ADMINISTRATORS' LEADERSHIP STYLES IN INDUSTRIAL REVOLUTION 4.0 TOWARDS A PROPOSED LEADERSHIP EDUCATIONAL MODEL

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ABSTRACT

This study examines school leadership in Bangladesh's evolving digital landscape of the Fourth Industrial Revolution (IR 4.0). Quantitative methods assess leadership proficiency in Strategic, Interpersonal, Intrapersonal, and Digital Leadership, focusing on AI and Cloud Computing. Administrators perceive higher practice levels than teachers and students across styles, indicating a perceptual gap. Strategic Leadership faces challenges in understanding and responding to IR 4.0 changes. Interpersonal Leadership reveals deficiencies in relationship building and communication. Intrapersonal Leadership underscores the need for improved self-leadership skills. Digital Leadership, particularly in AI and Cloud Computing, requires extensive professional development. Findings inform the development of a School Leadership Development Programme. Aligning leadership with the digital landscape is crucial, emphasizing vision, innovation, and future-ready skills. Success in IR 4.0 requires preparing students adequately through effective leadership practices.

Keywords: Strategic, Interpersonal, Intrapersonal, Digital Leadership, Artificial Intelligence, Cloud Computing

INTRODUCTION

In an era defined by rapid technological advancements and digital transformation, the Fourth Industrial Revolution (IR 4.0) presents both opportunities and challenges for educational institutions worldwide. This revolution, characterized by the integration of artificial intelligence (AI), cloud computing, and other digital technologies into daily life, necessitates a reevaluation of leadership within schools, particularly in developing countries like Bangladesh. The adaptation of educational leaders to these changes is crucial for steering their institutions successfully through the complexities of the digital age. This study seeks to bridge a critical research gap by examining the leadership styles of school administrators in Bangladesh within the context of IR 4.0. It aims to understand how these leaders are adjusting their strategies, interpersonal relations, and self-management to navigate the evolving landscape of education influenced by digitalization.

The importance of strategic foresight, the ability to foster human connections, and the need for personal adaptability in leadership have never been more pronounced. Drawing from the insights of Kouzes and Posner on strategic leadership, Northouse on the significance of interpersonal leadership, and Goleman's work on emotional

intelligence, this study explores the multifaceted nature of leading educational institutions through technological change. Moreover, it delves into the contributions of Brynjolfsson and McAfee, and Armbrust et al., on the roles of AI and cloud computing in enhancing decision-making agility and promoting collaborative environments within schools.

As Bangladesh grapples with the impacts of IR 4.0 on its educational system, understanding the nuances of effective leadership in this new era is imperative. This study not only aims to identify current leadership practices but also to inform the development of policies and interventions that can enhance the capability of educational leaders to embrace and leverage digital transformation. By addressing the ethical considerations tied to technological integration, such as job displacement and data privacy, this research provides a comprehensive overview of the challenges and opportunities presented by IR 4.0, underscoring the critical role of adaptable leadership in achieving educational success in the digital era.

OBJECTIVES OF THE STUDY

This study aimed to identify the most effective leadership style in schools in Bangladesh within the context of the Fourth Industrial Revolution (IR 4.0). In accordance, it sought to gather insights from administrators, teachers, and students to answer the following research questions:

1. Assess the level of practice of strategic leadership, interpersonal leadership, intrapersonal leadership, and digital leadership (including artificial intelligence and cloud computing) among administrators in the context of IR 4.0, as perceived by the three groups of respondents.

2. Determine if there is a significant difference in the assessment of the administrators' level of practice of the mentioned leadership styles among the three groups of respondents (administrators, teachers, and students).

3. Based on the findings, propose an IR 4.0 Leadership Educational Model that aligns with the identified effective leadership styles and practices within the educational context of Bangladesh.

METHODOLOGY

This study employs a quantitative research method with a descriptive research design to examine different leadership styles within the Fourth Industrial Revolution (IR 4.0) in Bangladesh's educational context. Purposive sampling was used to select 90 participants of Administrators, Teachers, and Students from various schools across Bangladesh. The research instrument, a survey questionnaire, underwent validity testing by five experts in the field of education and reliability testing using Cronbach's Alpha. Data were gathered via Google Forms, supplemented by observations and interviews, and analyzed using statistical methods including a One-sample T-test in SPSS. The questionnaire utilized a Five-Point Likert scale to assess the extent of administrators' practice of leadership styles in IR 4.0, with statistical analysis facilitating the interpretation of results.

RESULTS AND DISCUSSION

1. Administrators' Extent of Practice

1.1. In terms of Strategic Leadership in the Industrial Revolution 4.0

Self-assessment data from Administrators suggest a high extent of Strategic Leadership practice in an Industrial Revolution 4.0 (IR 4.0) school setting in Bangladesh, with mean ratings ranging from 3.50 to 4.49 (Cheema et al., 2020). However, Teachers and Students perceive this

practice to be at a more moderate level, with mean ratings ranging from 2.50 to 3.49 (Hitt et al., 2017).

Table 1

Administrators' Extent of Practice in terms of Strategic Leadership in the Industrial Revolution 4.0

Indicators	Administrators		Teachers		Students	
	Mean SD	Interpretation	Mean SD	Interpretation	Mean SD	Interpretation
1. The administrators foster a culture of innovation and continuous improvement within the school by incorporating action plans that support the IR 4.0 use of artificial intelligence or intelligent computers in teaching and learning and other school process.	M=3.70 SD=0.92	High Extent	M=3.30 SD=0.87	Moderate Extent	M=3.50 SD=0,69	High Extent
2. The administrators ensure that strategic decisions and initiatives align with the needs and aspirations of your school community to incorporate Industrial Revolution 4.0 leadership requirements.	M=3.87 SD=0.82	High Extent	M=3.15 SD=0.77	Moderate Extent	M=3.50 SD=0.64	High Extent
3. The administrators foster collaboration and teamwork among staff members to support the implementation of the strategic plan that is IR4.0-aligned	M=3.70 SD=0.79	High Extent	M=3.37 SD=0.97	Moderate Extent	M=3.36 SD=0.78	Moderate Extent
4. The administrators communicate the strategic vision and goals aligned to IR 4.0 to the entire school community to ensure understanding and buy-in	M=3.50 SD=0.82	High Extent	M=3.22 SD=0.85	Moderate Extent	M=3.39 SD=0.88	Moderate Extent
5. The administrators take steps to reflect on and adjust to the IR 4.0 strategic leadership approach based on feedback and lessons learned	M=3.33 SD=1.03	Moderate Extent	M=3.15 SD=0.77	Moderate Extent	M=3.36 SD=0.73	Moderate Extent
Administrators' Extent of Practice of Strategic Leadership	**M=3.62 SD=0.65**	**High Extent**	**M=3.24 SD=0.78**	**Moderate Extent**	**M=3.42 SD=0.63**	**Moderate Extent**

This disparity underscores the need for a comprehensive evaluation of leadership practices (Brown & Lord, 2001). It may stem from cognitive biases where individuals tend to overrate their abilities (Mezulis et al., 2004). Moreover, it highlights the complexity of leadership perception in educational contexts (Avolio & Gardner, 2005). Addressing these differences is crucial to ensure alignment and engagement among stakeholders, particularly in embracing new technologies and fostering innovation within the school setting.

1.2. In terms of the Interpersonal Leadership in the Industrial Revolution 4.0

Table 2 presents the assessment of Administrators' practice of Interpersonal Leadership in the context of Industrial Revolution 4.0 (IR 4.0) education, as evaluated by Administrators, Teachers, and Students.

Table 2

Administrators' Extent of Practice in terms of the Interpersonal Leadership in the Industrial Revolution 4.0

Indicators	Administrator		Teachers		Students	
	Mean SD	Interpretation	Mean SD	Interpretation	Mean SD	Interpretation
1. The administrators promote a positive and inclusive IR 4.0 work environment within the school setting.	M=3.70 SD=0.75	High Extent	M=3.30 SD=0.87	Moderate Extent	M=3.36 SD=0,68	Moderate Extent
2. The administrators engage in open and honest communication with their team members or colleagues as regards IR 4.0 integration.	M=3.27 SD=1.05	Moderate Extent	M=3.33 SD=0.92	Moderate Extent	M=3.43 SD=0.79	Moderate Extent
3. The administrators establish trust and credibility with their peers and subordinates to promote the IR 4.0 working relationship	M=3.80 SD=1.27	High Extent	M=3.37 SD=1.36	Moderate Extent	M=3.71 SD=0.98	High Extent
4. The administrators recognize and appreciate the contributions of others in attaining the IR 4.0 goals.	M=3.50 SD=0.78	High Extent	M=3.07 SD=0.78	Moderate Extent	M=3.29 SD=0.85	Moderate Extent
5. The administrators foster a sense of collaboration and shared vision among their team or colleaques in achieving IR 4.0 perspectives.	M=3.67 SD=0.96	High Extent	M=3.22 SD=0.89	Moderate Extent	M=3.43 SD=0.69	Moderate Extent
Administrators' Extent of Practice of Interpersonal Leadership	**M=3.59 SD=0.73**	**High Extent**	**M=3.26 SD=0.91**	**Moderate Extent**	**M=3.44 SD=-0.61**	**Moderate Extent**

Administrators perceive their practice of Interpersonal Leadership to be at a high extent (M=3.59, SD=0.73), while Teachers (M=3.26, SD=0.91) and Students (M=3.44, SD=0.61) rate it within a moderate extent (Brown & Lord, 2001; Mezulis et al., 2004). This disparity suggests potential misalignment in perceptions, which could be influenced by biases and differing expectations rooted in social identity and organizational norms (Avolio & Gardner, 2005). Addressing these differences is crucial for fostering effective communication, trust, and collaboration among stakeholders, which are essential for the successful implementation of IR 4.0 initiatives in Bangladeshi schools.

1.3. In terms of the Intrapersonal Leadership

Table 3

Administrators' Extent of Practice in terms of the Intrapersonal Leadership in the Industrial Revolution 4.0

Indicators	Administrator Mean SD	Administrator Interpretation	Teachers Mean SD	Teachers Interpretation	Students Mean SD	Students Interpretation
1. The administrators engage in self-reflection and introspection to gain insights into their leadership style and effectiveness.	3.27 0.87	Moderate Extent	3.30 0.72	Moderate Extent	3.57 0.74	High Extent
2. The administrators align their values and beliefs with their IR 4.0 leadership practices in the school setting.	3.47 0.82	Moderate Extent	3.19 0.79	Moderate Extent	3.54 0.69	High Extent
3. The administrators demonstrate a growth mindset and continuously seek opportunities for IR 4.0 personal and professional development.	3.73 0.94	High Extent	3.19 0.79	Moderate Extent	3.39 0.83	Moderate Extent
4. The administrators establish and maintain a sense of purpose and vision for themselves as IR 4.0 school leaders.	3.70 0.95	High Extent	3.26 0.81	Moderate Extent	3.29 0.53	Moderate Extent
5. The administrators exhibit self-confidence and assertiveness in advocating for IR 4.0 important educational initiative.	3.60 0.81	High Extent	3.22 0.70	Moderate Extent	3.32 0.67	Moderate Extent
Administrators' Extent of Practice of Intrapersonal Leadership	**M=3.55 SD=0.67**	**High Extent**	**M=3.23 SD=0.73**	**Moderate Extent**	**M=3.42 SD=0.55**	**Moderate Extent**

Table 3 illustrates the assessment of Administrators' practice of Intrapersonal Leadership in the context of Industrial Revolution 4.0 (IR 4.0) education, evaluated by Administrators, Teachers, and Students. Administrators perceive their practice of Intrapersonal Leadership to be at a high extent (M=3.55, SD=0.67), while Teachers (M=3.23, SD=0.73) and Students (M=3.42, SD=0.55) rate it within a moderate extent. The disparity suggests potential biases and differing expectations among stakeholders, which can impact communication and alignment. Administrators who demonstrate high levels of Intrapersonal Leadership engage in self-reflection, self-regulation, and personal growth, contributing to effective leadership in the IR 4.0 context. However, a discrepancy in perceptions underscores the need for effective communication and a balanced approach to leadership development, incorporating interpersonal and strategic leadership alongside intrapersonal skills.

1.4. In terms of the Digital Leadership – Artificial Intelligence

Table 4

Administrators' Extent of Practice in terms of the Digital Leadership – Artificial Intelligence in the Industrial Revolution 4.0

Indicators	Administrator Mean SD	Administrator Interpretation	Teachers Mean SD	Teachers Interpretation	Students Mean SD	Students Interpretation
1. The administrators collaborate with teachers and staff to identify their digital needs and provide appropriate support for IR 4.0 initiative.	3.23 0.68	Moderate Extent	3.15 0,82	Moderate Extent	3.46 0.69	Moderate Extent
2. The administrators encourage and support teachers in adapting to their IR 4.0 instructional practices to leverage digital tools effectively.	3.40 0.72	Moderate Extent	3.15 0.77	Moderate Extent	3.07 0.81	Moderate Extent
3. The administrators assess the effectiveness and impact of AI initiatives or programs to align with IR 4.0 perspectives.	2.87 0.86	Moderate Extent	2.96 0.81	Moderate Extent	2.96 0.96	Moderate Extent
4. The administrators facilitate a successful collaboration or partnership with external organizations or experts in the field of AI in IR 4.0 education.	2.97 0.72	Moderate Extent	3.00 0.78	Moderate Extent	3.04 0.96	Moderate Extent
5. The administrators take steps to ensure continuous improvement and growth in their own understanding and use of artificial intelligent technologies in their IR 4.0 leadership style.	2.97 0.67	Moderate Extent	2.93 0.68	Moderate Extent	2.82 0.90	Moderate Extent
Administrators' Extent of Practice of Digital Leadership – A.I.	**M=3.09 SD=0.54**	**Moderate Extent**	**M=3.04 SD=0.65**	**Moderate Extent**	**M=3.07 SD=0.67**	**Moderate Extent**

Table 4 presents the assessment of Administrators' practice of Digital Leadership - Artificial Intelligence in the context of Industrial Revolution 4.0 (IR 4.0) education, evaluated by Administrators, Teachers, and Students. All groups perceive the extent of this practice to be at a moderate level, with Administrators rating it slightly higher (M=3.09, SD=0.54) compared to Teachers (M=3.04, SD=0.65) and Students (M=3.07, SD=0.67) (Cheema et al., 2020; Hitt et al., 2017). Despite potential differences in perception across stakeholders, there appears to be consensus regarding the moderate extent of

Digital Leadership - Artificial Intelligence practice in IR 4.0 school settings.

The findings underscore the importance of enhancing technological competencies among Administrators to effectively leverage AI tools and technologies in education (Harris et al., 2018). Additionally, there is a need for robust strategic planning, stakeholder engagement, and addressing ethical considerations to ensure the responsible and ethical use of AI in schools (Jung et al., 2019). Failure to fully integrate AI technologies due to moderate Digital Leadership practices may hinder the development of future-ready skills among students and limit the school's ability to stay competitive and meet the evolving needs of the education landscape.

1.5. In terms of the Digital Leadership – Cloud Computing

Table 5

Administrators' Extent of Practice in terms of the Digital Leadership – Cloud Computing in the Industrial Revolution 4.0

Indicators	Administrator		Teachers		Students	
	Mean SD	Interpretation	Mean SD	Interpretation	Mean SD	Interpretation
1. The administrators engage in strategic planning and goal setting related to the integration of cloud computing in their IR 4.0 leadership practices	3.00 0.74	Moderate Extent	3.15 0.60	Moderate Extent	3.04 0.64	Moderate Extent
2. The administrators encourage and support teachers in leveraging cloud computing to enhance their IR 4.0 instructional practice	3.07 1.05	Moderate Extent	3.22 0.58	Moderate Extent	2.93 0.86	Moderate Extent
3. The administrators address concerns related to data security, privacy, and confidentiality when utilizing cloud services in their IR 4.0 leadership style.	3.17 0.87	Moderate Extent	3.15 0.72	Moderate Extent	2.96 0.79	Moderate Extent
4. The administrators address resistance to change or skepticism towards cloud computing integration in the IR 4.0 endeavor among staff members.	2.80 0.76	Moderate Extent	3.04 0.65	Moderate Extent	3.00 0.86	Moderate Extent
5. The administrators assess the effectiveness and impact of cloud computing to achieve IR 4.0 initiatives or programs	2.87 0.68	Moderate Extent	2.93 0.62	Moderate Extent	3.04 0.69	Moderate Extent
Administrators' Extent of Practice of Digital Leadership – Cloud Computing	**M=2.98 SD=0.67**	**Moderate Extent**	**M=3.10 SD=0.52**	**Moderate Extent**	**M=2.99 SD=0.69**	**Moderate Extent**

Table 5 displays the assessment of Administrators' practice of Digital Leadership - Cloud Computing in the context of the Industrial Revolution 4.0 (IR 4.0), as evaluated by Administrators, Teachers, and Students. The findings reveal a shared perception among all three groups, indicating a moderate extent of practice (Administrators: M=2.98, SD=0.67; Teachers: M=3.10, SD=0.52; Students: M=2.99, SD=0.69) (Cheema et al., 2020; Hitt et al., 2017). This alignment suggests a collective recognition of the importance of cloud computing leadership in educational settings, albeit with room for further improvement.

The moderate extent of Digital Leadership - Cloud Computing practice highlights the need for ongoing professional development and strategic planning to fully capitalize on the benefits of cloud-based solutions in education (Harris et al., 2018). Administrators should focus on upgrading infrastructure, addressing data security concerns, providing training opportunities, and optimizing resource allocation to maximize the potential of cloud computing technologies in driving educational innovation and efficiency.

2. Test of Significant Difference on the Assessment of the Administrators' Extent of Practice

2.1. In terms of Strategic Leadership in the Industrial Revolution

Table 6

Test of Significant Difference on the Assessment of the Administrators' Extent of Practice in terms of Strategic Leadership in the Industrial Revolution

Respondents	Overall Means	Standard Deviation	Computed F	P-value	Decision If p = or < 0.05, reject Ho	Interpretation
Administrators	3.62	0.65				
Teachers	3.24	0.78	2.209	0.116	Accept Ho	Not Significant
Students	3.42	0.63				
Post Hoc Tukey Test p-value is < or = 0.05, significant	Not Applicable					

Table 6 illustrates the results of a one-way ANOVA, indicating no statistically significant difference in the extent of Strategic Leadership practice among Administrators in an Industrial Revolution 4.0 school setting ($F(2, 82) = 2.209$, $p = 0.116$). Although Administrators' mean scores were higher than those of Teachers and Students, the difference was not statistically distinctive, suggesting a similarity in their perceptions of Administrators' Strategic Leadership practice.

While the numerical disparity in ratings suggests a trend favoring Administrators, it does not imply a significant difference that could be attributed to random chance or sampling variability. Consequently, this discrepancy is confined to the sample and does not generalize to a larger population.

The absence of significant differences in Strategic Leadership practice among administrators has several implications for school operations and leadership styles in Bangladesh. This consistency suggests a shared commitment to strategic leadership across different schools, fostering collaboration and cohesion toward common educational goals in the IR4.0 era. It also implies stable decision-making processes based on data-driven insights, enhancing operational efficiency and predictability. However, it's essential for administrators to continuously enhance their leadership skills and adapt to evolving IR4.0 challenges to ensure sustained educational excellence.

2.2. In terms of Interpersonal Leadership in the Industrial Revolution 4.0

Table 7 indicates no statistically significant difference in the extent of Interpersonal Leadership practice among Administrators in an Industrial Revolution 4.0 school setting ($F(2, 82) = 1.330$, $p = 0.270$). Despite Administrators' mean scores being higher than those of Teachers and Students, the lack of significant distinction suggests a uniformity in their perceptions of Interpersonal Leadership practice.

Table 7

Test of Significant Difference on the Assessment of the Administrators' Extent of Practice in terms of Interpersonal Leadership in the Industrial Revolution 4.0

Respondents	Overall Means	Standard Deviation	Computed F	P-value	Decision If p = or < 0.05, reject Ho	Interpretation
Administrators	3.59	0.73				
Teachers	3.26	0.91	1.330	0.270	Accept Ho	Not Significant
Students	3.44	0.61				
Post Hoc Tukey Test p-value is < or = 0.05, significant	Not Applicable					

This uniformity implies that Administrators in Bangladesh are adopting similar approaches to interpersonal interactions, recognizing the importance of effective communication and collaboration in the IR4.0 era. Cultural influences, shared training experiences, and aligned leadership goals may contribute to this consistency.

The absence of significant differences underscores a collective emphasis on fostering positive relationships and collaboration among stakeholders, potentially leading to enhanced teamwork and a supportive school environment. While encouraging, administrators should remain proactive in their growth and development to adapt to evolving challenges in the digital age.

In summary, the consistent practice of interpersonal leadership among administrators reflects shared values and goals, contributing to improved school operations and a cohesive school climate conducive to meeting the demands of the digital era. Continued focus on personal and professional development is essential to sustain this effectiveness in leadership approaches.

2.3. In terms of Intrapersonal Leadership in the Industrial Revolution

Table 8 indicates no statistically significant difference in the extent of Intrapersonal Leadership practiced by Administrators in an

Industrial Revolution 4.0 school setting (F(2, 82) = 1.758, p = 0.179). Despite Administrators' mean scores being higher than those of Teachers and Students, the lack of significant distinction suggests uniformity in their perceptions of Intrapersonal Leadership practice.

Table 8

Test of Significant Difference on the Assessment of the Administrators' Extent of Practice in terms of Intrapersonal Leadership in the Industrial Revolution

Respondents	Overall Means	Standard Deviation	Computed F	P-value	Decision If p = or < 0.05, reject Ho	Interpretation
Administrators	3.55	0.67				
Teachers	3.23	0.73	1.758	0.179	Accept Ho	Not Significant
Students	3.42	0.55				
Post Hoc Tukey Test p-value is < or = 0.05, significant	Not Applicable					

This uniformity implies that administrators in Bangladesh recognize the importance of self-awareness, self-regulation, and personal growth in their leadership roles within the IR4.0 context. Shared training experiences, professional standards, and organizational culture may contribute to this consistency.

The absence of significant differences underscores a shared understanding among administrators regarding the significance of intrapersonal skills in the digital age. This shared focus can lead to a harmonious leadership approach, fostering improved collaboration, decision-making, and overall school operations.

Consistent intrapersonal leadership practices among administrators can serve as a model for teachers and staff, encouraging the development of similar skills within the school community. While encouraging, administrators should remain committed to personal development in this area to enhance their adaptability in the dynamic IR4.0 landscape.

2.4. In terms of Digital Leadership – Artificial Intelligence

Table 9 indicates no statistically significant difference in the extent of Digital Leadership – Artificial Intelligence practiced by Administrators in an Industrial Revolution 4.0 school setting (F(2, 82) = 0.047, p = 0.954). Despite Administrators' mean scores being higher than those of Teachers and Students, the lack of significant distinction suggests uniformity in their perceptions of Digital Leadership – AI practice.

Table 9

Test of Significant Difference on the Assessment of the Administrators' Extent of Practice in terms of Digital Leadership – Artificial Intelligence in the Industrial Revolution

Respondents	Overall Means	Standard Deviation	Computed F	P-value	Decision If p = or < 0.05, reject Ho	Interpretation
Administrators	3.09	0.54				
Teachers	3.04	0.65	0.047	0.954	Accept Ho	Not Significant
Students	3.07	0.67				
Post Hoc Tukey Test p-value is < or = 0.05, significant	Not Applicable					

This uniformity implies that administrators in Bangladesh share a similar awareness and understanding of the importance of AI in education within the IR4.0 context. Factors such as equal access to AI resources, collaboration initiatives, and supportive policies may contribute to this consistency.

The absence of significant differences underscores a collective commitment among administrators to leverage AI technologies for instructional purposes, student support, and administrative efficiency. This consistency can lead to streamlined processes, enhanced data-driven decision-making, and improved educational outcomes in the IR4.0 era.

Although there may not be significant differences in AI leadership practices, administrators should continue engaging in professional development to stay updated with the latest advancements and best practices in AI integration. This ongoing learning will enable administrators to effectively navigate the evolving landscape of AI in education and continuously refine their leadership styles.

2.5. In terms of Digital Leadership – Cloud Computing

Table 10 found no statistically significant difference in the extent of Digital Leadership – Cloud Computing practiced by Administrators in an Industrial Revolution 4.0 school setting ($F(2, 82) = 0.282$, $p = 0.755$). Despite Teachers' mean scores being higher, there were no significant distinctions among the groups' ratings.

Table 10
Test of Significant Difference on the Assessment of the Administrators' Extent of Practice in terms of Digital Leadership – Cloud Computing in the Industrial Revolution

Respondents	Overall Means	Standard Deviation	Computed F	P-value	Decision If p = or < 0.05, reject Ho	Interpretation
Administrators	2.98	0.67				
Teachers	3.10	0.52	0.282	0.755	Accept Ho	Not Significant
Students	2.99	0.69				
Post Hoc Tukey Test p-value is < or = 0.05, significant	Not Applicable					

This uniformity suggests widespread recognition among administrators in Bangladesh regarding the benefits of cloud computing for education in the IR4.0 era. Factors such as equal access to resources and consistent training programs may contribute to this consistency.

The lack of significant differences indicates a cohesive approach to utilizing cloud computing technologies for data management, collaboration, and resource accessibility. This consistency can enhance efficiency, and accessibility to educational resources, and streamline administrative processes in schools.

While there may not be significant differences in cloud computing leadership practices, administrators should continue to stay updated with technological advancements. Ongoing professional development and exploration of emerging cloud technologies can help administrators fully leverage the potential of cloud computing for improved school operations and educational outcomes.

CONCLUSION

The study revealed that administrators perceived their practice of strategic leadership, interpersonal leadership, intrapersonal leadership, and digital leadership to be at a higher extent than the perceptions of teachers and students. This aligns with the "illusion of leadership" phenomenon, where leaders tend to overestimate their effectiveness (Brown & Lord, 2001). Discrepancies in perceptions highlight the importance of bridging communication gaps through open dialogue and shared decision-making processes (Avolio & Gardner, 2005). Additionally, discrepancies in interpersonal and intrapersonal leadership practices underscore the need for administrators to develop emotional intelligence and self-reflection skills (Goleman, 1995; Day et al., 2009). Assessment of Administrators' Leadership Level by Different Groups: Statistical analyses accepted null hypotheses stating that the assessment of leadership style by students, teachers, and administrators does not significantly differ in the context of IR 4.0. Administrators perceived their leadership practices to be at relatively high extents, consistent with prior research (Cheema et al., 2020; Hitt et al., 2017). This perception may be influenced by their positions of authority and responsibility (Van Velsor & Leslie, 1995).

RECOMMENDATION

In response to the challenges and opportunities presented by the Fourth Industrial Revolution (IR 4.0), recommendations have been proposed to guide schools in Bangladesh towards effective adaptation and transformation.

1. Offer training programs for administrators focusing on strategic, interpersonal, and intrapersonal leadership in the IR 4.0

context. Encourage a culture of continuous improvement and innovation.

2. Implement a comprehensive plan for integrating IR 4.0 technologies among stakeholders. Ensure access to necessary infrastructure for seamless adoption.
3. Create an environment conducive to exploring and adopting disruptive technologies. Foster collaboration between administrators, teachers, and students to identify and implement innovative practices.
4. Develop strategies for adapting to post-pandemic learning modalities, including hybrid models and remote teaching. Provide support and training to navigate challenges and leverage opportunities.
5. Establish decision-making processes that incorporate data-driven approaches and collaboration. Involve teachers, students, and parents to ensure diverse perspectives and ownership of decisions.
6. Identify and enhance skills required for effective leadership in the IR 4.0 era, including digital literacy and critical thinking. Provide targeted professional development programs for administrators and teachers.
7. Promote collaboration among subject-area teachers, technology specialists, and administrators to develop interdisciplinary approaches. Enhance teaching and learning experiences through the integration of various disciplines.
8. Recognize the importance of cloud computing in leadership practices. Provide training and resources for administrators to effectively integrate cloud computing tools in decision-making processes and resource management.

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