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Confirmatory factor analysis model of agile leadership for school administrations in secondary level under the local administrative organization

Ritthichai Wisetchat[1], Piangkae Poophayang [1], Sirisak Ardwichai[1]
[1]Faculty of Education and Human Development, Chaiyaphum Rajabhat University, Thailand

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ABSTRACT

This study aimed to examine and validate the structural components of agile leadership among secondary school administrators under local administrative organizations. The sample consisted of 286 administrators and teachers selected through multi-stage sampling to ensure representation across school contexts. A five-point Likert scale questionnaire with high reliability ($\alpha = 0.962$) was employed, and data were analyzed using descriptive statistics and first-order confirmatory factor analysis (CFA). The findings revealed that all five components of agile leadership were rated at a very high level, arranged alphabetically as follows: adaptation, collaboration, flexibility, learning orientation, and team management. The CFA results indicated that the proposed measurement model demonstrated an excellent fit with the empirical data ($\chi^2 = 7.041$, $\chi^2/df = 1.760$, $df = 4$, $p = 0.134$, AGFI = 0.964, CFI = 0.998, NFI = 0.995, RMR = 0.005, RMSEA = 0.052). These results confirm the construct validity of agile leadership as a multidimensional competency essential for administrators operating in dynamic and complex educational environments and provide a validated framework to inform leadership development and policy implementation.

Corresponding Author:
Ritthichai Wisetchat
Faculty of Education and Human Development
Chaiyaphum Rajabhat University
Thailand
Email: torychem@gmail.com

1. INTRODUCTION

Educational institutions in the 21st century operate within increasingly complex, uncertain, and rapidly changing environments that require adaptive and responsive leadership. School administrators play a pivotal role in shaping organizational culture, instructional quality, and school effectiveness (Hallinger, 2011; Leithwood et al., 2020). Leadership has consistently been identified as the second most influential school-level factor affecting student achievement after classroom instruction (Robinson et al., 2008). In decentralized systems, particularly those under local administrative organizations, school leaders must balance policy implementation, community expectations, and institutional

performance (Bush, 2018; OECD, 2020). Consequently, traditional hierarchical leadership approaches may no longer be sufficient in dynamic educational contexts (Fullan, 2016).

Agile leadership has emerged from organizational and management theory as a response to volatility, uncertainty, complexity, and ambiguity (VUCA) environments (Rigby et al., 2018). Rooted in agile management principles originally developed in the software industry (Beck et al., 2001), agile leadership emphasizes adaptability, collaboration, iterative learning, and responsiveness to change (Joiner & Josephs, 2007; Denning, 2018). Scholars argue that agile leaders foster decentralized decision-making, empower teams, and promote continuous improvement (Uhl-Bien & Arena, 2018; Meyer, 2015). These characteristics align closely with contemporary educational reforms that require innovation, flexibility, and stakeholder engagement.

Within the educational sector, agile leadership is increasingly recognized as a critical competency for school administrators facing curriculum reform, digital transformation, and community-based accountability (Harris, 2014; Kools & Stoll, 2016). Educational leaders must cultivate collaborative cultures, encourage professional learning, and respond effectively to emerging challenges (Day et al., 2016; Hargreaves & Fullan, 2012). Empirical research suggests that adaptive and collaborative leadership practices are associated with improved school climate and organizational resilience (Heifetz et al., 2009; Mulford, 2008). However, despite growing conceptual interest, systematic validation of agile leadership constructs in school contexts remains limited.

The measurement of leadership constructs requires rigorous methodological validation to ensure construct clarity and empirical robustness. Confirmatory factor analysis is widely used to test the validity of theoretical measurement models and examine latent constructs (Brown, 2015; Kline, 2016). Structural equation modeling (SEM) enables researchers to assess model fit and examine relationships among observed and latent variables (Hair et al., 2019). Valid measurement is essential for leadership development research, as poorly defined constructs may limit theoretical advancement and practical application (Hinkin, 1998). Therefore, validating the structural components of agile leadership using CFA provides a methodological foundation for reliable application in educational settings.

Although international studies have examined adaptive and transformational leadership in schools (Bass & Riggio, 2006; Bush & Glover, 2014), few studies have empirically tested agile leadership as a multidimensional construct within secondary schools under local administrative organizations. In the Thai context, decentralization policies have expanded the responsibilities of local educational administrators, increasing the need for flexible and collaborative leadership approaches (Office of the Education Council, 2021; World Bank, 2018). However, empirical validation of agile leadership structures specific to this administrative context remains underexplored.

This study addresses this gap by examining and validating the structural components of agile leadership among secondary school administrators under local administrative organizations. By employing confirmatory factor analysis, the research contributes to both leadership theory and measurement development. The validated model provides empirical evidence supporting agile leadership as a multidimensional competency framework and offers practical implications for leadership development, policy formulation, and capacity building in decentralized educational systems.

2. METHOD

2.1 Research Design

This study employed a quantitative research design using a survey methodology to examine and validate the structural components of agile leadership among secondary school administrators under local administrative organizations. The research aimed to empirically test the construct validity of a hypothesized five-factor measurement model consisting of adaptation, flexibility, collaboration, learning, and team management. To achieve this objective, first-order confirmatory factor analysis was applied to assess the extent to which the proposed latent constructs were supported by empirical data. The design enabled systematic examination of both descriptive characteristics and the structural relationships among observed and latent variables within the measurement framework.

2.2 Population and Sample

The population comprised 1,001 administrators and teachers working in secondary schools under local administrative organizations in Thailand. These personnel represent key stakeholders involved in leadership implementation and school operations within decentralized administrative

structures. A total of 286 participants were selected as the sample for this study. The sample size was determined based on recommended criteria for structural equation modeling to ensure adequacy for confirmatory factor analysis. Multi-stage random sampling was employed to obtain representation across different school contexts and administrative units. Both school administrators and teachers were included in the sample, as leadership behaviors are enacted by administrators and perceived by teachers within the same organizational environment. This approach enhanced the representativeness and validity of the collected data.

2.3 Research Instrument

The research instrument was a structured questionnaire developed through an extensive review of theoretical frameworks and empirical studies related to agile leadership. The research instrument consisted of two main sections. The first section gathered demographic information, including gender, position, age, educational level, and work experience. The second section measured agile leadership using a five-point Likert scale ranging from 1 (lowest level) to 5 (highest level). The scale was designed to assess five components: adaptation, flexibility, collaboration, learning, and team management. Each component was operationalized through indicators synthesized from relevant literature to ensure conceptual alignment with the theoretical framework. Content validity was examined by a panel of experts using the Index of item-objective congruence. All items exceeded the acceptable criterion, indicating satisfactory alignment between the items and research objectives. A pilot test was subsequently conducted with 30 respondents to evaluate reliability. The overall Cronbach's alpha coefficient was 0.96, demonstrating high internal consistency and confirming that the instrument was suitable for large-scale data collection and further structural analysis.

2.4 Data Collection

Data were collected through questionnaire administration to the selected participants. Prior to data collection, respondents were informed of the research objectives and assured that participation was voluntary. Confidentiality and anonymity were emphasized to encourage honest responses. After collection, all questionnaires were carefully screened for completeness and accuracy before proceeding to statistical analysis.

2.5 Data Analysis

Data analysis was conducted in two primary stages. First, descriptive statistics were employed to examine the demographic characteristics of respondents and to determine the overall level of agile leadership components. Frequency and percentage were used to describe demographic variables, while mean and standard deviation were calculated to assess the perceived level of each leadership component. Second, first-order confirmatory factor analysis was performed to validate the measurement model of agile leadership. Model fit was evaluated using multiple goodness-of-fit indices, including Chi-square (χ^2), the Chi-square to degrees of freedom ratio (χ^2/df), Adjusted Goodness-of-Fit Index (AGFI), Comparative Fit Index (CFI), Normed Fit Index (NFI), Root Mean Square Residual (RMR), and Root Mean Square Error of Approximation (RMSEA). Standardized factor loadings, critical ratios (t-values), and squared multiple correlations (R^2) were examined to assess the strength and significance of the relationships between latent constructs and observed variables. Furthermore, Composite Reliability (CR) and Average Variance Extracted (AVE) were calculated to evaluate internal consistency and convergent validity. The recommended thresholds of CR greater than 0.70 and AVE greater than 0.50 were applied to determine the adequacy of construct reliability and validity.

2.6 Ethical Considerations

Participation in this study was entirely voluntary. Respondents were clearly informed about the purpose of the research and assured that all data would be used solely for academic purposes. Confidentiality and anonymity were strictly maintained throughout the research process to protect participants' rights and privacy.

3. RESULT AND DISCUSSION

3.1 The Components of Agile Leadership for School Administrations

The components of agile leadership for school administrations in secondary level under the local administrative organization consist of 5 elements:

1. Adaptation is widely conceptualized as a core structural dimension of agile leadership, reflecting the capacity of leaders to realign strategies, processes, and decision pathways in response to

rapidly shifting conditions. According to Surapto et al. (2024), leaders who demonstrate adaptability are able to restructure organizational priorities and adjust operational routines to maintain alignment with emerging environmental demands. This capacity becomes particularly crucial in volatile educational contexts where external pressures—such as policy shifts, technological disruptions, or demographic changes—require timely recalibration of leadership practices. In support of this perspective, Sunatar (2023) emphasizes that adaptability is not merely a behavioral reaction but a cognitive orientation that enables leaders to reinterpret uncertainty, view negative experiences as learning stimuli, and convert disruptive events into opportunities for organizational renewal. Such psychological readiness plays a central role in ensuring that leaders remain stable yet flexible in the face of ambiguity.

From a strategic management standpoint, Prasongko & Adianto (2019) argue that adaptability sustains organizational competitiveness in the era of Industry 4.0, where leaders must continually adjust structures, workflows, and resource allocations to keep pace with technological acceleration and globalized market volatility. Their findings highlight that adaptability involves both micro-level behavioral changes and macro-level strategic alignment. Similarly, Younis (2018) expands the conceptualization of adaptability by framing it as anticipatory rather than reactive—emphasizing that agile leaders forecast emerging trends, anticipate disruptions, and position their organizations ahead of impending challenges. This active dimension ensures long-term institutional resilience. Complementing these viewpoints, Pontillo et al. (2022) reveal that adaptability has become essential in digitally mediated environments, particularly where leaders must navigate hybrid working models, remote collaboration, and digital communication infrastructures. Their work underscores that adaptability enables leaders to fluidly transition between technological platforms and rethink traditional forms of coordination. Within the agile leadership framework, adaptability serves as the mechanism through which leaders sustain organizational momentum, maintain coherence during turbulence, and foster a culture that embraces change rather than resists it. The consistent emphasis across the five studies clearly justifies the inclusion of adaptability as a latent variable within the CFA model developed for this research.

2. Flexibility constitutes a critical dimension of agile leadership, capturing the leader's capacity to modify decisions, adjust operational methods, and respond dynamically to shifting organizational circumstances. Surapto et al. (2024) argue that flexible leaders intentionally decentralize authority, allowing team members to exercise discretion and determine context-appropriate solutions rather than relying on predetermined procedures. This decentralization not only expedites decision-making but also fosters a culture of adaptive autonomy within the organization. Correspondingly, Sunatar (2023) highlights that cognitive flexibility is essential for leaders to integrate diverse perspectives, especially when navigating complex situations that require reassessment of initial assumptions. Leaders who value multiple viewpoints are better equipped to reframe problems and identify innovative pathways, reflecting the intellectual openness essential to agile leadership.

In environments characterized by rapid technological and structural change, Prasongko & Adianto (2019) emphasize that flexible decision-making enhances organizational resilience by enabling leaders to pivot strategies in response to unpredictable market and policy fluctuations. Their findings suggest that flexibility functions not only as an interpersonal competence but also as a strategic mechanism for managing uncertainty. Meanwhile, Delioglu & Uysal (2023) conceptualize flexibility as an agile managerial orientation characterized by proactive adjustment of goals, workflows, and resource allocations to address emerging challenges. Their work underscores the leader's role in continually realigning organizational processes with situational demands. Complementarily, Ait Si Ahmad et al. (2022) describe flexibility as an essential governance approach in which leaders employ distributed decision-making and empower individuals to reshape procedures in accordance with evolving organizational needs.

Collectively, these studies depict flexibility as a multidimensional construct encompassing cognitive openness, procedural adjustability, rapid decision-making, and shared governance. Within the agile leadership paradigm, flexibility enables leaders to navigate complexity, respond to situational variability, and sustain operational continuity despite external turbulence. Its theoretical robustness across the five studies firmly supports its position as a key latent construct within the CFA model of this research.

3. Collaboration is widely acknowledged as a relational pillar of agile leadership, embodying the ability of leaders to foster cooperative interactions, shared ownership, and collective problem-

solving within organizations. Sunatar (2023) underscores that collaboration begins with a leader's capacity to build and sustain meaningful networks with key stakeholders both inside and outside the organization, ensuring that decision-making reflects a diversity of interests and perspectives. This network-oriented view positions collaboration as a mechanism for enhancing organizational legitimacy and alignment. Complementing this, Delioglu & Uysal (2023) highlight the shift from hierarchical command structures toward participatory leadership, arguing that agile leaders cultivate environments in which members are empowered to exchange ideas, co-create solutions, and participate actively in shaping organizational directions. Their perspective demonstrates that collaboration not only strengthens team cohesion but also accelerates problem resolution.

In rapidly digitalizing contexts, Pontillo et al. (2022) emphasize that collaboration becomes even more critical as teams increasingly operate remotely or across technological platforms. Agile leaders must therefore leverage digital tools and communication technologies to maintain cohesion, transparency, and trust. Their findings illustrate that collaborative leadership supports adaptability by ensuring that information flows freely across boundaries. Additionally, Abreu and Casagrande (2024) frame collaboration as an organizational culture characterized by openness, shared responsibility, and mutual accountability. They argue that leaders play a vital role in shaping the norms and values that promote collective commitment and psychological safety—conditions essential for effective collaboration. Finally, Crnogaj et al. (2022) stress the relevance of emotional intelligence in collaborative settings, noting that leaders who manage emotions constructively can nurture trust-based relationships and facilitate productive group dynamics.

The study illustrates that collaboration is not merely a functional interaction among team members but a strategic leadership competency that enables agile leaders to mobilize collective intelligence, align diverse actors toward shared goals, and sustain organizational performance in complex environments. The convergence of theoretical and empirical support across the five studies affirms collaboration as a key latent construct within the agile leadership CFA model.

4. Learning is conceptualized as a developmental engine within agile leadership, enabling continuous enhancement of capabilities, perspectives, and organizational practices. Sunatar (2023) highlights the central role of reflective learning, wherein leaders reinterpret setbacks, disruptions, and unexpected events as opportunities to gain new insights and refine leadership approaches. This reflective stance supports resilience and fosters a mindset oriented toward growth rather than avoidance. Expanding on this perspective, Prasongko & Adianto (2019) argue that continuous learning is indispensable in fast-changing technological and industrial contexts, emphasizing that agile leaders cultivate environments rich in feedback, experimentation, and iterative improvement. Such environments allow individuals and teams to challenge assumptions and co-develop new methods for problem-solving.

In agile-oriented organizations, Shamim (2024) describes learning as a cyclical process embedded within the principles of continuous improvement, where leaders promote experimentation, rapid prototyping, and evaluation as routine practices rather than one-time initiatives. This dynamic learning model encourages adaptability and innovation at both individual and organizational levels. Meanwhile, Crnogaj et al. (2022) introduce an affective dimension to learning by emphasizing emotional intelligence as a critical facilitator. Leaders who effectively interpret emotional cues and relational dynamics can adjust their behaviors, strengthen team relationships, and create interpersonal conditions conducive to deeper learning. Apaisom et al. (2565) underscore that lifelong learning is essential for leaders in educational settings, particularly in contexts facing ongoing pedagogical transformation, curriculum reforms, and technological integration. Their findings highlight that leaders who engage in ongoing professional development set a powerful example that cascades to teachers and teams, fostering a school-wide culture of learning.

Collectively, these five studies demonstrate that learning within agile leadership extends beyond individual skill acquisition; it represents a transformative process that integrates reflection, feedback, emotional intelligence, and continuous development. As such, learning forms a robust and multidimensional latent construct within the CFA model, capturing the deep, ongoing processes that enable leaders and their organizations to thrive amid complexity and change.

5. Team management is recognized as a strategic dimension of agile leadership, reflecting the leader's ability to mobilize collective capability, cultivate cohesive team dynamics, and guide members

toward shared organizational objectives. Surapto et al. (2024) emphasize that effective agile leaders elevate team performance by empowering individuals, distributing responsibility, and fostering a culture where members feel trusted to make meaningful contributions. This empowerment reinforces team confidence and drives higher levels of initiative. Delioglu & Uysal (2023) highlighted that agile leaders intentionally shape high-performing teams by establishing collaborative norms, clarifying expectations, and creating structural conditions that support coordinated action in dynamic environments. Their work underscores the leader's role in orchestrating team processes that enable adaptability and collective efficacy.

In digitally mediated contexts, Pontillo et al. (2022) note that team management increasingly demands the ability to integrate remote communication tools, virtual collaboration platforms, and hybrid work structures. Agile leaders must therefore ensure clarity, accountability, and psychological connectedness despite physical distance. Their findings suggest that team management now extends beyond traditional face-to-face interactions to include technologically enabled coordination. From a structural perspective, Abreu & Casagrande (2024) illuminate the importance of self-organizing teams within agile leadership frameworks. Leaders are encouraged to create conditions that enable teams to autonomously coordinate tasks, take ownership of decisions, and self-correct their performance. This autonomy promotes agility at the team level, reducing reliance on hierarchical command.

Finally, Younis (2018) emphasizes the interpersonal foundation of team management, arguing that leaders who build trust, demonstrate reliability, and communicate transparently strengthen team loyalty and cooperation. Trust-based team environments enhance information sharing, reduce conflict, and promote more effective collaboration under pressure. Collectively, these studies frame team management as a multifaceted construct that involves empowerment, structural support, technological coordination, and relational leadership. The converging evidence strongly supports its conceptualization as a key latent variable within the agile leadership CFA model employed in this research.

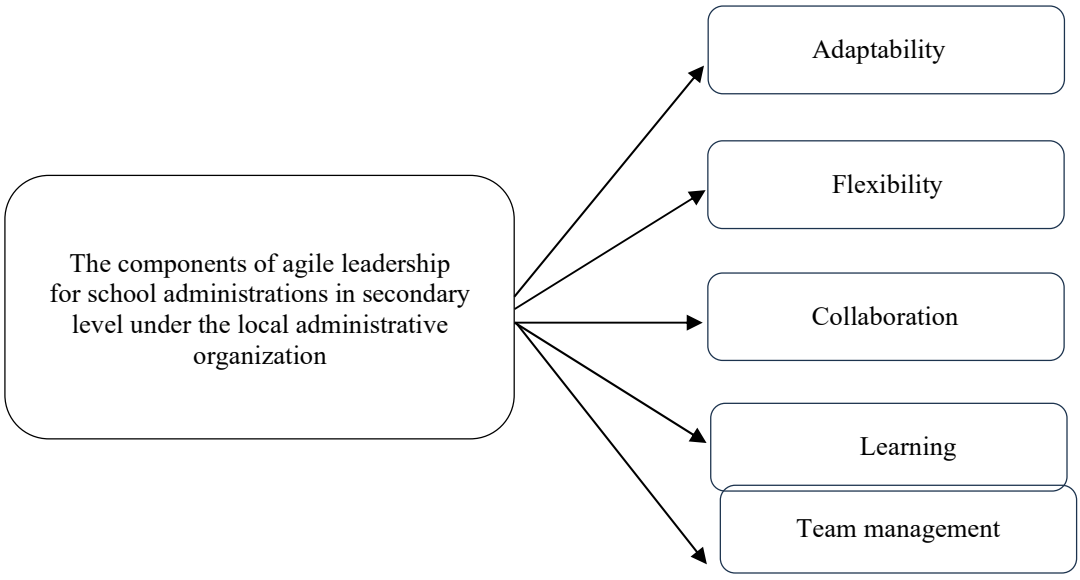

Figure 1. Model components of agile leadership for school administrations

3.2 The Components of Agile Leadership for School Administrations

The components of agile leadership can be provide in belows (Table 1).

1. Adaptability refers to a leader's ability to adjust strategies, behaviors, and decisions in response to rapid changes and unpredictable organizational conditions. It enables agile leaders to remain effective when facing uncertainty and to reposition their teams toward emerging priorities. This capacity involves reframing challenges as opportunities for improvement and maintaining composure during

turbulence. Adaptable leaders demonstrate situational awareness and the readiness to modify established routines when necessary. Such adaptability enhances organizational resilience and long-term sustainability. According to Surapto et al. (2024), agile leaders who adapt quickly to shifting environments are better able to guide their organizations through dynamic and complex contexts.

2. Flexibility reflects a leader's ability to adjust decisions, approaches, and processes when circumstances change unexpectedly. Agile leaders demonstrate openness to alternative viewpoints and readily modify their strategies when new information emerges. This attribute allows leaders to remain effective in complex and fluid organizational environments. Flexibility also supports quick problem-solving and the capacity to navigate competing demands. Leaders who exhibit flexible thinking encourage teams to adapt confidently without fear of failure. Sunatar (2023) emphasizes that openness to diverse perspectives is a defining characteristic of flexible and agile leadership.

3. Collaboration involves fostering shared responsibility, mutual trust, and collective engagement among team members. Agile leaders promote cooperative relationships and ensure that communication flows freely across the organization. This collaborative environment encourages joint decision-making and enhances team cohesion. Leaders who value collaboration also empower employees to contribute actively to organizational goals. Such environments cultivate psychological safety and stronger interpersonal connections. Abreu & Casagrande (2024) highlight that transparency and shared ownership are vital elements of collaborative leadership within agile organizations.

4. Learning represents the leader's commitment to continuous improvement, reflective thinking, and personal development. Agile leaders view mistakes as valuable sources of insight and opportunities to refine practices. They cultivate environments where feedback is welcomed and experimentation is encouraged. This emphasis on ongoing learning strengthens both individual competence and organizational innovation. Leaders who learn continuously inspire their teams to do the same. Shamim (2024) notes that cultures grounded in continuous improvement are essential for achieving agile leadership effectiveness.

5. Team management concerns the leader's ability to coordinate people, strengthen team dynamics, and guide members toward shared objectives. Effective agile leaders empower teams, distribute responsibilities appropriately, and ensure that individuals feel supported. They also maintain clear communication and build trust to enhance cooperation and performance. Strong team management helps teams respond confidently to challenges and adapt to new tasks. Leaders who excel in this area contribute significantly to organizational agility. Younis (2018) emphasizes that trust-building and strategic guidance are key to cultivating high-performing and resilient teams.

Table 1. The components of agile leadership for school administrations

Components	Mean	SD	Level	Rank
Adaptability	4.22	0.70	High	5
Flexibility	4.23	0.67	High	4
Collaboration	4.38	0.70	High	1
Learning	4.31	0.66	High	3
Team management	4.33	0.71	High	2

The demographic analysis of the respondents revealed that 43.7% were male and 56.3% were female. A total of 23.4% served as school administrators, while 76.6% were teachers. The majority were between 35–45 years old (36.4%) and 46–55 years old (29.7%). Most respondents held a bachelor's degree (41.6%) or a master's degree (47.9%). Regarding work experience, 42.0% had 5–10 years of service and 34.3% had 16–25 years.

The analysis table 1 of the five components of agile leadership indicated that all dimensions were rated at a high level, reflecting strong perceptions of agile-oriented behaviors among school administrators. Collaboration emerged as the most highly rated component (Mean = 4.38, SD = 0.70), suggesting that administrators are perceived as effective in cultivating cooperative environments, promoting shared decision-making, and establishing open communication channels. Such strengths align with the view that collaborative capacity is central to agile leadership, particularly in educational settings where complex challenges require collective engagement.

The second-highest component, Team Management (Mean = 4.33, SD = 0.71), reflects administrators' strong capabilities in coordinating team processes, empowering members, and maintaining trust-based professional relationships. These results underscore leaders' proficiency in mobilizing collective capacity toward shared organizational goals—an essential requirement for sustaining agility. Learning (Mean = 4.31, SD = 0.66) ranked third and indicates that administrators are committed to continuous improvement, reflective practice, and professional growth, reinforcing the critical role of lifelong learning in agile leadership effectiveness.

Flexibility (Mean = 4.23, SD = 0.67) and Adaptability (Mean = 4.22, SD = 0.70) were also rated highly but ranked fourth and fifth, respectively. These findings suggest that although administrators demonstrate openness to change and the capacity to adjust their decisions, there remains a need to strengthen proactive adjustment and strategic responsiveness in highly dynamic contexts. The slightly lower scores in these two dimensions highlight areas where targeted professional development could enhance leaders' readiness for rapid transformation.

Overall, the agile leadership is strongly manifested among school administrators, with particular strengths in collaboration, team management, and continuous learning—qualities essential for navigating today's complex educational landscape. These findings are consistent with Surapto et al. (2024), who demonstrated that collaboration and team empowerment are pivotal in agile leadership effectiveness, and with Abreu & Casagrande (2024), who emphasized that agile leadership thrives in environments that value transparency, shared responsibility, and ongoing learning.

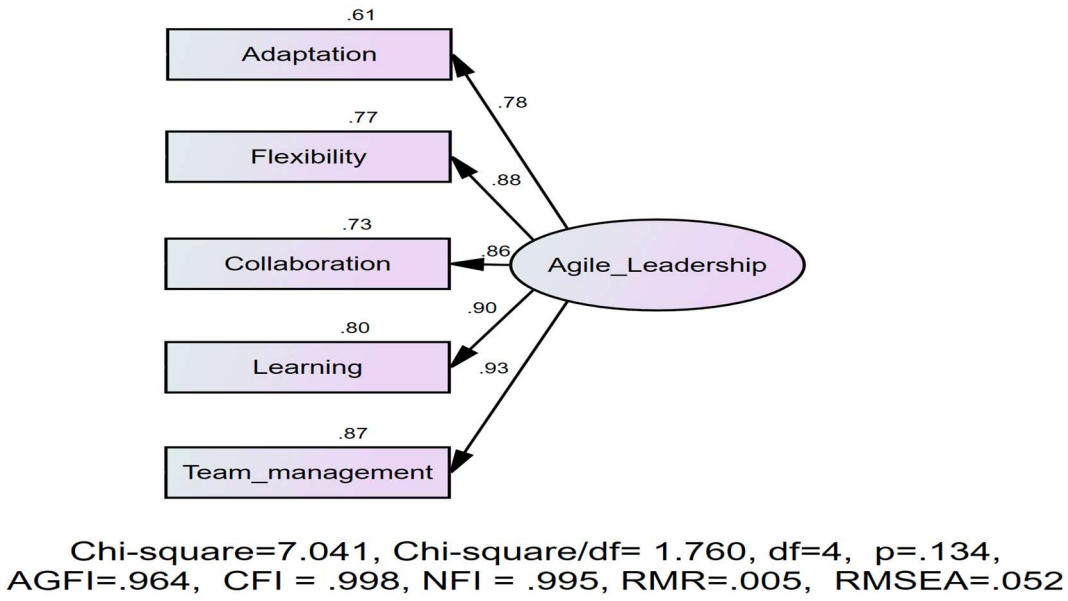

Figure 2. Diagram of components of agile leadership for school administrations

The first-order confirmatory factor analysis indicated that the measurement model for agile leadership among secondary school administrators under local administrative organizations demonstrated strong construct validity (Figure 2). All standardized factor loadings (β) ranged from 0.782 to 0.932, exceeding the recommended threshold of 0.70, confirming that each observed variable substantially contributed to its latent construct. The critical ratio (t-values), ranging from 18.060 to 25.044, were statistically significant at the .01 level, indicating strong and meaningful relationships between the latent construct and its observed indicators. The squared multiple correlations (R^2) further revealed that Team Management had the highest explanatory power ($R^2 = 0.869$), while Adaptation demonstrated the lowest yet acceptable level ($R^2 = 0.611$).

Table 2. Standardized and unstandardized factor loadings from the first-order CFA

Components	b (Unstandardized)	B (Standardized)	S.E.	t-value	R^2
Adaptation	0.820	0.782	0.045	18.060**	0.611
Flexibility	0.883	0.876	0.038	23.540**	0.768
Collaboration	0.896	0.855	0.040	22.190**	0.731
Learning	0.892	0.896	0.036	25.044**	0.803
Team Management	1.000	0.932	***	***	0.869

**statistically significant at the .01 level $\chi^2 = 7.041$, $\chi^2/df = 1.760$, df = 4, p = 0.134, AGFI = 0.964, CFI = 0.998, NFI = 0.995, RMR = 0.005, RMSEA = 0.052

Following the evaluation of individual factor loadings, the overall model fit was assessed (Table 2). The model demonstrated excellent fit to the empirical data, as evidenced by the χ^2/df ratio of 1.760, which was below the commonly accepted threshold of 2.00. Additional goodness-of-fit indices—including AGFI = 0.964, CFI = 0.998, NFI = 0.995, RMR = 0.005, and RMSEA = 0.052—fell within acceptable or optimal ranges, confirming that the proposed measurement structure was both adequate and stable. To further verify convergent validity and construct reliability, Composite Reliability (CR) and Average Variance Extracted (AVE) were calculated. Both indices exceeded recommended thresholds (CR > 0.70; AVE > 0.50), providing additional support for the internal consistency of the model (Table 3).

Table 3. Composite Reliability (CR) and Average Variance Extracted (AVE)

Latent construct	CR	AVE	Interpretation
Agile leadership	0.971	0.756	Excellent reliability and convergent validity

The five-dimensional structure of agile leadership—adaptation, flexibility, collaboration, learning, and team management—accurately represents the theoretical construct within the educational context examined. The strong contributions of Collaboration, Learning, and Team Management align with Surapto et al. (2024), who emphasized the importance of collaborative engagement, team empowerment, and continuous capacity development in agile leadership. Similarly, the substantial loading values of Flexibility and Learning reinforce the results of Abreu & Casagrande (2024), who highlighted flexible decision-making, transparent communication, and the establishment of learning-oriented cultures as essential characteristics of agile leaders in dynamic organizational environments. These combined statistical and theoretical foundations affirm that agile leadership among school administrators is multidimensional, empirically robust, and theoretically grounded.

4. CONCLUSION

The study revealed that both administrators and teachers, regardless of age, educational background, or professional experience, consistently held high perceptions of agile leadership across all five components. Collaboration emerged as the strongest dimension, reflecting the central role of shared decision-making, interpersonal synergy, and collective problem-solving in school leadership. Team Management and Learning were also rated highly, indicating that structured coordination and continuous professional development remain essential practices for effective leadership in dynamic educational environments. Although Flexibility and Adaptation were similarly rated at high levels, their comparatively lower rankings suggest opportunities for strengthening proactive responsiveness, strategic adjustment, and context-sensitive decision-making among school leaders.

The first-order confirmatory factor analysis demonstrated excellent construct validity, with all standardized factor loadings exceeding 0.78 and achieving statistical significance at the .01 level. Model fit indices—including CFI = 0.998, NFI = 0.995, AGFI = 0.964, RMR = 0.005, and RMSEA = 0.052—confirmed that the proposed five-component measurement structure accurately represented the construct of agile leadership in this educational context. These empirical findings affirm that agile leadership among secondary school administrators is robust, multidimensional, and theoretically coherent.

Overall, the results provide a strong empirical foundation for enhancing leadership practices within schools under local administrative organizations. The validated model offers a reliable

framework for designing leadership development programs, guiding policy initiatives, and fostering organizational cultures that emphasize collaboration, adaptability, and continuous learning. Future research may expand the model by incorporating additional contextual factors or applying multigroup analyses to compare leadership perceptions across different school types, regions, or administrative structures.

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