leadership strengthens dynamic capabilities by orchestrating AI based tools within strategic decision-making routines. Leaders rely on algorithms to extend sensing capabilities, evaluate multiple options simultaneously, and guide timely resource reallocation. This perspective positions algorithmic leadership as a meta capability that enhances organizational adaptability and enables firms to respond effectively to uncertainty and technological turbulence (Dwivedi & Paul, 2022).

Socio technical systems (STS) theory provides a complementary lens for understanding the integration of human and algorithmic agents in modern workplaces. STS emphasizes that organizations are composed of intertwined social and technical subsystems that must be aligned for optimal performance. Digital transformation reshapes this balance by positioning algorithms as central actors in coordinating tasks, monitoring performance, and distributing knowledge. Algorithmic leadership ensures that these technologies support rather than undermine human expertise (Kabra et al., 2025). It involves establishing governance mechanisms, fostering algorithmic transparency, and developing trust in AI generated decisions. As described in Table 1, STS highlights the need for leaders to harmonize human judgment with algorithmic processes, ensuring that both subsystems reinforce rather than constrain one another (Chen & Xing, 2025; Cheng et al., 2024).

Human capital theory (HCT) underscores the importance of skills, knowledge, and learning in achieving organizational success. In technology intensive environments, valuable human capital increasingly includes digital literacy, data interpretation skills, and the ability to collaborate with intelligent systems (Eke et al., 2022). Employees must adapt to algorithmically mediated workflows and continuously update their competencies. Algorithmic leadership directly shapes these developmental processes by promoting digital learning cultures, supporting personalized training through AI driven feedback systems, and establishing expectations for responsible algorithm use. By aligning human capabilities with technological opportunities, algorithmic leadership enhances workforce readiness and strengthens long term organizational competitiveness. This theoretical grounding establishes human capital as a central channel through which algorithmic leadership produces value.

Table 1. Theoretical Foundations and Their Relevance to Algorithmic Leadership

Theory	Core Idea	Relevance to Algorithmic Leadership

Resource Based View (RBV)	Organizations gain advantage through unique, valuable, and hard to imitate resources.	Positions algorithmic leadership as a strategic capability that integrates human and digital resources to create competitive advantage.
Dynamic Capabilities Theory	Firms must sense, seize, and transform in response to environmental change.	Algorithmic tools enhance sensing and seizing processes; leaders orchestrate these tools to strengthen adaptability.
Socio Technical Systems (STS) Theory	Organizational outcomes depend on alignment between social and technical subsystems.	Algorithmic leadership harmonizes human expertise with algorithmic processes and ensures responsible system integration.
Human Capital Theory (HCT)	Skills, knowledge, and learning drive organizational performance.	Highlights how algorithmic leadership develops digital and analytical capabilities across the workforce.

CONCEPTUALIZING ALGORITHMIC LEADERSHIP

Algorithmic leadership describes a leadership capability that integrates artificial intelligence, algorithms, and advanced analytics into decision making and people management processes (Esangbedo et al., 2024). Unlike traditional leadership, which relies primarily on human intuition and relational influence, algorithmic leadership operates through a hybrid form of intelligence in which human judgment is complemented by algorithmic insights (Fernandez-Miguel et al., 2024; Frick et al., 2021). This approach enables leaders to process complex information more accurately and respond to uncertainty with greater precision. As summarized in Table 2, algorithmic leadership is shaped by both technological and human elements, making it uniquely suited for environments characterized by rapid digital transformation (Mackey & Cuomo, 2020). Figure 1 further illustrates the mechanisms through which algorithmic leadership functions in practice.

A clearer understanding of algorithmic leadership requires identifying the characteristics that set it apart from earlier leadership models (Danaeefard, 2025). One defining characteristic is its data centric orientation, where algorithmic outputs are treated as essential components of decision making rather than supplementary indicators. Equally important is algorithmic transparency, which ensures that leaders understand how AI models generate recommendations and recognize the assumptions behind them (Ganuthula, 2025). Another characteristic is the emphasis on human algorithm collaboration, enabling employees to use intelligent tools to enhance their work. The final characteristic involves promoting continuous digital learning to sustain organizational adaptability (Mackey & Cuomo, 2020). These elements align with the construct definitions provided in Table 2.

Algorithmic leadership also operates through a set of interconnected mechanisms that shape how leaders interact with intelligent systems (Grego et al., 2025). Algorithmic augmentation expands leaders' cognitive capacity by enabling them to interpret complex datasets and identify subtle patterns (Hamann-Lohmer et al., 2023). Algorithmic orchestration allocates tasks strategically between humans and algorithms to improve efficiency. Algorithmic supervision uses real time analytics to monitor performance, identify developmental needs, and facilitate continuous improvement. Algorithmic alignment ensures that automated systems support organizational values and strategic goals. These mechanisms are visually represented in Figure 1 and correspond to the conceptual distinctions presented in Table 2, showing how algorithmic leadership influences organizational structures and work dynamics.

Table 2. Key Constructs and Definitions

Construct	Definition	Theoretical Foundation
Algorithmic Leadership	A leadership capability that integrates human judgment with algorithmic insights to guide decisions, manage work, and coordinate human AI collaboration.	RBV, DC, STS
Algorithmic Augmentation	The enhancement of human decision-making capacity through AI tools and data driven models.	DC, HCT
Algorithmic Orchestration	Strategic distribution of tasks between humans and algorithms to optimize performance.	STS
Algorithmic Supervision	Using real time analytics to monitor performance, deliver feedback, and support learning.	STS, HCT
Algorithmic Alignment	Ensuring AI systems support organizational goals and ethical principles.	RBV, STS

The broader implications of algorithmic leadership extend beyond technological implementation and into areas such as trust, governance, and human development. Leaders must address concerns regarding bias, fairness, and accountability in algorithmic systems to maintain employee confidence (Hamdy, 2024; Hofacker et al., 2020; Imran et al., 2021). Transparent communication about how algorithms support decisions is critical, especially when employees perceive automated tools as intrusive or opaque. Additionally, leaders must balance efficiency gains with opportunities for employee growth, ensuring that human development remains a priority (Heshmatisafa & Seppänen, 2023; Ishaq, 2025). Algorithmic leadership thus represents both a technological capability and a relational capability, functioning as a bridge between machine intelligence and human potential (Jamwal et al., 2024; John et al., 2025; Kabra et al., 2025). This integrated perspective reinforces the conceptual boundaries of algorithmic leadership described in Table 2 and illustrated in Figure 1.

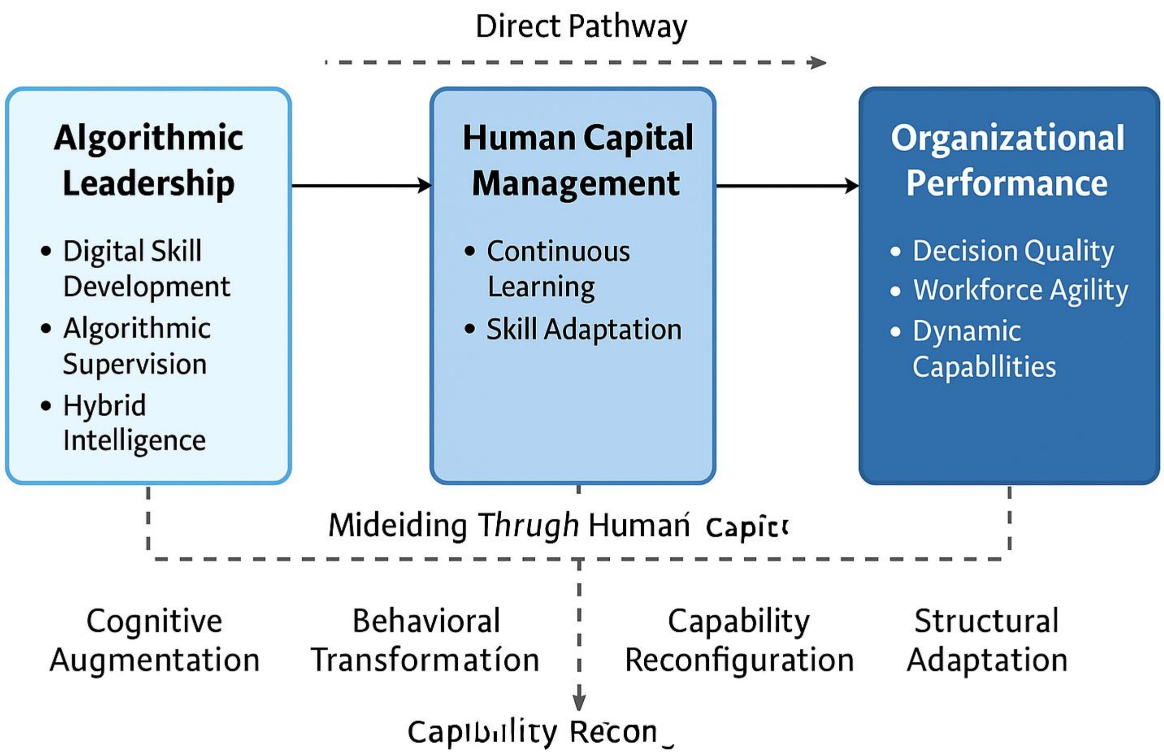

Figure 1. Conceptual Model

PROPOSED CONCEPTUAL MODEL

The proposed conceptual model integrates insights from the resource-based view, dynamic capabilities theory, socio technical systems theory, and human capital theory to explain how algorithmic leadership shapes organizational performance in technology intensive environments. The model positions algorithmic leadership as a central capability that orchestrates the interaction between human and algorithmic resources. As shown in Figure 2, algorithmic leadership influences human capital management through several pathways, including digital skill development, algorithmic supervision, and hybrid intelligence formation. These pathways collectively enhance organizational adaptability and strengthen performance outcomes. The framework highlights how algorithmic leadership functions as both a technological and relational capability that reshapes organizational decision-making processes (Kayan et al., 2025).
The model proposes that algorithmic leadership directly enhances human capital management by supporting continuous learning, fostering digital skill development, and integrating AI enabled feedback systems. Algorithmic leaders establish expectations for algorithmic literacy, promote responsible engagement with intelligent systems, and encourage collaborative use of technology (Mackey & Cuomo, 2020). These efforts contribute to the formation of hybrid intelligence, where human judgment and algorithmic insights complement one another. As referenced in Figure 2,

human capital capabilities act as mediating forces, translating the influence of algorithmic leadership into improved decision quality, workforce agility, and stronger organizational capabilities. This mediating role underscores the centrality of human capital in digital transformation processes.

A second pathway within the model highlights the direct effect of algorithmic leadership on organizational performance. Leaders who effectively incorporate algorithmic tools into strategic and operational decisions enhance analytical precision, reduce cognitive biases, and respond more quickly to environmental uncertainty. These improvements strengthen dynamic capabilities by enabling organizations to sense emerging opportunities, seize them efficiently, and reconfigure resources with agility. In Figure 2, this direct effect is represented by the pathway linking algorithmic leadership with organizational performance, independent of human capital. This relationship suggests that algorithmic leadership generates value not only by developing people but also by enhancing organizational routines and decision-making structures (Khin & Ho, 2019; Kim et al., 2022).

The model also incorporates feedback loops that show how enhanced organizational performance reinforces the development of human capital. As organizations adopt more advanced technologies and refine their decision-making systems, they create environments that encourage further learning, experimentation, and capability building (Kabra et al., 2025). These reinforcing mechanisms create a cycle in which algorithmic leadership, improved human capital, and organizational performance continually strengthen one another. Figure 2 captures this dynamic system, illustrating how algorithmic leadership supports continuous capability evolution. In this way, the conceptual framework provides a foundation for future empirical research aimed at validating the relationships and testing the conditions under which algorithmic leadership is most effective.

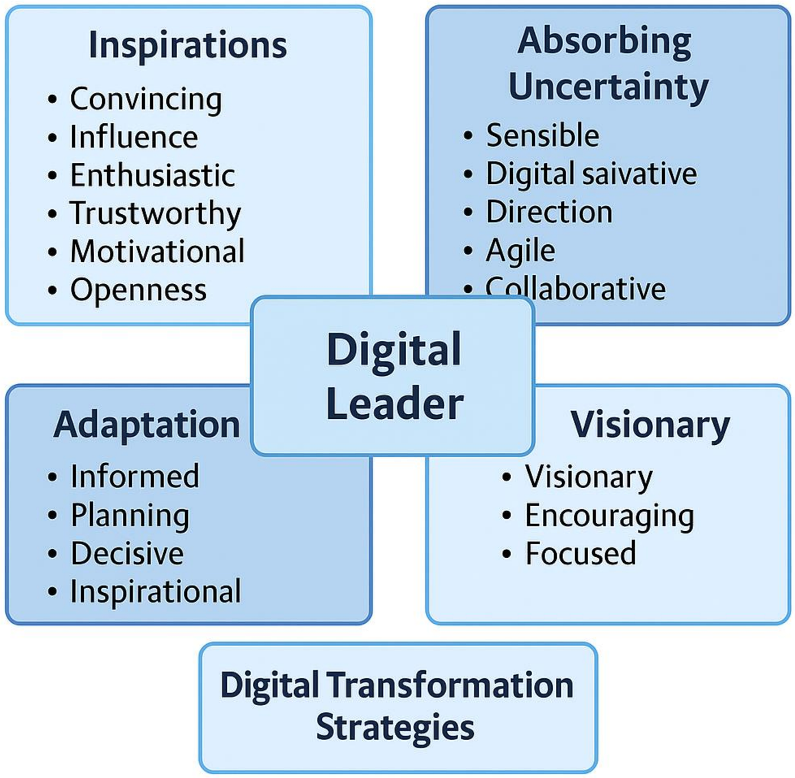

Figure 2. Digital Leader Model Diagram

PATHWAYS LINKING ALGORITHMIC LEADERSHIP AND PERFORMANCE

Algorithmic leadership enhances organizational performance through several interconnected pathways that influence how decisions are made, how information is processed, and how resources are aligned (Kowalkowski et al., 2024). The first pathway involves cognitive augmentation, where algorithmic tools expand leaders' analytical capacity by enabling the processing of large datasets, identifying subtle relationships, and generating predictive insights (Kraus et al., 2019). This reduces uncertainty and supports more rational, evidence-based decisions (Li et al., 2024). Algorithmic systems also help mitigate human biases, improving the consistency and accuracy of strategic choices. Through this augmentation process, leaders can navigate complex environments more effectively, and organizations benefit from faster, more reliable decision cycles grounded in objective analysis.

A second pathway operates through behavioral transformation, where algorithmic leadership reshapes employee behavior and work practices. Real time analytics make performance expectations more transparent and provide immediate insights into progress, allowing employees to adjust their actions more quickly (Liu et al., 2023). Algorithmic supervision supports targeted feedback that encourages skill development and continuous improvement. As employees interact with algorithmic systems, they develop new digital competencies and become more comfortable integrating data into their daily tasks (Mackey & Cuomo, 2020). This transformation strengthens organizational learning and enhances responsiveness, as the workforce becomes more aligned with data driven norms and digital work patterns that support improved performance outcomes.

A third pathway centers on capability reconfiguration, where algorithmic leadership supports the reorganization of human capital and operational systems to adapt to evolving technological demands. Predictive analytics inform leaders about emerging skill gaps, workforce needs, and performance patterns, enabling more strategic talent deployment. Algorithmic insights also help identify inefficiencies and areas where automation can enhance productivity (López Custodio et al., 2025). This capability driven reconfiguration allows organizations to continuously align their resources with strategic goals. As a result, human capital becomes more adaptive, workflows become more efficient, and the organization develops a stronger capacity to manage technological disruption and competitive pressures.

The final pathway concerns structural adaptation, where algorithmic leadership contributes to more agile and dynamic organizational structures. Algorithmic tools allow for decentralized decision-making by equipping teams with immediate access to relevant data. This reduces bottlenecks and enhances operational flexibility. Additionally, algorithmic leadership encourages experimentation and innovation by providing low risk environments for testing new ideas using simulations and digital prototypes. As structures become more fluid and responsive, organizations can adjust more rapidly to market changes and technological shifts. These structural adaptations create a reinforcing loop, where enhanced agility strengthens performance, and improved performance further supports the continued adoption of algorithmic leadership practices.

THEORETICAL CONTRIBUTIONS

This paper contributes to leadership theory by conceptualizing algorithmic leadership as a distinct and contemporary leadership capability shaped by the widespread integration of artificial intelligence and data-driven systems. Traditional leadership frameworks emphasize interpersonal influence, emotional competence, or visionary guidance, but they offer limited insight into contexts where algorithms participate directly in decision-making. By defining algorithmic leadership and identifying its core mechanisms, this paper extends the boundaries of leadership theory into the domain of hybrid intelligence (Luo et al., 2024). It highlights the increasing interdependence between human judgment and algorithmic processing, offering a revised understanding of how leadership operates in digitally intensive environments where information complexity exceeds human cognitive limits.

A second theoretical contribution lies in integrating algorithmic leadership into the resource-based view and positioning it as a strategic organizational capability. While RBV traditionally centers on human skills, knowledge, and intangible resources, this paper expands the framework to include algorithmic systems and data assets as complementary resources that shape leadership effectiveness. Algorithmic leadership emerges as a VRIN capability because it requires unique combinations of technological literacy, ethical reasoning, governance competence, and strategic insight. This reconceptualization broadens RBV by demonstrating how competitive advantage now depends not only on human expertise but also on the organization's ability to orchestrate interactions between humans and intelligent technologies.

The paper also advances dynamic capabilities theory by explaining how algorithmic leadership enhances sensing, seizing, and transforming processes. Digital environments require rapid detection of emerging trends, evaluation of strategic alternatives, and continual reconfiguration of resources. Algorithmic tools accelerate these capabilities by providing predictive insights, enabling data driven experimentation, and supporting real time adaptation. Algorithmic leadership strengthens dynamic capabilities by embedding these tools into organizational routines and by guiding employees in interpreting and applying algorithmic outputs. This perspective enriches dynamic capabilities theory by incorporating algorithmic intelligence as a central driver of organizational agility and by positioning leadership as a mediator between technological potential and realized strategic outcomes.

Finally, this paper contributes to socio technical systems and human capital theory by clarifying how algorithmic leadership shapes the evolution of human capabilities in digitally intensive organizations. The model illustrates how algorithmic systems influence learning processes, performance evaluation, and skill development, thereby transforming traditional assumptions about how human capital is cultivated. Algorithmic leadership emerges as a mechanism for harmonizing social and technical subsystems, ensuring that algorithmic tools complement rather than replace human expertise (Abourokbah et al., 2023). This integration deepens theoretical understanding of how human capital evolves in hybrid work environments and highlights the importance of leadership in fostering trust, transparency, and responsible technology use. Together, these contributions establish a comprehensive foundation for future research on leadership in the algorithmic era.

PRACTICAL IMPLICATIONS

Algorithmic leadership offers several practical implications for organizational leaders seeking to navigate digital transformation (Ambrogio et al., 2022). First, leaders must develop algorithmic literacy to effectively evaluate, interpret, and question AI generated insights. This requires an understanding of how algorithms function, what assumptions they rely upon, and where potential biases may arise. Leaders who cultivate these skills can integrate algorithmic outputs more thoughtfully into strategic decisions, reducing reliance on intuition while maintaining essential human judgment. Organizations should therefore incorporate AI literacy and data driven decision making into their leadership development programs, ensuring that leaders are equipped to guide their teams in increasingly complex and information rich environments.

A second implication concerns human capital development. As algorithmic tools reshape the nature of work, organizations must design learning systems that support continuous skill acquisition and adaptation. Algorithmic leadership encourages the use of personalized learning pathways, performance dashboards, and predictive analytics to identify skill gaps and tailor development initiatives (Mackey & Cuomo, 2020). This approach enables employees to build digital competencies at a sustainable pace while aligning learning activities with organizational priorities. Practical steps include integrating AI enabled training platforms, offering microlearning resources, and creating opportunities for hands on experimentation with digital tools. These initiatives foster a workforce capable of thriving alongside intelligent technologies.

Algorithmic leadership also has important implications for organizational governance and ethical oversight (Majumdarr et al., 2025; Mattila et al., 2021). Leaders must establish clear guidelines governing the use of algorithmic systems, including protocols for transparency, accountability, and data protection (Ning & Yao, 2023). This is particularly crucial in areas such as employee evaluation, recruitment, or task allocation, where algorithmic decisions can directly impact careers and workplace dynamics (Nurhayati et al., 2022). Leaders should promote open dialogue about how algorithms are used, clarify which decisions remain under human control, and implement safeguards to minimize unintended discrimination or bias. By institutionalizing ethical governance, organizations can enhance trust in algorithmic tools and ensure their responsible integration into daily operations.

A final practical implication involves organizational structure and culture. Algorithmic leadership supports more agile, decentralized decision making by equipping teams with real time data and analytics. To leverage this, organizations may need to redesign workflows, reduce hierarchical bottlenecks, and encourage cross functional collaboration. Leaders should cultivate a culture that values experimentation, evidence-based decision making, and constructive engagement with digital systems. This cultural shift enables employees to interact confidently with algorithmic tools and fosters collective ownership of digital transformation. When combined with supportive structures and clear communication, algorithmic leadership can accelerate innovation, improve operational responsiveness, and strengthen organizational resilience in rapidly evolving environments.

FUTURE RESEARCH DIRECTIONS

Future research should develop rigorous measurement instruments that capture the unique dimensions of algorithmic leadership. Current leadership scales do not adequately address leaders' interactions with AI systems, their ability to interpret algorithmic outputs, or their role in managing human algorithm collaboration. Scholars should therefore design and validate multidimensional scales that reflect the constructs identified in this paper, such as algorithmic augmentation, orchestration, supervision, and alignment. Longitudinal designs would allow researchers to examine how these leadership behaviors evolve as organizations adopt more advanced technologies. Such measurement work is foundational for empirical testing and for positioning algorithmic leadership as a legitimate construct within the broader leadership literature.

Another promising research direction involves examining trust dynamics within hybrid intelligence systems. As algorithms assume greater influence over decisions, employees may question the fairness, transparency, or legitimacy of automated recommendations. Future studies should investigate the psychological conditions under which employees trust or distrust algorithmic tools, and how leadership behaviors mitigate these concerns. Researchers could explore how communication practices, ethical guidelines, and shared governance structures shape trust formation. Comparative studies across industries may also reveal how trust dynamics differ in sectors such as healthcare, finance, manufacturing, or education, where stakes and technological maturity vary significantly.

Research is also needed to explore the ethical and governance challenges associated with algorithmic leadership. As organizations rely more heavily on algorithmic decision systems, questions arise regarding accountability, bias, privacy, and autonomy. Future studies should examine how leaders balance efficiency with ethical considerations and how governance frameworks can ensure responsible AI deployment. This includes investigating the trade offs between transparency and intellectual property, as well as the role of regulatory structures in

shaping organizational practices. Empirical research could analyze how different governance models influence employee outcomes, organizational legitimacy, and long-term performance.
Finally, researchers should investigate the co-evolution of human capital and algorithmic capabilities. As employees adapt to algorithmic tools, their skills, learning processes, and work identities evolve. Future research could explore how algorithmic leadership influences these changes and how hybrid intelligence systems reshape career trajectories, workplace roles, and skill requirements. Mixed method approaches may be particularly valuable in capturing the nuanced interplay between technological and human factors. Longitudinal and multi level studies could also examine how improvements in human capital contribute to organizational agility and innovation over time. This line of inquiry will deepen understanding of how algorithmic leadership fosters sustainable competitive advantage in digitally intensive environments.

CONCLUSION

Algorithmic leadership represents a significant advancement in understanding how leadership must evolve in environments shaped by artificial intelligence, automation, and data intensive technologies. By integrating human judgment with algorithmic insights, this leadership approach enhances organizational decision making, strengthens human capital development, and supports continuous adaptation. The conceptual model presented in this paper clarifies the mechanisms through which algorithmic leadership influences performance, operating through cognitive augmentation, behavioral transformation, capability reconfiguration, and structural adaptation. These pathways demonstrate that algorithmic leadership is both a technological and relational capability, requiring ethical governance, transparency, and sustained investment in digital skills. As organizations continue to navigate digital transformation, algorithmic leadership offers a robust framework for building resilience, fostering innovation, and achieving long term competitive advantage in technology intensive environments.

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REFERENCES

Abourokbah, S. H., Mashat, R. M., & Salam, M. A. (2023). Role of absorptive capacity, digital capability, agility, and resilience in supply chain innovation performance. *Sustainability*, *15*(4), 3636.

Ambrogio, G., Filice, L., Longo, F., & Padovano, A. (2022). Workforce and supply chain disruption as a digital and technological innovation opportunity for resilient manufacturing systems in the COVID-19 pandemic. *Computers & Industrial Engineering*, *169*, 108158.

Blichfeldt, H., & Faullant, R. (2021). Performance effects of digital technology adoption and product & service innovation–A process-industry perspective. *Technovation*, *105*, 102275.

Caliskan, A., Özkan Özen, Y. D., & Ozturkoglu, Y. (2021). Digital transformation of traditional marketing business model in new industry era. *Journal of Enterprise Information Management*, *34*(4), 1252-1273.

Chen, Z., & Xing, R. (2025). Digital economy, green innovation and high-quality economic development. *International Review of Economics & Finance*, *99*, 104029.

Cheng, W., Li, Q., Wu, Q., Ye, F., & Jiang, Y. (2024). Digital capability and green innovation: The perspective of green supply chain collaboration and top management's environmental awareness. *Heliyon*, *10*(11).

Corsaro, D., & D’Amico, V. (2022). How the digital transformation from COVID-19 affected the relational approaches in B2B. *Journal of Business & Industrial Marketing*, *37*(10), 2095-2115.

Danaeefard, H. (2025). Digital Transformation in the Iranian Public Sector: Exploring Strategies for Moving Forward and Climbing Upward. In *The Art of Digital Governance: Navigating Platforms and AI Revolution* (pp. 217-233). Springer.

Dobrovnik, M., Herold, D. M., & Kummer, S. (2025). Exploring supply chain managers' complex perceptions of dynamic capabilities for digital transformation. *Digital Business*, *5*(1), 100098.

Dwivedi, A., & Paul, S. K. (2022). A framework for digital supply chains in the era of circular economy: Implications on environmental sustainability. *Business Strategy and the Environment*, *31*(4), 1249-1274.

Eke, D., Oloyede, R., Ochang, P., Borokini, F., Adeyeye, M., Sorbarikor, L.,…Akintoye, S. (2022). Nigeria’s digital identification (ID) management program: Ethical, legal and socio-cultural concerns. *Journal of Responsible Technology*, *11*, 100039.

Esangbedo, C. O., Zhang, J., Perez, P. B., & Skitmore, M. (2024). Sustainable performance and supply chain leadership in logistic firms: the role of corporate sustainability strategies and digital supply chain. *Supply Chain Management: An International Journal*, *29*(6), 963-977.

Fernandez-Miguel, A., Garcia-Muina, F. E., Jimenez-Calzado, M., San Román, P. M., del Hoyo, A. P. F., & Settembre-Blundo, D. (2024). Boosting business agility with additive digital molding: An Industry 5.0 approach to sustainable supply chains. *Computers & Industrial Engineering*, *192*, 110222.

Frick, N. R., Mirbabaie, M., Stieglitz, S., & Salomon, J. (2021). Maneuvering through the stormy seas of digital transformation: the impact of empowering leadership on the AI readiness of enterprises. *Journal of Decision Systems*, *30*(2-3), 235-258.

Ganuthula, V. R. R. (2025). AI-enabled individual entrepreneurship theory: redefining scale, capability, and sustainability in the digital age. *Journal of Innovation and Entrepreneurship*, *14*(1), 85.

Grego, M., Bartosiak, M., Palese, B., Piccoli, G., & Denicolai, S. (2025). Disentangling the 'digital': A critical review of information technology capabilities, information technology–enabled capabilities and digital capabilities in business research. *International Journal of Management Reviews*, *27*(2), 238-260.

Hamann-Lohmer, J., Bendig, M., & Lasch, R. (2023). Investigating the impact of digital transformation on relationship and collaboration dynamics in supply chains and manufacturing networks–A multi-case study. *International journal of production economics*, *262*, 108932.

Hamdy, A. (2024). Supply chain capabilities matter: digital transformation and green supply chain management in post-pandemic emerging economies: a case from Egypt. *Operations Management Research*, *17*(3), 963-981.

Heshmatisafa, S., & Seppänen, M. (2023). Exploring API-driven business models: Lessons learned from Amadeus's digital transformation. *Digital Business*, *3*(1), 100055.

Hofacker, C., Golgeci, I., Pillai, K. G., & Gligor, D. M. (2020). Digital marketing and business-to-business relationships: a close look at the interface and a roadmap for the future. In (Vol. 54, pp. 1161-1179): Emerald Publishing Limited.

Imran, F., Shahzad, K., Butt, A., & Kantola, J. (2021). Digital transformation of industrial organizations: Toward an integrated framework. *Journal of change management*, *21*(4), 451-479.

Ishaq, F. (2025). Examining how digital transformation and responsible leadership affect green innovation in SMEs: a moderated and mediation model. *Strategy & Leadership*.

Jamwal, A., Kumari, S., Agrawal, R., Sharma, M., & Gölgeci, I. (2024). Unlocking Circular Economy Through Digital Transformation: The Role of Enabling Factors in SMEs. *International Journal of Global Business and Competitiveness*, *19*(1), 24-36.

John, H. B., Agrawal, M., Nema, P., Hasan, A., Rakhra, I. K., & Singh, A. (2025). Green growth: a bibliometric analysis of digital innovation and Sustainable Development Goals (SDGs). *Journal of Innovation and Entrepreneurship*, *14*(1), 15.

Kabra, G., Ghosh, V., & Mukherjee, R. (2025). Discovering latent topics and trends in digital technologies and disaster management research: A structural topic modeling approach. *Engineering Management Journal*, 1-17.

Kayan, R. R., Jauhar, S. K., Kamble, S. S., & Belhadi, A. (2025). Optimizing bio-hydrogen production from agri-waste: A digital twin approach for sustainable supply chain management and carbon neutrality. *Computers & Industrial Engineering*, *204*, 111021.

Khin, S., & Ho, T. C. (2019). Digital technology, digital capability and organizational performance: A mediating role of digital innovation. *International journal of innovation science*, *11*(2), 177-195.

Kim, S., Lee, M., Yu, I., & Son, J. (2022). Key initiatives for digital transformation, green new deal and recovery after COVID-19 within the construction industry in Korea. *Sustainability*, *14*(14), 8726.

Kowalkowski, C., Wirtz, J., & Ehret, M. (2024). Digital service innovation in B2B markets. *Journal of Service Management*, *35*(2), 280-305.

Kraus, S., Palmer, C., Kailer, N., Kallinger, F. L., & Spitzer, J. (2019). Digital entrepreneurship: A research agenda on new business models for the twenty-first century. *International Journal of Entrepreneurial Behavior & Research*, *25*(2), 353-375.

Li, Z., Miao, S., & Xu, L. (2024). Digital transformation and environmental, social, and governance greenwashing: Evidence from China. *Journal of Environmental Management*, *365*, 121460.

Liu, L., Song, W., & Liu, Y. (2023). Leveraging digital capabilities toward a circular economy: Reinforcing sustainable supply chain management with Industry 4.0 technologies. *Computers & Industrial Engineering*, *178*, 109113.

López Custodio, J. M., Parra Huerta, G., & Arias Cerón, J. S. (2025). Tracing the evolution of digital leadership: a bibliometric study employing reference publication year spectroscopy. *Strategy & Leadership*.

Luo, X., Qian, W., Liu, M., Yu, X., & Liu, Y. (2024). Towards sustainability: Digital capability, sustainable business model innovation, and corporate environmental responsibility of high-performing enterprises in an emerging market. *Business Strategy and the Environment*, *33*(6), 5606-5623.

Mackey, T. K., & Cuomo, R. E. (2020). An interdisciplinary review of digital technologies to facilitate anti-corruption, transparency and accountability in medicines procurement. *Global health action*, *13*(sup1), 1695241.

Majumdarr, S., Dasgupta, S. A., Hassan, Y., Behl, A., & Pereira, V. (2025). Linking digital transformational leadership, symmetrical internal communication with innovation capability: a moderated mediation model. *Journal of Knowledge Management*, *29*(8), 2478-2496.

Mattila, M., Yrjölä, M., & Hautamäki, P. (2021). Digital transformation of business-to-business sales: what needs to be unlearned? *Journal of Personal Selling & Sales Management*, *41*(2), 113-129.

Ning, L., & Yao, D. (2023). The impact of digital transformation on supply chain capabilities and supply chain competitive performance. *Sustainability*, *15*(13), 10107.

Nurhayati, N., Musa, S., & Pusparini, E. S. (2022). The roles of transformational leadership, perceived organizational support, digital capability towards employees' adaptability and readiness for digital transformation. Eurasia Business and Economics Society Conference,

Park, S., Zo, H., Ciganek, A. P., & Lim, G. G. (2011). Examining success factors in the adoption of digital object identifier systems. *Electronic commerce research and applications*, *10*(6), 626-636.

Pașcalău, S.-V., Popescu, F.-A., Bîrlădeanu, G.-L., & Gigauri, I. (2024). The effects of a digital marketing orientation on business performance. *Sustainability*, *16*(15), 6685.

Permana, E., Poerwoko, B., Widyastuti, S., & Rachbini, W. (2019). Digital capability and innovation strategy to develop the performance and competitive advantages of fashion Smes in Jakarta, Indonesia. *International Journal of Managerial Studies and Research*, *7*(11), 2349-0349.0711002.