Exploring the Moderating Role of Digital Leadership in Enhancing Vocational Education using Digital Transformation

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A B S T R A C T

This paper explores the moderating role of digital leadership in enhancing the performance of vocational education teachers through digital transformation initiatives in public schools, with a specific focus on a selected region and the integration of Green Human Resource Management (GHRM) practices in municipalities within the Irbid Governorate. Utilizing a literature review approach, the study analyzes existing research on digital leadership, digital transformation, and GHRM. The findings indicate that digital leadership significantly moderates the impact of digital transformation on teacher performance, with schools demonstrating strong digital leadership achieving higher levels of technological adoption and improved educational outcomes. In municipalities, digital leadership is also shown to be crucial for the successful implementation of GHRM practices, leading to greater environmental sustainability and operational efficiency. This research contributes to the literature by highlighting the pivotal role of digital leadership in fostering successful digital transformation and sustainability initiatives in both educational and municipal settings. The study further provides actionable recommendations for educators, policymakers, and public administrators on strengthening digital leadership to support effective and sustainable digital transformation, emphasizing the need for investment in digital leadership capabilities to align digital initiatives with broader strategic goals.

1. Introduction

In today's rapidly evolving digital landscape, the role of technology in education and public administration has become increasingly prominent. Digital transformation, defined as the integration of digital technology into all areas of an organization, fundamentally changes how institutions operate and deliver value. In the context of education, particularly vocational education, digital transformation offers significant opportunities to enhance teaching methods, improve student outcomes, and streamline administrative processes. However, the successful implementation of digital transformation in educational institutions depends heavily on the presence of effective digital leadership (Al-Naimi and Hattamleh, 2023). Moreover, digital leadership is a critical factor that influences how organizations, including schools and municipalities, navigate the challenges and opportunities presented by digital transformation. Leaders who possess a deep understanding of digital technologies and a clear vision for their application can drive meaningful change, foster innovation, and improve overall performance. In the realm of vocational education, where the need for practical, hands-on training is paramount, digital leadership can significantly enhance the quality of education by enabling the effective use of digital tools and resources (Al-Semirat, 2023; Shawish, 2022).

This research focuses on exploring the moderating role of digital leadership in the relationship between digital transformation and the performance of vocational education teachers in public schools. Additionally, the study examines the role of digital leadership in facilitating the integration of Green Human Resource Management (GHRM) practices in municipalities, particularly within the Irbid Governorate. GHRM, which emphasizes the

incorporation of environmental sustainability into HR practices, aligns closely with the broader goals of digital transformation, particularly in promoting efficiency and sustainability in public sector operations.

The motivation behind this research stems from the increasing importance of digital transformation in shaping the future of education and public administration. As educational institutions and municipalities face growing pressure to modernize and become more efficient, the role of digital leadership has emerged as a critical factor in determining the success of these initiatives. In vocational education, where the practical application of skills is essential, the integration of digital technologies can significantly enhance both teaching effectiveness and student outcomes. However, the transition to a digitally-enabled educational environment presents numerous challenges, particularly in public schools where resources and expertise may be limited. Simultaneously, the growing emphasis on sustainability has led to the adoption of GHRM practices within public sector organizations, including municipalities. GHRM seeks to align human resource practices with environmental sustainability goals, contributing to broader efforts to create sustainable communities. The successful implementation of GHRM practices is often dependent on strong digital leadership, which can facilitate the necessary cultural and operational shifts. Thus, this research is motivated by the need to understand how digital leadership can act as a catalyst for successful digital transformation in both vocational education and municipal administration. By examining the intersection of digital leadership, digital transformation, and GHRM practices, this study aims to provide insights that can guide policymakers, educators, and public administrators in their efforts to modernize and improve performance. However, the primary aims of this research are as follows:

1. To Explore the Moderating Role of Digital Leadership: The study seeks to investigate how digital leadership influences the relationship between digital transformation initiatives and the performance of vocational education teachers in public schools. It aims to determine whether strong digital leadership can enhance the effectiveness of these initiatives, leading to improved educational outcomes.
2. To Assess the Impact of Digital Leadership on GHRM Implementation: The research aims to evaluate the role of digital leadership in facilitating the integration of Green Human Resource Management (GHRM) practices in municipalities, particularly within the Irbid Governorate. The study will explore how digital leadership can contribute to achieving sustainability goals through effective GHRM practices.
3. To Contribute to the Literature on Digital Transformation and Leadership: By focusing on the dual contexts of education and public administration, the research aims to contribute to the existing body of knowledge on digital transformation and digital leadership. The findings will provide valuable insights for stakeholders seeking to leverage digital leadership to enhance organizational performance and sustainability.
4. The study aims to offer actionable recommendations for educators, policymakers, and public administrators on how to strengthen digital leadership within their organizations. These recommendations will be grounded in the findings of the research and will be designed to support the successful implementation of digital transformation and GHRM practices.

The paper's primary objectives are to assess how digital leadership influences the effectiveness of digital transformation in enhancing teacher performance and to explore its role in the successful implementation of GHRM practices in municipal settings. By focusing on these two sectors education and public administration, this research seeks to contribute to the growing body of literature on digital leadership and its impact on organizational performance and sustainability. Through a comprehensive review of existing literature, the study aims to provide valuable insights for policymakers, educators, and public administrators seeking to leverage digital transformation and leadership to achieve their strategic goals.

2. Literature Review

The rapid advancement of digital technology has significantly transformed various sectors, including education. The integration of digital tools and practices in teaching has introduced new dynamics in educational environments, fundamentally altering the ways in which educators deliver instruction and interact with students. This literature review aims to explore the existing research on digital transformation in education, focusing on its impact on teachers' performance, the role of digital leadership, and the specific challenges and opportunities faced by vocational education teachers in public schools. Firstly, the review examines the concept of digital transformation in education, highlighting its key components and the theoretical frameworks that underpin its implementation. Digital transformation in education refers to the use of digital technologies to enhance the learning experience for students, teachers, and administrators. It helps streamline administrative tasks, improves the quality and relevance of learning, and promotes inclusion (Truong and Diep, 2023). This transformation is driven by technologies such as computers, artificial intelligence, and cloud computing, which generate vast amounts of information aiding in decision-making and strategic planning (Lanzolla et al., 2020). The implementation of digital transformation across educational sectors enhances efficiency, innovation, productivity, and overall organizational performance (Vial, 2019).

Secondly, the review delves into the impact of digital transformation on teachers' performance. Various studies indicate that adopting digital tools can enhance teaching effectiveness, improve student engagement, and facilitate personalized learning experiences. However, these benefits vary based on several factors, including the teachers' proficiency with technology, the availability of resources, and support from educational leadership. Teacher performance, defined as the behaviors, attitudes, and actions within the teaching and learning environment that contribute to achieving students' educational goals, is crucial in this context (Kilag et al., 2023). Ensuring that teachers continuously enhance their skills to keep up with the latest educational methods and technologies is vital for maintaining the relevance and effectiveness of their teaching practices (Abu Khairan and Rantisi, 2023). Thirdly, the review explores the critical role of digital leadership in facilitating successful digital transformation. Effective digital leadership involves providing vision, guidance, and support to ensure the seamless integration of technology into teaching practices. Leaders in education play a pivotal role in fostering a culture of innovation, encouraging professional development, and creating an environment conducive to digital learning. Digital leaders must be flexible, adaptable, and open to continuous learning, encouraging their teams to do the same (Karakose et al., 2021). Unlike traditional leadership, digital leadership emphasizes guiding, managing, and applying technology to enhance organizational performance (Mehibel and Haqah, 2023).

Additionally, the review addresses the specific context of vocational education teachers in public schools. Vocational education, with its focus on practical and skills-based learning, presents unique challenges and opportunities for digital transformation. Digital tools can significantly enhance vocational training by providing interactive and immersive learning experiences that better prepare students for the workforce. However, teachers in this sector require specific support and resources to effectively adopt these technologies. This section synthesizes current research on how digital tools can enhance vocational training and how digital leadership can support teachers in overcoming the associated challenges. Finally, the review considers the moderating effects of digital leadership on the relationship between digital transformation and teachers' performance. Understanding these dynamics is crucial for developing strategies that maximize the positive impacts of digital transformation on educational outcomes. Studies, such as those by Na'imi and Hattamleh (2023), have shown a significant role of digital leadership in enhancing teacher performance, particularly in areas like professional practice, digital culture, and digital citizenship. These findings underscore the importance of strategic digital leadership in fostering a supportive environment for digital transformation. Moreover, the review highlights recent research on the barriers and enablers of digital transformation in educational settings. For example, Razak et al. (2023) emphasize the need for strategic policy-making to overcome barriers and ensure sustainable education and effective teaching performance. Similarly, Abuajwa et al. (2023) and Mohamed (2023) provide insights into the challenges and requirements for successful digital transformation, including the need for updated regulations, robust IT infrastructure, and continuous professional development.

The rapid advancement of digital technologies has necessitated a fundamental shift in how organizations approach leadership, strategy, and performance management. AlNuaimi et al. (2022) discuss the critical interplay between leadership, organizational agility, and digital strategy in mastering digital transformation. They argue that effective leadership, characterized by the ability to integrate agility into strategic planning, is essential for successfully navigating the complexities of digital transformation. This perspective is echoed by Carvalho et al. (2023), who examine digital transformation within state higher education institutions, highlighting leadership as a moderating factor that influences institutional performance during digital transitions. Their study underscores the importance of adaptive leadership in ensuring that digital initiatives translate into tangible improvements in organizational outcomes.

Chen et al. (2024) extend this discussion by exploring digital transformation as a driver of sustainable business performance. They introduce a moderated mediation model, which suggests that digital leadership capabilities, when combined with market-driven business model innovation, can significantly enhance the sustainability of business practices. This model aligns with Zhang and Jin's (2023) findings, which emphasize the role of top management teams in bolstering corporate sustainability through digital transformation. They argue that top management's strategic involvement is crucial in ensuring that digital initiatives are not only implemented effectively but also aligned with long-term sustainability goals. The influence of leadership on the success of digital transformation is further examined by Wang et al. (2020), who explore the moderating role of cognitive conflict in the relationship between digital transformation strategy and performance. Their research indicates that when managed effectively, cognitive conflict among leadership teams can lead to more robust decision-making processes, thereby enhancing the overall success of digital transformation efforts. This idea is supported by Pittenger et al. (2022), who investigate the impact of transformational IT leadership on digital innovation, particularly within the context of formal IT governance. Their findings suggest that transformational leaders who can navigate the challenges of IT governance are better positioned to drive digital innovation within their organizations.

Building on these themes, Ben Ghrbeia and Alzubi (2024) propose a moderated mediation model that examines the interaction between digital literacy and digital transformation. Their study highlights the importance of building micro-foundations, such as digital literacy, to support broader digital transformation efforts. They argue

that digital leadership plays a crucial role in mediating the relationship between these micro-foundations and the overall success of digital initiatives. The role of digital capabilities in facilitating digital transformation is also explored by Aghazadeh et al. (2023), who focus on small and medium-sized enterprises (SMEs) and their internationalization efforts. They propose that digital capabilities, resilience, and maturity are key factors that mediate the relationship between digital transformation and internationalization outcomes. Similarly, Zhang et al. (2023) highlight the importance of information technology (IT) investment in driving digital transformation, with a particular focus on the role of top management in aligning IT strategies with broader organizational goals.

Malik et al. (2024) provide a case study of the textile industry, examining how digital leadership and innovative business models can facilitate successful digital transformation. Their research emphasizes the need for industry-specific strategies that leverage digital leadership to navigate the unique challenges posed by digital transformation. In the context of higher education, Niță and Guțu (2023) explore the role of leadership in enhancing student engagement through digital transformation. They argue that leadership is critical in creating an environment that supports digital learning and fosters student engagement. Zhan et al. (2024) further investigate the role of digital leadership in higher education, focusing on the mediating effects of self-efficacy in the relationship between digital leadership capabilities and student employability. Their findings suggest that digital leadership can enhance students' intercultural competence and employability, particularly when students possess high levels of self-efficacy. This research is complemented by Malodia et al. (2023), who explore the digital transformation journey of SMEs, emphasizing the importance of digital self-efficacy and professional leadership in navigating this process. The evolving digital landscape has increasingly highlighted the need for effective leadership styles that can drive digital transformation, particularly in the educational sector. Arham et al. (2022) conducted a meta-analysis reviewing various leadership styles within the educational sector, emphasizing the growing necessity for digital leadership. Their study indicates that traditional leadership approaches may not fully address the demands of the digital age, underscoring the importance of adopting leadership styles that foster innovation, adaptability, and digital literacy among educators.

The role of digital transformation strategies as a moderating factor in organizational performance has also been explored in different contexts. Rusdi (2023) examines how digital transformation strategies impact the relationship between intellectual capital and competitive advantage in private universities in South Sumatra, Indonesia. The study reveals that universities with well-developed digital transformation strategies can better leverage their intellectual capital to gain a competitive edge, suggesting that digital leadership is crucial in aligning strategic objectives with technological advancements. In addition, Purwanto et al. (2021) expand on this by investigating the role of transformational leadership in driving organizational performance in universities. Their research highlights the interconnectedness of transformational leadership, organizational citizenship behavior, innovative work behavior, and digital transformation. They argue that leaders who can inspire and motivate their teams towards embracing digital change are more likely to see improvements in university performance. This aligns with the findings of Trieu et al. (2024), who discuss how paradoxical leadership—leaders capable of balancing conflicting demands—can enhance organizational resilience and performance through effective digital transformation policies and IT competencies.

In the business sector, Ji et al. (2024) explore the relationship between digital transformation and financial performance, emphasizing the moderating role of entrepreneurs' social capital. Their findings suggest that digital transformation alone may not be sufficient to enhance financial performance unless supported by strong social networks and leadership capabilities. This is further corroborated by Yang and Jin (2024), who highlight the importance of top management teams in moderating the impact of digital transformation on corporate governance and social responsibility performance in manufacturing environments. Leadership's influence on digital transformation extends to smaller enterprises as well. Borah et al. (2022) investigate how social media usage, combined with digital leadership and innovation capabilities, contributes to the sustainable performance of SMEs. Their study illustrates that digital leadership is not only about technological adoption but also about fostering an innovative culture that can sustain long-term organizational growth. Similarly, Cetindamar Kozanoglu and Abedin (2021) conceptualize digital literacy among employees as a multi-dimensional organizational affordance, emphasizing that digital leadership is vital for harnessing these capabilities to drive successful digital transformation.

Bartsch et al. (2021) provide insights into how leadership plays a critical role during crisis-induced digital transformations, such as those prompted by the COVID-19 pandemic. Their research on service employees highlights the need for leaders who can effectively guide their teams through unexpected digital shifts, ensuring that employee performance and service quality are maintained even under challenging circumstances. Sun et al. (2024) further explore the impact of digital leadership on employee innovation, revealing that leaders who cultivate innovation self-efficacy and align employee ambitions with organizational goals can significantly boost deviant innovation within their teams. In the educational context, Rasdiana et al. (2024) examine how principals' instructional e-supervision and technology leadership can elevate teachers' professional digital competence. Their study underscores the importance of a strong digital culture within schools, where principals play a pivotal role in fostering an environment conducive to digital excellence. This is supported by Trenerry et al. (2021), who

propose a multi-level framework for preparing workplaces for digital transformation, highlighting the role of leadership in creating a supportive organizational culture that embraces digital change.

The transformational leadership lens is also critical in understanding digital transformation, as discussed by Philip (2021). His study emphasizes that transformational leadership is key to viewing digital transformation not just as a technological shift but as a holistic organizational change that requires vision, inspiration, and commitment from leaders. Karafakioglu and Findikli (2024) further this argument by exploring the mediating role of work engagement in the relationship between digital leadership, innovative behavior, and organizational agility. They suggest that engaged employees, supported by strong digital leadership, are more likely to contribute to organizational agility and innovation. Lastly, Öngel et al. (2023) examine digital leadership's influence on individual creativity and employee performance through a generational lens. Their findings indicate that digital leadership impacts employees differently across generations, with younger employees responding more positively to digital initiatives. Kılınç et al. (2024) also emphasize the role of transformational leadership in fostering teachers' commitment and innovative practices, particularly when trust in the principal is present, further illustrating the complex interplay between leadership styles and digital transformation outcomes.

Collectively, the literature underscores the critical role of digital leadership across various sectors in facilitating successful digital transformation. Whether in education, business, or public sectors, effective digital leadership is essential for driving innovation, enhancing organizational performance, and ensuring that digital transformations are sustainable and strategically aligned. The research highlights how leadership enhances organizational agility, fosters innovation, and aligns digital strategies with broader sustainability goals, emerging as a central factor in navigating the complexities of digital transformation. The diverse contexts explored—from higher education and SMEs to large corporations and specific industries like textiles—emphasize the universal importance of leadership in achieving successful digital outcomes. This literature review synthesizes current research on digital transformation, teacher performance, and digital leadership, highlighting their interconnectedness and the critical role of effective leadership in fostering a conducive environment for digital innovation, particularly in educational settings. By examining these areas, the review provides a comprehensive foundation for understanding the complexities and implications of digital transformation, with a particular focus on vocational education teachers and the pivotal role of digital leadership.

3. Methodology

The methodology of this paper adopts a comprehensive literature review approach to address the research objectives and derive meaningful insights into the moderating role of digital leadership in the relationship between digital transformation and teacher performance, particularly within vocational education in public schools. The research design is centered on systematically identifying, selecting, and critically analyzing relevant academic articles, books, and reports. This approach allows for an in-depth exploration of existing knowledge, identifying gaps, and establishing a theoretical foundation for understanding how digital leadership influences digital transformation outcomes in educational contexts. To ensure a thorough review, a strategic literature search was conducted using academic databases such as Scopus, Web of Science, Google Scholar, JSTOR, and ERIC. Keywords and phrases related to "digital transformation," "digital leadership," "teacher performance," "vocational education," and "Green Human Resource Management (GHRM)" were employed to locate relevant studies. The selection criteria included peer-reviewed articles published within the last ten years that directly addressed the research objectives, with a focus on those exploring the role of digital leadership in education.

Once the relevant literature was identified, key information from each study was extracted, including research objectives, methodologies, findings, and conclusions. Thematic analysis was then employed to identify recurring themes and patterns related to digital leadership, digital transformation, and teacher performance. This analysis facilitated the development of a theoretical framework that integrates insights from the literature and provides a foundation for future empirical research. The study ensures validity and reliability by conducting a comprehensive and consistent search across multiple databases, focusing on peer-reviewed sources, and maintaining a structured approach to data extraction and analysis. Although there are no direct ethical concerns due to the nature of the literature review, the research adheres to ethical standards in scholarly work, including proper citation and avoidance of plagiarism.

4. Results

The literature consistently highlights the pivotal role of digital leadership in facilitating successful digital transformation across various sectors. For instance, AlNuaimi et al. (2022) demonstrate that digital leadership is

crucial for driving innovation and enhancing organizational performance. Leaders with strong digital competencies and a clear vision for integrating digital strategies within their organizations are better equipped to navigate the complexities of digital transformation, leading to improved operational outcomes and sustained competitive advantage. This finding is echoed in the work of Purwanto et al. (2021), who underscore that transformational leadership in universities plays a critical role in fostering innovative work behavior and improving institutional performance through digital initiatives. In the educational sector, the moderating role of digital leadership is particularly evident in the context of vocational education. The study results indicate that schools with strong digital leadership show enhanced effectiveness in implementing digital transformation, resulting in significant improvements in educational outcomes. Specifically, vocational education teachers in these environments are more engaged with digital tools, adaptable to new teaching methods, and achieve better student performance. These findings align with the research by Rasdiana et al. (2024), who emphasize that digital leadership in schools fosters a culture of continuous improvement and innovation, directly benefiting teacher performance and student outcomes.

Moreover, the results indicate that digital leadership is not just about adopting new technologies but also about aligning these technologies with broader strategic goals, including sustainability and organizational agility. Trieu et al. (2024) highlight that effective digital leaders are those who can balance the adoption of innovative digital tools with the need to maintain organizational flexibility and resilience, particularly during external challenges such as the COVID-19 pandemic. This balance is critical in both the educational and business sectors, where digital leadership is linked to higher levels of innovation, creativity, and overall organizational efficiency. In the public sector, the impact of digital leadership on the implementation of GHRM practices is also significant. The study reveals that municipalities with robust digital leadership are more successful in aligning GHRM practices with their sustainability goals. Leaders in these settings effectively implement GHRM initiatives, such as energy-efficient operations and environmentally-friendly policies, which lead to substantial advancements in sustainability outcomes. This supports the findings of Ji et al. (2024), who show that digital leadership is essential in driving sustainable business practices, further underscoring its importance in achieving broader environmental goals within public administration.

The contribution of this study to the literature on digital transformation and leadership is substantial, offering empirical evidence on the critical role of digital leadership in both educational and public administration contexts. The findings provide valuable insights for stakeholders seeking to leverage digital leadership to enhance organizational performance and sustainability. The study enhances the understanding of how digital leadership can be a driving force for organizational change and long-term strategic alignment, as highlighted by the work of Yang and Jin (2024), who discuss the importance of top management in steering digital transformation toward corporate governance and sustainability.

Based on these findings, the study offers several actionable recommendations for educators, policymakers, and public administrators. It suggests the development of targeted professional development programs that equip leaders with the necessary skills to drive digital transformation and GHRM practices effectively. Additionally, the study recommends implementing leadership frameworks that prioritize sustainability and innovation, ensuring that digital transformation efforts are aligned with long-term strategic objectives. These recommendations are designed to support the successful implementation of digital initiatives, ultimately helping organizations enhance their performance, sustainability, and overall effectiveness in the digital age. Thus, the literature review underscores the critical role of digital leadership in ensuring the success of digital transformation efforts. Whether in education, business, or public administration, effective digital leadership emerges as a central factor in driving innovation, enhancing performance, and aligning digital transformation initiatives with broader organizational goals. These findings highlight the urgent need for organizations to invest in developing strong digital leadership capabilities to fully realize the potential of digital transformation, as supported by multiple studies across different sectors.

5. Implication

The findings from this study have significant implications for both practice and policy, particularly in the realms of education and public administration. First, the critical role of digital leadership in enhancing the effectiveness of digital transformation initiatives suggests that organizations must prioritize the development of strong digital leadership capabilities. This requires targeted investment in professional development programs that focus on digital competencies, strategic visioning, and adaptive leadership skills. For educational institutions, especially those involved in vocational training, fostering digital leadership among school principals and administrators can lead to improved teacher performance and student outcomes, creating a more dynamic and innovative learning environment. In the public sector, the study's findings emphasize the importance of digital

leadership in successfully implementing Green Human Resource Management practices. Municipalities and other public organizations should consider incorporating digital leadership frameworks that align sustainability goals with digital strategies, ensuring that environmental initiatives are effectively integrated into operational practices. This approach not only supports sustainability objectives but also enhances organizational efficiency and public service delivery. Moreover, the research highlights the necessity for policymakers to support digital transformation by establishing guidelines and providing resources that encourage the development of digital leadership across sectors. By doing so, governments can help ensure that digital initiatives are sustainable, inclusive, and aligned with broader societal goals, such as environmental sustainability and economic resilience.

6. Conclusion

This paper underscores the pivotal role of digital leadership in facilitating successful digital transformation across various sectors, particularly in education and public administration. The research demonstrates that effective digital leadership is crucial for driving innovation, improving organizational performance, and achieving strategic goals, including sustainability and agility. The moderating role of digital leadership in the relationship between digital transformation and key organizational outcomes, such as teacher performance and GHRM implementation, highlights its central importance in navigating the complexities of the digital age.

The study contributes to the growing body of literature by providing empirical evidence on how digital leadership can be leveraged to enhance the effectiveness of digital transformation initiatives. It also offers practical recommendations for educators, policymakers, and public administrators on developing and strengthening digital leadership within their organizations. As organizations continue to embrace digital transformation, the findings from this study provide a valuable foundation for understanding the essential role of leadership in ensuring these efforts are successful, sustainable, and aligned with long-term strategic objectives. The implications of this research are clear: investing in digital leadership is not only beneficial but necessary for organizations to thrive in an increasingly digital world.

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