Leadership in Times of Artificial Intelligence: Social Network Analysis on X Data

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ABSTRACT

Introduction: X, the second most popular social networking site in Malaysia, is a platform for sharing news, messages, photos, and short videos with a large audience. X generates vast amounts of data, which can be valuable for understanding online social communities and trending topics. However, there is a gap in understanding how leaders discuss and address these challenges in public discourse, particularly on digital platforms like X (formerly Twitter). Despite the growing relevance of AI in education, little is known about the key influencers driving discussions related to leadership in the AI era. This research identifies key influencers in X discussions related to leadership in the Artificial Intelligence era.

Methods: This study conducted a social network analysis and content analysis of Twitter data collected over a period (from January 1, 2023, to September 23, 2024). Influential users were examined via clusters in social network graphs. The nodes were ordered according to their betweenness centrality scores, and the graph's vertices were clustered using the Clauset-Newman-Moore algorithm. NodeXL Pro extracted data efficiently, and public usernames were collected to map network edges. The data was then filtered and refined to ensure a detailed analysis.

Results: The findings found the ten most important X users and URLs within a network of 299 individuals. This study indicates that the network-oriented approach is essential for AI-driven leadership, facilitating the exchange of critical AI-related knowledge. However, the fragmentation of leadership networks and lack of unified vision across institutions hinder transformative AI integration in education. This study suggests that leadership roles will increasingly depend on a leader's ability to navigate and bridge fragmented networks, ensuring that innovations in AI are shared, understood, and implemented across educational systems.

Conclusion: The study highlights the role of social networking platforms in shaping AI-driven school leadership discussions. It reveals that effective AI-driven leadership requires dynamic knowledge exchanges and a shared vision across institutions. The fragmented nature of leadership networks presents challenges, and leaders must bridge gaps, collaborate, and ensure consistent application of advancements. The study provides strategic insights for evolving school leadership to meet AI-driven demands.

Keywords: Social Network Analysis, Artificial Intelligence, leadership, influencer

INTRODUCTION

The proliferation of AI in socio-technical systems necessitates strong leadership to effectively deploy and utilize AI, fostering a culture that embraces AI while enhancing skills and competencies (Alamelu, 2024). The integration of Artificial Intelligence (AI) into leadership practices is reshaping traditional paradigms. AI is transforming how leaders operate, requiring them to adapt to a more data-driven, ethical, and technologically advanced environment. Leaders must adapt to the rapid development of AI by creating a supportive AI culture and strategically transforming their organizations to leverage AI's full potential (Alamelu, 2024). As AI continues to evolve and mature, its influence on leadership practices becomes more apparent, necessitating a more comprehensive examination of how it is altering the fundamental nature of leadership (Madanchian et al., 2023). This research is highly relevant as it illuminates the convergence of leadership practices with artificial intelligence. Social media has become a pivotal tool in shaping modern leadership paradigms, influencing both the development of leadership skills and the dynamics of leader-follower relationships (Lazim & Ariffin, 2023).

X (previously Twitter) has emerged as the second most popular social networking site in Malaysia, where it plays a crucial role in sharing news, messages, photos, and short videos with a large audience. Millions of users' access X daily, attracted by its microblogging format, which makes it an efficient platform for staying updated on news, expressing opinions, and sharing brief messages. X users can connect with others, referred to as "followers," and stay updated through posts known as "tweets." They can interact with these tweets by retweeting, replying, or mentioning others. This interactive nature fosters the creation of social communities and a dynamic network structure (Mohd Rum et al., 2018). Every day, X generates vast amounts of data, which can be a valuable resource for exploring various aspects of online social communities and trending topics. For example, user-generated content on X can be utilized to understand consumer opinions about products, assess sentiment on different issues, and model social networks to reflect shared knowledge. Leveraging X data, alongside other social networking platforms, can be particularly beneficial for decision-making processes, both for organisations, and businesses and the broader community (Yang et al., 2022).

Despite the growing relevance of AI in various fields, little is known about the key influencers driving discussions related to leadership in the AI era (Heukamp, 2020; Tyson & Sauers, 2021). While X is not a replacement for official communication channels, such as government agencies or news organizations, its rapid dissemination of information often surpasses that of traditional media outlets. A key feature of X is the use of hashtags, which helps organize and categorize tweets. Hashtags make it easier for users and researchers to track and analyze live data by connecting tweets to specific topics. This function ensures that relevant content reaches a target audience. In academic research, X data has been widely used for social network analysis (SNA), particularly in medical, health, strategic, and political studies (Anugerah et al., 2022). However, there is a notable gap in using SNA for decision-making in educational research (Faroh & Lestari, 2021).

This research focuses on identifying key influencers in X discussions related to leadership in the Artificial Intelligence (AI) era. The study aims to address the following questions: (1) Who are the key influencers driving conversations about leadership and AI on X? (2) What online sources or URLs are frequently referenced in these discussions? (3) What are the top keywords that emerge from the discussions? The study collects and analyzes tweets using Social Network Analysis (SNA) techniques to achieve these objectives. The research employs network metrics such as betweenness centrality to map the interactions and influence within the network, while also identifying key elements like top influencers and top words. The theoretical framework supporting this research is rooted in structuralist theory, guiding the approach to analyzing social media networks.

LITERATURE REVIEW

Social Media

Social media platforms, often referred to as social networking sites (SNS), include popular names such as Flickr, X, Facebook, YouTube, Wikis, Weibo, and Snapchat. Some SNS platforms are restricted to certain regions, while others are banned countries for various reasons. Data from these platforms can be effectively analyzed using Social Network Analysis (SNA). Although SNA tools often prioritize platforms like Facebook, YouTube, Wikis, and X, X remains a preferred choice for many researchers due to its unique microblogging format and the accessibility of its data (Malik et al., 2019). Therefore, this research will focus on X data in analyzing conversations on leadership in times of Artificial Intelligence (AI). The increasing use of X in scholarly research stems from its accessibility and ease of gathering real-time data. In the context of leadership and AI, identifying key influencers on X can provide valuable insights. While SNA research in this area is still emerging, the analysis of X conversations holds great promise for understanding the interplay between technology and leadership. As the integration of AI in education continues to reshape the landscape, it is essential to map how leaders engage with these technological changes (Heukamp, 2020). This research aims to fill that gap by focusing specifically on leadership conversations in the times of AI, and identifying influential figures and key trends within these discussions.

Leadership in Artificial Intelligence Era in Malaysia

The leadership landscape in Malaysia is evolving significantly in the era of Artificial Intelligence (AI), with technology playing a pivotal role in shaping leadership styles and strategies. This transformation is driven by the integration of AI technologies across various sectors, influencing both the operational and strategic dimensions of leadership. AI technologies provide leaders with tools to enhance decision-making, personalize learning, and streamline administrative tasks. For example, in the context of AI integration in leadership practices, AI technologies are being utilized to address complex issues such as traffic congestion in Malaysia. An integrated model using Neural Networks, Fuzzy Logic, and Genetic Algorithms has been developed to optimize traffic flow in Kuala Lumpur and Kuantan, demonstrating AI's potential to assist decision-makers in formulating effective policies (Rahman, 2016). The automation of leadership behaviors, such as goal setting and performance monitoring, was explored by Derrick and Elson (2018). They suggest that AI can take over certain leadership functions, potentially enhancing efficiency and effectiveness in organizational settings. In the context of educational leadership, AI-driven systems can support leaders in identifying patterns in student performance, enabling data-driven interventions, and fostering more effective teaching strategies (Florea & Radu, 2019). Research on AI influencers globally, such as those noted in top lists of AI advocates, can further inspire leaders to incorporate AI in leadership practices. However, challenges remain, such as ensuring equitable access to AI tools and addressing ethical considerations in AI's use (Chaudhry & Kazim, 2021). These discussions are critical as AI reshapes the leadership landscape, enabling more dynamic, responsive, and forward-thinking school environments.

Structuralist Theory

The structuralist theory offers a valuable lens for analyzing how patterns of relationships within a social network can facilitate the discovery of key influencers, particularly within school leadership in the context of artificial intelligence (AI). This theory emphasizes the recursive nature of social interactions, as argued by Giddens (1984) and Whittington (2010), who suggest that actions are continually shaped and reshaped by social actors. In the case of leadership, AI-driven innovations and strategies are co-created through interactions among leaders, educators, and stakeholders, who redefine conditions for success. Two critical elements of structuralist theory—interaction and structure—are especially pertinent for this study. We focus on how these elements manifest within the social network of leaders, with particular attention to interactions that occur across space and time as it reveals how the configuration of these relationships—both in terms of density and proximity—affects the flow of influence. This interconnectedness allows leaders to navigate challenges effectively and adapt to changing conditions, thereby reshaping educational policies and practices.

METHODOLOGY

To study the interaction of leadership in times of Artificial Intelligence on X, we utilized Social Network Analysis (SNA) techniques. SNA helps map and measure relationships and flows among individuals, groups, organizations, or other knowledge-processing entities. Data were collected from these platforms using targeted hashtags, keywords, and user interactions specifically related to leadership in Artificial Intelligence era. In SNA, social structures are represented by networks and graphs, where nodes signify people, entities, or actors, and the ties or edges represent the relationships between them (Lin et al., 2021). These connections can be visualized in a social network graph, where lines (edges) connect the points (nodes), illustrating the relationships within the network. One key SNA concept is centrality, which measures the significance or influence of specific nodes in the network. For example, betweenness centrality identifies nodes that frequently act as bridges on the shortest paths between other nodes, making them critical connectors in the network. For this study, X data was the essential source. X is a microblogging platform where users post short updates called "tweets," fostering fast-paced conversations through follower interactions. To perform the analysis, we selected NodeXL Pro, an open-source tool popular for its network metrics and graph layouts. NodeXL Pro's integrated API allowed us to extract data from X efficiently. For X, public usernames were collected to map the network edges, capturing user interactions such as replies and retweets. After gathering the raw data, we filtered and refined it by removing duplicate edges, noise, and irrelevant information (Smith et al., 2009), ensuring the resulting network was clean and ready for further analysis.

FINDINGS

Overall Graph Matrices

The analysis shown in Table 1 is a directed network comprising 258 vertices and 227 unique edges. With 356 total edges, there are 129 edges with duplicates, indicating repeated connections between certain vertices. Self-loops, where nodes are connected to themselves, are also present with a count of 167, reflecting a network characteristic where entities exhibit interaction or connection within themselves. The reciprocated vertex pair ratio, at 0.0059, and the reciprocated edge ratio, at 0.0119, suggest low mutual connectivity between nodes, indicating a sparsely bidirectional network. There are 128 connected components, signifying the graph's fragmentation into multiple clusters, with 86 single-vertex components pointing to isolated nodes with no connection to others. The largest connected component contains 27 vertices and 48 edges, demonstrating the presence of a significant subgraph of interaction. The graph's diameter, or the longest shortest path between any two vertices, is 6, and the average geodesic distance is 1.952, indicating that on average, nodes are relatively close to one another in terms of steps needed to traverse between them. The graph density is quite low, at 0.0025, reinforcing the observation of a sparse network where only a small fraction of possible edges is present. The modularity score of 0.55486 suggests a moderate level of community structure, implying that the network can be divided into distinct subgroups or clusters with reasonable separation. In summary, the graph exhibits characteristics of a fragmented, sparsely connected network with notable internal self-referencing behaviors and moderate modular clustering.

Table 1. Overall Graph Metrics

Graph Type	Directed
Vertices	258
Unique Edges	227
Edges With Duplicates	129
Total Edges	356
Self-Loops	167
Reciprocated Vertex Pair Ratio	0.005988024
Reciprocated Edge Ratio	0.011904762
Connected Components	128
Single-Vertex Connected Components	86

Maximum Vertices in a Connected Component	27
Maximum Edges in a Connected Component	48
Maximum Geodesic Distance (Diameter)	6
Average Geodesic Distance	1.95243
Graph Density	0.002533707
Modularity	0.55486
NodeXL Version	1.0.1.537

Top Influential Users and Its Groups

Figure 1 illustrates several key insights into the discourse surrounding artificial intelligence (AI) in education leadership. The graph is segmented into distinct groups (G1-G7), representing various clusters of interconnected discussions, each centered on unique thematic areas. Group G1 focuses heavily on "artificial intelligence," "leadership," and "education," with specific emphasis on concepts like diversity, equity, and inclusion, indicating a broad interest in how AI can transform educational leadership while addressing social and ethical dimensions. The intra-group connections in G1 suggest a highly interconnected set of conversations, but many are relatively self-contained, as evidenced by the circular loop patterns within nodes, indicating little external interaction with other groups. Group G2 exhibits a network configuration with a central hub, emphasizing terms like "ethics," "AI," and "leadership." This centralization may suggest thought leadership or influential sources driving discussions, particularly around ethical AI use in leadership contexts. Groups G4, G5, and G6 show smaller, more dispersed networks, focusing on themes like "edtech," "leadership," "schools," and "podcasts." The nodes in these groups are characterized by a mix of internal and external linkages, suggesting moderate engagement and cross-pollination of ideas across different educational contexts.

Group 20 serves as a bridge between Group 1 (G1) and other parts of the network, establishing vital connections that indicate a transfer of information and ideas between clusters. Group 1 is heavily focused on AI, leadership, and diversity within education, as mentioned earlier, whereas Group 20 appears to be a smaller but critical intermediary cluster. The link between G1 and G20 highlights how specific topics or key figures in G20 are helping to disseminate or synthesize ideas from G1 into broader discussions across the network. The fact that G20 links to G1 suggests that this group might be engaging with the more specialized themes discussed in G1—such as equity, inclusion, or specific leadership practices—and bringing them into more general or interdisciplinary conversations. This connection indicates that while G1 may represent a focused area of discussion, G20 plays a key role in amplifying its influence by connecting these discussions to other, perhaps less specialized, but still relevant conversations across the AI in education leadership landscape.

The presence of this linking group suggests the emergence of knowledge brokers or influential nodes that facilitate the flow of ideas, ensuring that isolated thematic clusters are not siloed but instead contribute to a broader, system-wide understanding of AI in education. This is crucial for the evolution of AI discourse in educational leadership, as it allows innovations and ethical considerations from G1 to reach more diverse groups, potentially informing policy and practice in a wider range of educational settings. The overall network demonstrates a combination of modular clustering and centralized authority within themes. The distinct separation between groups points to the presence of specialized communities of practice that are relatively self-contained. However, the moderate cross-group connections, particularly from G2 and G6, suggest that while AI in education leadership is a diversely explored topic, there are emerging conversations linking different aspects of AI applications (like ethics and school leadership). This structure reflects the current state of AI integration in educational leadership—fragmented into specialized discussions but showing the potential for greater interdisciplinary collaboration and convergence.

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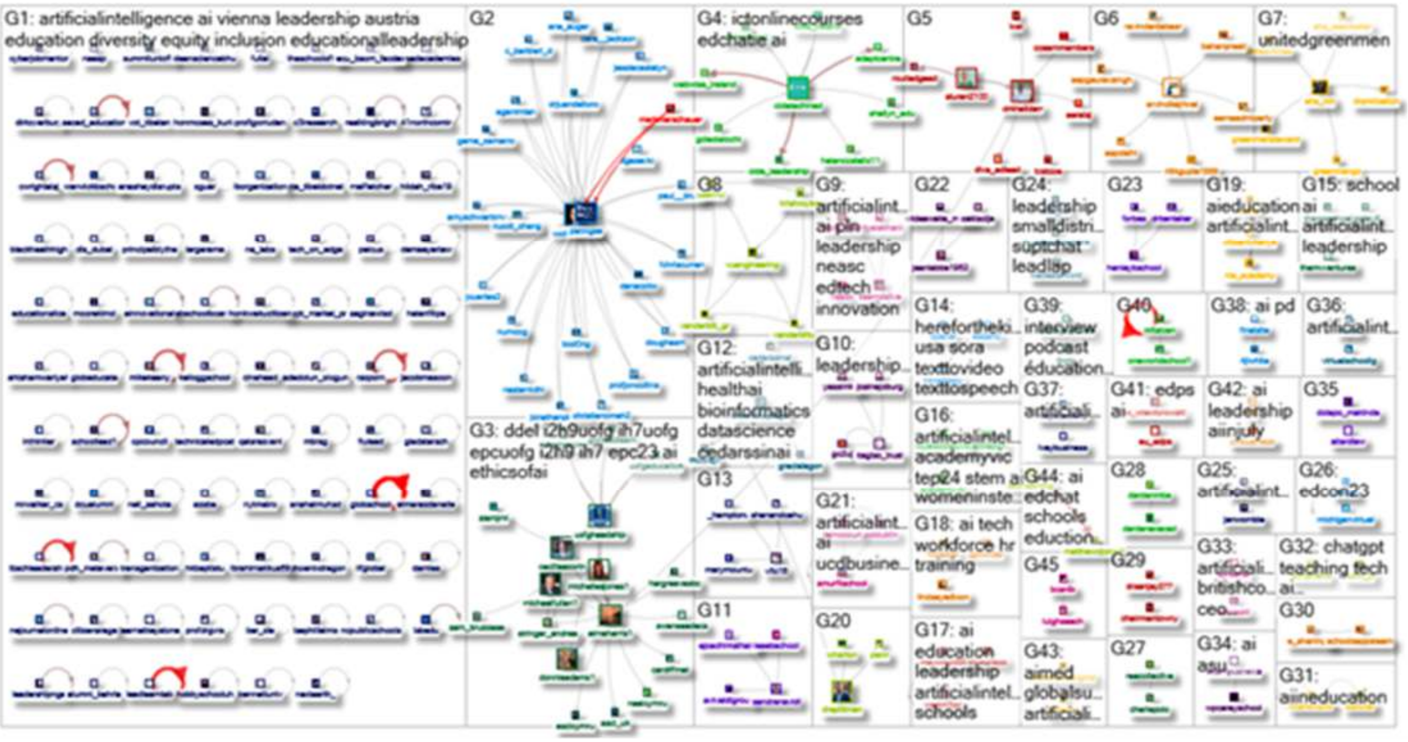

Figure 1. The social network graph of "leadership in AI era" on X

Table 2 has ranked the top influential users according to the betweenness centrality and in-degree score. The ranking of X accounts based on in-degree, betweenness centrality, and follower count provides valuable insights into the influence and network position of key figures in the discourse on AI and educational leadership. User 1 ranks highest with 24 in-degree connections and the largest betweenness centrality score (369.000) within Group 1, signifying its central role as a hub of interaction, likely disseminating critical information on leadership and education while connecting diverse nodes. Its substantial follower base (11,285) further emphasizes its influence in shaping AI leadership discussions, particularly in themes related to diversity and inclusion. User 2, ranked second, has relatively fewer direct connections (in-degree = 4) but demonstrates a significant betweenness centrality score of 302.800 within Group 3, indicating a pivotal role in bridging different parts of the network, likely focusing on leadership and AI ethics. Despite a lower follower count than User 1, her strategic position in connecting groups boosts her importance in network dynamics.

Table 2. Social Network Analysis on Top 10 X accounts

Rank	User	Account Description	In-Degree	Betweenness Centrality	Follower	Network Group in Figure 1
1.	User 1	University	24	369.000	11285	Group 1
2.	User 2	Researcher	4	302.800	12739	Group 3
3.	User 3	Researcher	2	292.000	1628	Group 5
4.	User 4	Researcher	0	272.800	81	Group 3
5.	User 5	Researcher	22	231.000	1718	Group 1
6.	User 6	University	0	138.800	2023	Group 3
7.	User 7	Consultant	0	98.000	869	Group 20
8.	User 8	Researcher	6	92.000	59680	Group 4
9.	User 9	Educational Team	4	56.000	22869	Group 3
10.	User 10	Researcher	3	50.800	1840	Group 5

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Notably, User 5 within Group 1 and User 8 within Group 4 have a mix of high in-degree scores (22 and 6, respectively) and substantial betweenness centrality, highlighting their roles as both information receivers and disseminators within their respective clusters. User 8's significant follower base (59,680) suggests a broad reach, particularly in conversations on educational innovation and AI leadership. Meanwhile, User 4 and User 6, though lacking direct in-degree connections, exhibit high betweenness centrality (272.800 and 138.800, respectively), implying their roles as critical intermediaries, possibly connecting isolated nodes or less dense sub-networks, especially within Group 3, which discusses leadership and AI integration.

Importantly, User 7, located in Group 20, has no direct connections (in-degree = 0), but the betweenness centrality score (98.000) and presence in the bridging group between Group 1 and Group 20 suggest they serve as a key link between otherwise disconnected segments of the network. This role positions them as a knowledge broker or conduit for transferring ideas between leadership-focused discussions and other emerging areas in AI and education. Overall, these findings reflect a network structure where certain nodes—like User 1, User 2, and User 7—act as both central hubs and key connectors, facilitating information flow across diverse thematic areas, from leadership to AI ethics and educational innovation. The combination of follower count, in-degree, and betweenness centrality underscores the varying types of influence and connectivity, shaping how AI and leadership are discussed and developed within the digital landscape.

Top 10 URLs

Table 3 presents the URLs that were most often shared during this period. The majority of the primary URLs pertain to the MIT Management Sloan School.

Table 3. The most shared URLs

Rank	URL	Counts
1.	https://mitsloan.co/4fRc4yC	8
2.	https://mitsloan.co/4bYKMmO	8
3.	https://mitsloan.co/43H3qgH	8
4.	https://mitsloan.co/4aiCmXO	7
5.	https://mitsloan.co/3tB7Gkl	7
6.	https://mitsloan.co/3Qmy4q2	6
7.	https://mitsloan.co/3A1w01D	6
8.	https://mitsloan.co/3PDMZf2	6
9.	https://mitsloan.co/3H38WQ6	6
10.	https://mitsloan.co/47V0YnQ	5

Brief Content Analysis

The Graph Metrics feature of NodeXL Pro software facilitates the identification of the most commonly utilised words in tweets, as illustrated in Figure 2. These words offer insights into the dialogue. The most commonly associated keywords were "artificial", "intelligence", "management" ,"ai" ,"school", "business" "generative" "data", "use" and "look".

Figure 2. Visualization of Top Words

DISCUSSION

The analysis of X account rankings based on in-degree, betweenness centrality, and groups uncovers crucial insights into the evolving dynamics of leadership in the era of artificial intelligence (AI). The prominence of User 1, with its high in-degree connections and dominant betweenness centrality, illustrates how certain institutions act as hubs of knowledge dissemination, shaping AI leadership discourse through their ability to connect diverse nodes (Vlasceanu et al., 2022). Institutions play a crucial role in shaping AI leadership discourse by acting as central nodes that facilitate the flow of knowledge across various stakeholders (Ding & Kong, 2024). This centralized role reflects a broader trend in AI adoption, where well-established educational entities are at the forefront of integrating and communicating AI-related innovations, particularly to themes like diversity, equity, and inclusion. As AI reshapes the digital landscape, these institutions leverage their influence to guide the direction of leadership discussions, further reinforcing their centrality in shaping the future of AI in schools.

The findings of this study highlight the increasing importance of bridging leaders who serve as intermediaries within the fragmented AI discourse. Their strategic positions within various sub-networks suggest that, in times of AI, leadership is no longer just about the number of connections but about the ability to act as a conduit between otherwise disconnected discussions—linking ethical considerations, leadership strategies, and AI integration into cohesive narratives. This role of knowledge brokers is particularly vital in an era where the integration of AI into organizations remains nascent and disparate. The betweenness centrality of these individuals signifies their importance in fostering collaboration and knowledge transfer between different communities, a critical need as organizations navigate AI's complexities. While intermediaries are essential in bridging gaps within the AI discourse, they are not a panacea. Broader systemic changes in political economy and policy are necessary to address underlying inequalities and ensure sustainable growth in AI talent and technology adoption (Giloth, 2022).

The high betweenness centrality of figures like User 7, despite having no direct connections (in-degree = 0), further illustrates that leadership in AI contexts extends beyond direct influence (Vlasceanu et al., 2022). Instead, it involves facilitating the exchange of ideas between traditionally isolated groups. This suggests that AI-driven leadership requires a network-oriented approach, where the ability to bridge gaps and foster cross-institutional collaboration is as valuable as direct hierarchical influence (Vlasceanu et al., 2022). Leaders like User 7 act as key brokers, enabling the flow of critical AI-related knowledge between emerging and established educational paradigms. The network analysis of school leadership in the context of artificial intelligence (AI) reveals critical structural challenges that undermine the potential for transformative AI integration in education. The fragmentation of leadership networks highlights the lack of unified vision across institutions, where AI tools and strategies are often adopted in isolation (Cihon et al., 2020). This fragmented landscape suggests that organizations are experimenting with AI in silos, leading to uneven progress and minimal inter-institutional knowledge sharing, which in turn stifles collective innovation.

Furthermore, the sparse connections between leaders, teachers, and policymakers exacerbate this issue. With limited collaboration and communication, leaders fail to develop cohesive AI strategies, resulting in a disconnected system where leadership innovations remain confined to individual organizations. This siloed approach is further compounded by internal self-referencing, as institutions increasingly turn inward to address their challenges rather than leveraging external expertise or learning from broader AI-driven initiatives (Cihon et al., 2020). Such self-contained experimentation restricts the cross-pollination of ideas and stunts the growth of shared, scalable solutions.

Moreover, the network's moderate modular clustering suggests that while sub-groups or communities of practice may emerge around shared AI interests—such as personalized learning or data analytics—these clusters remain disconnected from the broader ecosystem. The lack of integration between these AI-driven clusters and the wider leadership network underscores a missed opportunity for holistic, system-wide AI transformation. Ultimately, these findings suggest a fragmented and disjointed leadership landscape that is ill-prepared to harness the full potential of AI (Cihon et al., 2020). The network structure reflects a dynamic leadership landscape, where AI requires centralized hubs of expertise and key connectors who facilitate interdisciplinary dialogue. As AI integration accelerates, leadership roles will increasingly hinge on a leader's ability to navigate and bridge fragmented networks, ensuring that innovations in AI are shared, understood, and implemented across educational systems (Heukamp, 2020). This highlights a pivotal insight: in times of AI, effective leadership is as much about fostering connections and bridging silos as it is about direct influence within established institutions.

AI is most likely to reshape the educational leadership environment with improved decision-making, personalized learning experiences, and optimized administrative workloads. There are a few case studies we should pay attention to. For example, Carnegie Learning's Cognitive Tutor is an AI-based learning software called "Cognitive Tutor," which transforms its teaching methodology based on how well a student is doing (Shamikina, 2024). It leverages personalized learning to keep students on track, teaching us how AI can be integrated into educational leadership to enhance engagement and learning outcomes. The AI Tutor "Khanmigo" of Khan Academy is an AI-based tutor that gives personalized support to pupils and helps teachers with lesson planning and data analysis (Pillay, 2024). This tool is an example of how AI can help educational leaders deliver personalized learning experiences while positively impacting educational outcomes. Microsoft leverages AI to continuously optimize its leadership strategies such as AI-powered data analysis for identifying market trends and customer behavior (Andre, 2024). By analyzing the data and customer preferences, the company can stay ahead of the curve and base its decisions on solid insights that lead to new ideas and developments.

The implications of this research for diverse cultural contexts are AI can and should be used to enhance the value of leadership in a multicultural world, making it inclusive, and effective. AI systems can be designed to identify and respect cultural differences, helping ensure no biases deliver inequitable outcomes (Samuel et al., 2023). For example, AI in educational leadership must be culturally responsive to address the different needs of students. Furthermore, culturally adaptive AI education frameworks like Culturally Adaptive Thinking in Education for AI (CATE-AI) highlight the significance of personalizing AI learning experiences to foster comprehension and engagement among culturally diverse learners (Chen & Zmire, 2024). Moving into the unique field of the educational arena, AI societal leadership can reshape administrative processes and teaching methods (OECD, 2024). Text-based AI applications have also been shown to be promising in personalizing learning experiences, automating administrative processes, and generating data-driven insights helpful to informing educational strategies. Nonetheless, it is important to establish equitable and effective AI utilization by implementing targeted AI interventions that include addressing access issues, and systemic biases, and providing thorough teacher training.

CONCLUSION

The study highlights the role of social networking platforms in shaping leadership discussions in the times of Artificial Intelligence. The findings of this study reveal that effective leadership in the era of Artificial Intelligence requires dynamic knowledge exchanges and a shared vision across institutions. The fragmented nature of leadership networks presents challenges, and leaders must bridge gaps, collaborate, and ensure consistent application of advancements. The study provides insights for evolving leadership to meet AI-driven demands by following influencers and online materials provided. However, there were limitations in this study. The X data utilised in this study was constrained, temporally restricted, and contextually relevant. Secondly, as this study examined X networks, subsequent research could implement social network analysis on alternative social networking platforms such as YouTube and Wikis. Thirdly, the keywords utilised in this research are in the English language; hence, future studies may use other keywords or employ Malay keywords in data mining and extend the timeframe of data gathering. Furthermore, the output from NodeXL Pro, including social network data, may be subjected to additional analysis and enhanced visualisation utilising applications such as Microsoft Power BI and Gephi.

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