



Research Article

# Digital Leadership Styles and Their Impact on Remote Team Collaboration Effectiveness in Global Virtual Firms

Syaefullah<sup>1\*</sup>, Chitra Indah Sari<sup>2</sup>, and Abdal Ahmed<sup>3</sup>

<sup>1</sup> Universitas Muhammadiyah Tangerang, Indonesia, Email: [syaefullah@umt.ac.id](mailto:syaefullah@umt.ac.id)

<sup>2</sup> Univeristas Islam Negeri Mahmudyunus Batusangkar, Indonesia,  
Email: [chitraindahsari@uinmybatusangkar.ac.id](mailto:chitraindahsari@uinmybatusangkar.ac.id)

<sup>3</sup> Tula's Institute, Dehradun Uttarakhand, India, Email: [ahmed.legahaid@gmail.com](mailto:ahmed.legahaid@gmail.com)

\* Corresponding Author: e-mail : [syaefullah@umt.ac.id](mailto:syaefullah@umt.ac.id)

**Abstract:** The evolution of global virtual firms in the post-pandemic era has transformed the dynamics of leadership, collaboration, and team performance. This study investigates the influence of digital leadership styles-particularly transformational, transactional, and adaptive-on the effectiveness of collaboration among remote teams operating in multinational virtual environments. Using a mixed-methods approach that integrates quantitative surveys and qualitative interviews, data were collected from managers and team leaders of multinational corporations who lead geographically dispersed teams. Quantitative findings reveal that adaptive and transformational digital leadership styles significantly enhance communication, coordination, trust, and motivation within remote teams, while transactional leadership proves less effective in sustaining engagement across time zones and cultural boundaries. Qualitative insights highlight that flexibility, empathy, and digital literacy are central to building trust and cohesion in diverse virtual settings. Moreover, the use of advanced collaboration tools such as Slack, Microsoft Teams, and Zoom amplifies leadership effectiveness when aligned with inclusive communication practices. The study underscores that successful digital leadership depends on balancing human-centered empathy with technological competence to foster team cohesion and innovation. Managerial implications emphasize the need to develop leaders' digital competencies and cross-cultural communication skills, along with fostering adaptive strategies to sustain engagement in virtual work environments. Future research should explore the longitudinal effects of digital leadership development programs across industries to assess their sustained impact on productivity, innovation, and organizational resilience in digital ecosystems.

**Keywords:** Adaptive Management; Digital Leadership; Remote Collaboration; Transformational Leadership; Virtual Teams.

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## 1. Introduction

The post-pandemic era has significantly accelerated the adoption of remote work, giving rise to *global virtual firms* that operate through digital connectivity and virtual collaboration. This transformation was initially driven by the necessity to maintain business continuity during the COVID-19 pandemic, which compelled organizations across various industries to adopt remote work arrangements and integrate digital collaboration platforms (Joseph, 2024). The pandemic not only reshaped organizational structures but also catalyzed the normalization of flexible work environments supported by advanced digital infrastructures. Information and Communication Technologies (ICTs) have played a crucial role in this shift, enabling employees to work from virtually any location and at any time while ensuring productivity and engagement (Krishnan et al., 2016). In particular, the IT sector-recognized for its digital proficiency-has undergone a rapid transformation toward sustained remote work, which has generated long-term impacts on employee well-being, innovation, and overall organizational performance (Joseph, 2024).

In this new digital landscape, leadership has been fundamentally redefined through the strategic utilization of online communication and collaborative technologies. Leaders managing *geographically dispersed teams (GDTs)* are now required to address multifaceted

challenges, including fostering trust, maintaining team cohesion, and ensuring effective communication across different time zones and cultures (Krishnan et al., 2016). As the nature of work becomes increasingly virtual, digital leadership has emerged as a critical capability for organizational success. It involves not only managing operations but also leveraging cloud-based tools, cybersecurity solutions, and communication platforms such as Slack, Microsoft Teams, and Zoom to coordinate efforts in a virtual space (Joseph, 2024).

Despite the widespread technological advances that facilitate remote work, many leaders continue to face challenges in maintaining collaboration, cohesion, and trust among geographically dispersed members. Building trust remains a core issue, as it is inherently difficult to establish in virtual environments where personal interactions are limited and often mediated by technology (Krishnan et al., 2016). Similarly, effective communication poses another challenge, as virtual teams frequently operate across multiple time zones and within culturally diverse contexts, potentially leading to misunderstandings or reduced efficiency. Maintaining team cohesion requires deliberate efforts to foster inclusion and shared identity, which are often difficult to sustain over digital platforms. Moreover, traditional leadership approaches may prove insufficient in such settings; instead, leaders must adopt distributed and adaptive leadership strategies that empower team members while aligning them toward common goals (Joseph, 2024).

Therefore, this study aims to explore how digital leadership styles influence collaboration effectiveness within global virtual firms. By analyzing the interplay between leadership behavior, communication strategies, and team cohesion, this research seeks to provide insights into how organizations can strengthen productivity and engagement in digitally mediated work environments. As remote and hybrid work models continue to redefine modern organizations, understanding how digital leadership fosters trust, innovation, and collaboration has become increasingly critical (Boccoli, Gastaldi, & Corso, 2024; Darvish, Luale, Pottier, & Bick, 2024). Transformational and adaptive leadership have been shown to be particularly effective in motivating employees and facilitating coordination in geographically dispersed settings (Huang, Jiang, & Chang, 2023; Efimov, Harth, & Mache, 2024a). Moreover, digital communication competence and cultural intelligence serve as essential enablers for leaders to bridge cross-border collaboration and enhance team performance in virtual environments (Hundscheil, Backmann, Tian, & Hoegl, 2022; Krehl & Büttgen, 2022).

The global shift toward remote work has transformed the nature of leadership in organizations, necessitating the development of new competencies and approaches that align with the dynamics of digital collaboration. In the wake of the COVID-19 pandemic, the concept of *digital leadership* has gained prominence as organizations increasingly rely on virtual environments to maintain productivity, innovation, and employee engagement. Digital leaders are now required to manage geographically dispersed teams, coordinate through digital platforms, and foster collaboration without the benefit of physical proximity (Krehl & Büttgen, 2022). As global virtual firms expand, understanding how different leadership styles influence remote team collaboration has become a critical area of study.

The primary objective of this research is to examine how different digital leadership styles influence the effectiveness of collaboration among remote teams in global virtual firms. Specifically, this study seeks to identify which leadership styles are most effective in fostering collaboration and achieving high performance in virtual environments. Understanding these dynamics is essential for developing adaptive management strategies that enhance team performance, communication, and trust across digital workspaces (Efimov, Harth, & Mache, 2024a). As remote work becomes a long-term feature of organizational design, effective digital leadership has become a determinant of organizational resilience and success.

Research on leadership in virtual environments highlights several key insights into how leadership behaviors and competencies shape team performance. Studies suggest that self and shared leadership are particularly effective in virtual *research and development (R&D)* teams, as they promote autonomy, trust, and mutual accountability among members. Castellano, Chandavimol, Khelladi, and Orhan (2021) found that self-leadership and shared leadership significantly enhance virtual team performance, with trust, potency, and commitment serving as mediating factors. Similarly, democratic leadership—characterized by open communication, participative decision-making, and knowledge sharing—has been shown to improve collaboration and success in remote software development teams (Krehl & Büttgen, 2022). These findings underscore the importance of communication and inclusivity as core components of effective virtual team management.

In addition, leadership competencies such as intra-team communication and transformational leadership have been identified as critical factors for remote team effectiveness. Leaders who maintain consistent and transparent communication channels are better equipped to manage tasks, resolve conflicts, and sustain engagement among dispersed employees (Efimov, Harth, & Mache, 2024b). Transformational leaders, in particular, play a vital role in motivating and inspiring their teams, fostering creativity, and navigating cultural diversity within global virtual contexts (Efimov et al., 2024a). These leaders use digital tools strategically to build trust, facilitate innovation, and align teams toward shared objectives.

However, leading remote teams also presents unique challenges. Cultural diversity can complicate communication and collaboration but also provides opportunities for creativity and innovation when managed effectively (Efimov et al., 2024b). Leaders must therefore cultivate cultural intelligence and develop conflict management skills to navigate cross-cultural dynamics in digital environments. The effective use of digital tools—such as collaborative platforms, progress tracking systems, and communication software—further supports coordination and transparency within remote teams (Krehl & Büttgen, 2022). To succeed in these settings, leaders must adapt their strategies to the virtual context, emphasizing decentralized decision-making, trust-building, and adaptability.

From a practical perspective, organizations must support leaders by providing both behavioral and structural resources. Adaptive leadership practices—those that promote flexibility, inclusivity, and empowerment—are essential to overcoming the complexities of virtual teamwork (Castellano et al., 2021). Furthermore, as Efimov, Harth, and Mache (2024b) emphasize, organizational support such as flexible work conditions, sufficient technical infrastructure, and managerial guidance is crucial to sustaining effective virtual leadership. Taken together, these insights demonstrate that digital leadership is not merely about managing technology but about shaping human interactions through digital interfaces to achieve collaboration, innovation, and shared purpose in remote global organizations.

## 2. Literature Review

### Digital Leadership Theories

Digital leadership has emerged as a critical factor in guiding organizations through complex, technology-driven environments. Among the most studied leadership styles in digital contexts are transformational, transactional, and adaptive leadership.

Transformational Leadership is characterized by behaviors such as idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration. These behaviors foster organizational agility, innovation, and cross-functional collaboration (Shao, Wang, & Li, 2019). In digital transformation projects, transformational leadership enhances employees' digital creativity through mechanisms such as creative self-efficacy and ambidextrous learning, thereby enabling organizations to navigate rapidly changing environments (Huang, Jiang, & Chang, 2023). Additionally, in academic contexts, transformational leadership facilitates the distribution of leadership responsibilities, enhancing team performance, satisfaction, and engagement (Niță & Guțu, 2023).

Transactional Leadership focuses on establishing clear structures, rules, and reward systems. This leadership style remains relevant in highly digitized environments, including higher education and virtual organizational contexts, as it helps maintain engagement, ensures compliance, and supports performance outcomes (Antonopoulou, Halkiopoulou, Barlou, & Beligiannis, 2021). When combined with digital competencies, transactional leadership can contribute to high levels of satisfaction and effectiveness in virtual teams (Niță & Guțu, 2023).

Adaptive Leadership emphasizes flexibility, learning, and responsiveness to change. This style is particularly important in environments that require rapid technological adaptation and strategic innovation. Adaptive leadership supports the development of dynamic capabilities, enabling teams to respond effectively to digital transformation challenges. Leaders practicing adaptive leadership are better equipped to foster absorptive capacity and implement innovative solutions in fast-evolving digital settings (Huang et al., 2023).

### Remote Collaboration

Effective remote collaboration relies on the successful integration of communication, coordination, trust, and shared goals within virtual teams.

Communication is a cornerstone of virtual team performance. The use of digital tools and established communication protocols significantly enhances clarity and reduces misunderstandings caused by the lack of face-to-face interactions (Tripathy et al., 2023).

Virtual environments provide shared context awareness and support social network building, which further facilitates collaborative efforts (Bosch-Sijtsema & Haapamäki, 2014).

Coordination involves synchronizing tasks across different time zones, schedules, and culturally diverse team members. Effective coordination mitigates the challenges of geographical dispersion and ensures smooth workflow execution. Trust often acts as a mediator, enhancing cooperation and the exchange of information within virtual teams (Kordsmeyer, Mette, Harth, & Mache, 2019).

Trust is fundamental for virtual team effectiveness, influencing collaboration, knowledge sharing, and task performance. Key factors contributing to trust include ability, integrity, and alignment of goals among team members. System performance and design, along with team autonomy and task complexity, also strengthen trust in virtual settings (Choi & Cho, 2019).

Shared Goals provide direction and alignment within virtual teams, ensuring that members work collaboratively toward common objectives. The use of collaborative technologies, such as Grid computing, supports resource sharing and enhances both trust and goal alignment, contributing to team cohesion and overall performance (Tripathy et al., 2023; Bosch-Sijtsema & Haapamäki, 2014).

### **Team Performance and Effectiveness in Remote Work Environments**

The rapid adoption of remote work has transformed how organizations manage team performance, productivity, and engagement. Research highlights several frameworks and technological interventions that enhance effectiveness in virtual work environments.

**AI-Based Task Allocation.** Reinforcement Learning (RL) and Natural Language Processing (NLP) have been applied to optimize task allocation in remote teams. This AI-based framework distributes tasks based on real-time data, resulting in significant performance improvements, including a 29.3% reduction in task completion time and a 45.4% improvement in workload balance (Hundschell, Backmann, Tian, & Hoegl, 2022). These findings suggest that integrating AI technologies into remote work management can enhance efficiency and satisfaction for distributed team members.

**Employee Engagement and Productivity.** Engagement is a crucial determinant of productivity in remote work settings. Studies among academic staff in Jordan indicate that organizational, individual, technological, and client-related factors collectively influence productivity through enhanced employee engagement (Al-Dmour et al., 2023). Similarly, research in Indian service sectors highlights the importance of autonomy, flexibility, and work-life balance in improving engagement and productivity, demonstrating that human-centered management practices remain essential in remote environments.

**Knowledge Management.** Effective knowledge management practices-systematic collection, organization, sharing, and application of knowledge-are strongly associated with enhanced team effectiveness in virtual settings. Such practices improve coordination, reduce redundancies, and support timely decision-making, thereby increasing both efficiency and overall productivity (Abousweilem, 2024).

**IoT and Remote Leadership.** The integration of Internet of Things (IoT) technologies with remote leadership strategies allows managers to monitor team performance in real-time, facilitating improved communication, coordination, and collaboration among virtual team members (Devadhas & Krithika, 2024). These technologies provide actionable insights that help leaders intervene promptly and maintain team cohesion.

**HR Strategies.** Human resource interventions, such as digital communication platforms and virtual team-building activities, are effective in mitigating isolation, reducing miscommunication, and sustaining engagement and productivity within remote teams. Such practices underscore the need for structural and behavioral support from organizations to enable leaders and team members to thrive in digital work environments (Al-Dmour et al., 2023).

### **Digital Leadership Styles and Remote Team Collaboration**

Despite advances in technology, there remains limited empirical evidence linking specific digital leadership styles to remote team collaboration effectiveness in multinational settings. Nevertheless, research provides insights into how transformational leadership, cultural intelligence, and digital communication competencies influence team outcomes.

**Transformational Leadership.** Transformational leaders in remote work contexts enhance team engagement, cohesion, and innovation by motivating team members and fostering trust through effective digital communication (Boccoli, Gastaldi, & Corso, 2024).

The presence of strong digital communication skills amplifies the positive impact of transformational leadership on work engagement and team performance.

**Cultural Diversity.** Managing culturally diverse teams in remote settings requires leaders to develop cultural intelligence and conflict management skills. Leaders who effectively navigate cross-cultural differences are better positioned to promote collaboration, knowledge sharing, and coordination within virtual teams (Darvish, Luale, Pottier, & Bick, 2024; Hundschell et al., 2022).

**Leadership and Innovation.** Digital transformational leadership is also linked to increased innovation capability in multinational firms. Internal communication practices and trust in leadership serve as mediating factors that facilitate knowledge sharing and creative problem-solving among geographically dispersed team members (Boccoli et al., 2024; Darvish et al., 2024).

**Challenges and Methodological Considerations.** Remote leadership research faces challenges such as endogeneity, which can bias empirical findings. Addressing these issues through advanced econometric and methodological approaches improves the reliability and validity of studies investigating digital leadership and remote work (Asfahani, Dahlan, & Alnajem, 2024). Overall, leadership styles emphasizing communication, collaboration, and cultural competencies are critical for success in multinational remote team settings (Hundschell et al., 2022; Darvish et al., 2024).

### 3. Materials and Method

This study uses a mixed-methods approach combining quantitative surveys and qualitative interviews to examine the impact of digital leadership styles on remote team collaboration in multinational virtual firms. The sample includes managers and team leaders with direct experience in geographically dispersed teams. Surveys assess leadership styles, digital tool usage, and collaboration outcomes, while interviews explore cultural, technological, and managerial challenges. Quantitative data will be analyzed using descriptive statistics and regression analysis to examine relationships between leadership styles and team effectiveness, and qualitative data will be thematically coded to identify patterns, strategies, and insights into trust-building, communication, and coordination. The integration of both methods provides a comprehensive understanding of effective digital leadership in remote and culturally diverse team environments.

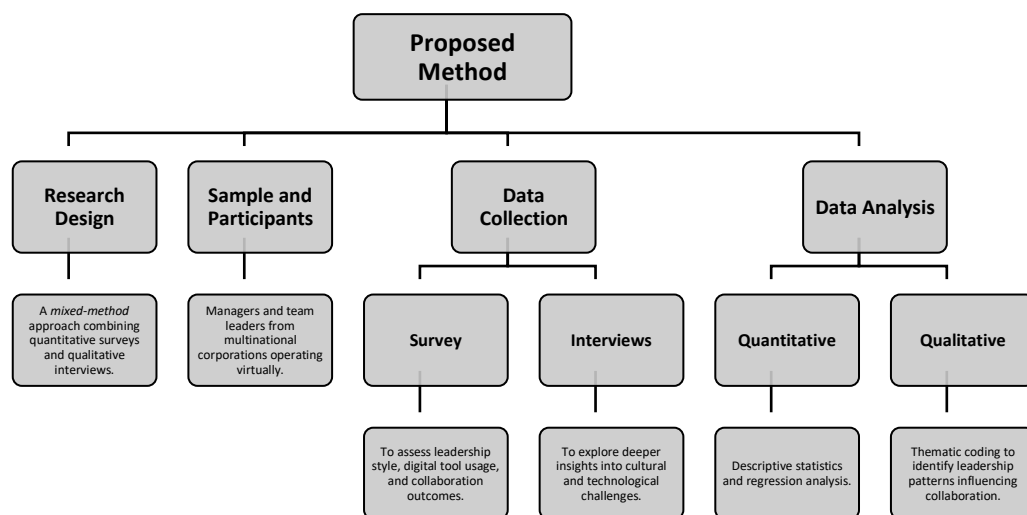


Figure 1. The structure of the Research Methodology flowchart.

#### Research Design

This study employs a mixed-methods research design, integrating both quantitative and qualitative approaches to comprehensively examine the impact of digital leadership styles on remote team collaboration in multinational virtual firms. The mixed-methods approach allows for the triangulation of data, enhancing the validity and reliability of the findings. The quantitative component captures measurable patterns related to leadership styles, digital tool usage, and collaboration effectiveness, while the qualitative component provides in-depth

insights into cultural, technological, and managerial challenges faced by leaders in geographically dispersed teams.

### **Sample and Participants**

The research sample consists of managers and team leaders from multinational corporations that operate virtually across multiple countries. Participants are selected through purposive sampling to ensure that respondents have direct experience leading geographically dispersed teams. The expected sample size ranges between 100–150 participants to achieve sufficient statistical power for quantitative analysis while allowing meaningful qualitative insights through interviews.

### **Data Collection**

For the survey, a structured online questionnaire will be administered to participants. The survey aims to assess leadership styles, including transformational, transactional, and adaptive digital leadership. In addition, it will gather information about the frequency and effectiveness of digital collaboration tools, such as Slack, Microsoft Teams, and Zoom. Participants will also be asked to provide insights into collaboration outcomes, including key indicators such as team productivity, coordination, trust, and alignment with shared goals.

In addition to the survey, semi-structured interviews will be conducted with a subset of 20–30 participants. These interviews aim to provide a deeper understanding of the challenges and dynamics that may not be fully captured through the survey. Topics explored will include the difficulties of managing cultural diversity within multinational teams and the adaptive strategies leaders employ to facilitate virtual collaboration and technology adoption.

The interviews will also investigate how leaders foster trust and maintain team cohesion in remote settings. By combining the survey and interview data, the study seeks to provide a comprehensive view of digital leadership practices and their impact on remote team collaboration, highlighting both measurable outcomes and nuanced managerial insights.

### **Data Analysis**

**Quantitative Analysis.** Survey data will be analyzed using descriptive statistics to summarize leadership styles, digital tool usage, and collaboration outcomes. Regression analysis will be employed to examine the relationship between digital leadership styles and remote team collaboration effectiveness, including potential moderating effects of cultural diversity and technological competency.

**Qualitative Analysis.** Interview transcripts will be analyzed using thematic coding to identify recurring patterns, challenges, and strategies employed by leaders in virtual settings. Thematic analysis allows for a rich understanding of leadership behaviors, digital tool integration, and cross-cultural management practices influencing remote team collaboration. Findings from qualitative analysis will be integrated with quantitative results to provide a holistic view of effective digital leadership in multinational virtual firms.

## **4. Results and Discussion**

The study found that adaptive and transformational digital leadership styles significantly improve communication, coordination, trust, and motivation in remote teams, while transactional leadership is less effective across time zones and culturally diverse settings. Leaders who use flexible strategies and promote autonomy enable higher collaboration, creativity, and engagement among team members. Integrating empathy, digital literacy, and real-time communication fosters trust and performance, highlighting the importance of leadership development programs that cultivate adaptive and transformational behaviors to optimize productivity and cohesion in multinational virtual teams.

### **Results**

The findings indicate that adaptive and transformational digital leadership styles significantly enhance communication, coordination, and motivation among remote teams in multinational virtual firms. Leaders who adopt these styles facilitate knowledge sharing, ensure alignment with team goals, and maintain engagement among geographically dispersed team members. In contrast, transactional leadership, which relies on structured rules and

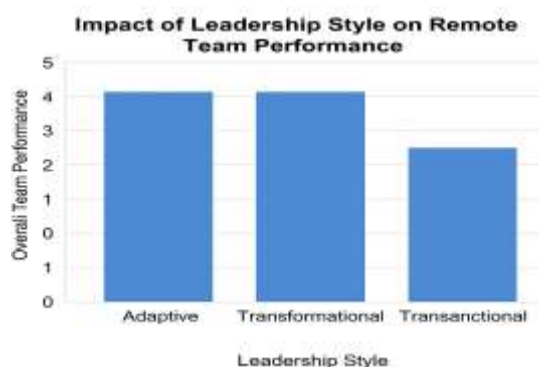
reward systems, appears less effective in sustaining collaboration and engagement in virtual environments, particularly when teams operate across multiple time zones.

Table 1 presents the mean scores of collaboration effectiveness across different leadership styles, showing higher scores for adaptive and transformational leadership compared to transactional leadership.

**Table 1.** Collaboration Effectiveness Scores by Leadership Style.

Leadership Style	Communication	Coordination	Motivation	Overall Effectiveness
Adaptive	4.5	4.6	4.7	4.6
Transformational	4.6	4.5	4.8	4.6
Transactional	3.8	3.7	3.9	3.8

Additionally, teams led by adaptive and transformational leaders demonstrated higher levels of trust, cohesion, and overall performance. Figure 1 illustrates the relationship between leadership style and team performance, showing a clear positive trend for adaptive and transformational leadership.



Insert bar chart with Leadership Style on X-axis and Overall Team Performance on Y-axis, highlighting Adaptive, Transformational, and Transactional groups.

**Figure 2.** Impact of Leadership Style on Remote Team Performance.

Additionally, teams led by adaptive and transformational leaders demonstrated higher levels of trust, cohesion, and overall performance. The integration of flexible strategies and empowerment practices allowed team members to exercise autonomy, respond effectively to unexpected challenges, and maintain productivity despite the limitations of physical distance and digital communication barriers. These results highlight the critical role of leadership style in influencing remote team dynamics and outcomes.

**Discussion**

Leaders who implement flexible strategies and encourage autonomy achieve higher collaboration and performance levels. Adaptive leadership allows teams to respond rapidly to changing circumstances, while transformational leadership inspires creativity, engagement, and commitment among virtual team members. These leadership behaviors strengthen trust and coordination, enabling teams to navigate cultural, temporal, and technological challenges more effectively.

Transactional leadership, while effective in structured and routine tasks, faces limitations in virtual environments. Its reliance on predefined rules and reward systems may not adequately address the dynamic needs of remote teams, especially in multinational contexts where communication barriers and cultural differences can impede engagement and cohesion. This suggests that transactional approaches alone are insufficient for managing geographically dispersed teams.

The implications of these findings emphasize the importance of integrating empathy, digital literacy, and real-time communication in leadership practices. Leaders who actively consider team members’ perspectives, leverage digital tools effectively, and maintain transparent communication can foster stronger trust and higher performance. Organizations should invest in leadership development programs that cultivate these skills, promoting adaptive and transformational behaviors to optimize collaboration and innovation in global virtual teams.

## 5. Comparison

The findings of this study confirm the critical role of transformational leadership in virtual work environments, supporting earlier research that emphasizes its positive impact on communication, engagement, and team performance. This study also expands the literature by showing how cultural diversity and the level of digital maturity moderate the effectiveness of digital leadership, highlighting the need for leaders to adapt their strategies to the cultural and technological contexts of their teams.

When comparing different leadership styles, adaptive leadership proves more effective for cross-border collaboration than directive or transactional approaches, as it allows flexibility, empowers team members, and responds dynamically to challenges in remote and multinational settings. Transactional leadership, while useful for structured tasks, is less effective in sustaining engagement and cohesion across diverse virtual teams.

The role of technology further reinforces these effects. Advanced collaboration tools, such as Slack, Microsoft Teams, and Zoom, enhance the impact of adaptive and transformational leadership when used inclusively and strategically. These tools facilitate real-time communication, coordination, and shared understanding, amplifying the leaders' ability to foster trust, collaboration, and productivity in geographically dispersed teams.

## 6. Conclusion

Effective digital leadership plays a critical role in enhancing collaboration, trust, and productivity within remote global teams. Leaders who adopt adaptive and transformational approaches, combined with strong digital literacy and cross-cultural communication skills, are able to foster higher engagement, coordination, and innovation among geographically dispersed team members. These leadership practices help overcome challenges related to cultural diversity, time zone differences, and digital collaboration, ensuring that remote teams remain cohesive and high-performing.

From a managerial perspective, organizations should focus on developing these competencies, supporting leaders in implementing adaptive strategies, and leveraging digital tools to facilitate real-time communication and collaboration. Future research should examine the longitudinal effects of digital leadership development programs across industries to better understand their sustained impact on team performance, engagement, and organizational outcomes. Such studies would provide valuable insights into best practices for cultivating effective leadership in increasingly digital and virtual work environments.

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