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# Management Capability on Transformational Leadership for Sustainable Development of Private Universities in Guangxi Province, China

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**Abstract.** In response to China's demographic shifts, enrollment pressure, and growing competition in higher education, this study examines how management competency influences transformational leadership, which promotes the long-term development of private universities in Guangxi Province. The study, which follows the "management capability-transformational leadership-sustainable development" conceptual framework, examines how administrators' knowledge, skills, and attitudes influence leadership behaviors and institutional outcomes. Data was collected by a questionnaire survey of 300 administrators from 27 private institutions in Guangxi Province. Structural Equation Modeling (SEM) was used to evaluate the predicted correlations between the constructs. The findings indicate that management talent has a significant favorable impact on both organizational and individual-oriented transformative leadership. These leadership orientations have a substantial positive impact on universities' long-term development, particularly in terms of governance effectiveness, faculty motivation, and academic excellence. Furthermore, both parts of transformational leadership contribute to a more balanced relationship between management capability and long-term growth. The study contributes to the field of higher education governance by identifying the transformative mechanism that translates management aptitude into leadership behaviors and long-term institutional sustainability. In practice, the findings offer evidence-based recommendations for university leaders to strengthen strategic and relational leadership capacities, as well as policy implications for designing differentiated support mechanisms to promote sustainable development and innovation in private universities in China's border regions.

**Keywords:** Guangxi province; management capability; private universities; sustainable development; transformational leadership

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## 1. Introduction

Over the past two decades, private colleges and universities in China have experienced rapid development and have become an indispensable part of the national higher education system. As of 2022, private colleges and universities accounted for 25.4% of all colleges and universities in China, with a student population of over seven million, making up 28.3% of all students in higher education across the country. Especially in the Guangxi Zhuang Autonomous Region, a multi-ethnic border province, private colleges and universities present unique development characteristics.

Over the past decade, approximately 40% of the newly established undergraduate institutions in this region have been private colleges and universities. The majors they offer mostly focus on regional shortage fields such as cross-border tourism and ASEAN languages, serving the national “Belt and Road Initiative” and China-ASEAN cooperation strategies. However, with rapid changes in the population structure, the development of higher education in China is facing unprecedented challenges, including a looming “population cliff” that threatens enrollment numbers and institutional viability (Zhang et al., 2024).

As private colleges and universities that are highly dependent on tuition income (with an average proportion of tuition income exceeding 85%), the future decline in student enrollment has become a key factor restricting their sustainable development. As a border and ethnic minority area, Guangxi’s higher education ecosystem is facing dual pressures: on one hand, regional economic development is relatively lagging, and high-quality resources are limited; on the other, factors such as governance traditions also present new requirements for the internal governance capabilities of colleges and universities.

Especially nowadays, many private colleges and universities tend to be similar in management models and educational positioning, and their educational characteristics are not prominent, leading to a decline in competitiveness in aspects such as student recruitment, teaching staff, and quality assurance. This makes it urgent for university administrators to enhance their strategic thinking and organizational governance capabilities in order to cope with the increasingly complex and uncertain external environment, as evidenced by recent studies highlighting the vulnerability of private institutions in emerging economies to demographic shifts and resource constraints (Sivakumaran et al., 2025).

Against this backdrop, transformational leadership has gradually become an important tool for solving the problem of transforming and developing colleges and universities. Previous studies have pointed out that elements like knowledge (such as policy understanding and strategic identification), skills (such as digital governance and emergency management), and attitudes (such as ethical guidance and collaborative thinking) in management capabilities have direct or indirect impacts on the governance performance of colleges and universities (Malik, 2023; Muthusi et al., 2024). For instance, Malik (2023) demonstrated that individual-focused transformational leadership enhances employee behaviors in organizational change, while Muthusi et al. (2024) confirmed its positive

correlation with performance in Kenyan private universities. Similarly, Sivakumaran et al. (2025) emphasized leadership traits' impact on Malaysian private higher education outcomes. However, despite these insights, the academic community still lacks systematic research on how the above-mentioned capabilities can be specifically transformed into leadership behaviors for institutional construction or personnel motivation. A logical argument for this research gap emerges from the absence of empirical verification of the mediating pathways: existing studies, primarily from Southeast Asia and Africa (e.g., Indonesia and Kenya), focus on general leadership-performance links but overlook differentiated transformational leadership paths (organization-oriented and individual-oriented) in border regions with unique ethnic and demographic challenges (Heatubun et al., 2025; Junusi et al., 2024).

This gap is particularly pronounced in China's context, where private universities face intensified "population cliff" pressures, and no prior research has integrated management capability dimensions with dual leadership orientations to examine their mediating role in sustainable development. The uniqueness of this research lies in its targeted focus on Guangxi's multi-ethnic border context, in contrast to broader national or international studies, and its novel integration of management capability dimensions with dual leadership paths—elements underexplored in prior works. This novelty offers a fresh perspective by empirically bridging management aptitude to institutional sustainability through a localized framework, providing actionable insights absent in existing literature.

This study focuses on 27 private colleges and universities in Guangxi. By constructing an analytical framework of "management ability-transformational leadership-sustainable development", and comprehensively using quantitative questionnaires, it explores the influence mechanism of the three core dimensions (knowledge, skills, and attitude) of management ability on transformational leadership. It further analyzes how organization-oriented and individual-oriented leadership mediates the promotion of sustainable development of colleges and universities.

The research aims to provide theoretical support and practical paths for private colleges and universities to achieve governance innovation and educational quality improvement, against the background of "population cliff", and to offer experience references for promoting modernized reform and policymaking in regional higher education. Grounded in Bass's transformational leadership theory (1985) and AMO Theory (Appelbaum et al., 2000), this framework integrates management capabilities as inputs, leadership as processes, and sustainability as outputs.

To guide this investigation, the study addresses the following research questions:

- 1) How do the dimensions of management capability (knowledge, skills, and attitude) influence organization-oriented and individual-oriented transformational leadership in private universities in Guangxi?
- 2) What is the impact of organization-oriented and individual-oriented transformational leadership on the sustainable development of these universities?
- 3) To what extent do organization-oriented and individual-oriented leadership mediate the relationship between management capability and sustainable development?

Based on these research questions, the following hypotheses are proposed:

- H1: Knowledge has a significant positive effect on organization-oriented leadership.
- H2: Knowledge positively influences individual-oriented leadership.
- H3: Skills exhibit a significant positive impact on organization-oriented leadership.
- H4: Skills demonstrate a positive effect on individual-oriented leadership.
- H5: Attitude significantly and positively affects organization-oriented leadership.
- H6: Attitude shows a positive relationship with individual-oriented leadership.
- H7: Organization-oriented leadership exerts a significant positive effect on sustainable development.
- H8: Individual-oriented leadership has a positive and significant impact on sustainable development.
- H9: Organization-oriented leadership mediates the positive relationship between holistic management capability and sustainable development.
- H10: Individual-oriented leadership positively mediates the association between aggregate management capability and sustainable development.

## 2. Literature Review

### 2.1 Theoretical Framework

This study is grounded in Bass's transformational leadership theory (Bass, 1985; Bass & Riggio, 2006) as the primary framework, which posits that leaders can inspire followers to achieve extraordinary outcomes by transcending self-interest and fostering organizational change. This theory's four dimensions—idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration—directly inform the bifurcation of transformational leadership into organization-oriented (focusing on institutional vision and systems) and individual-oriented (emphasizing personal development and motivation) pathways in this research.

Complementing this, the AMO theory (Appelbaum et al., 2000) provides a foundation for the management capability construct, linking ability (knowledge and skills), motivation (attitude), and opportunity to enhanced performance. Together, these frameworks structure the "management capability-

transformational leadership–sustainable development” model, enabling the interpretation of how administrative competencies translate into leadership behaviors and institutional sustainability at Guangxi’s private universities. The subsequent literature review builds on these theories by examining the core variables: attitude, skill, knowledge, individual-oriented leadership, organization-oriented leadership, and sustainable development.

This study focuses on these six variables, as they jointly constitute the core dimensions of the innovative management ability and leadership of colleges and universities, and they have a crucial impact on the development of institutions in Guangxi. The following literature review presents the conceptual definition, measurement dimensions, and application in university governance of each variable.

## 2.2 Knowledge

In the context of higher education reform and sustainable development, knowledge management is regarded as an important factor for private colleges and universities to enhance management capabilities and organizational performance. Studies have shown that the acquisition, sharing, and application of knowledge play a crucial role in enhancing the strategic vision of university leaders, improving organizational learning ability, and promoting change (Kulkarni & Rajhans, 2024).

The research of Tyminski and Owens (2024) pointed out that in private universities, organizational culture significantly impacts knowledge management through green innovation, emphasizing the mediating role of environmental factors and cultural mechanisms in the process of knowledge transformation. This indicates that private colleges and universities need to build a positive culture of innovation to use knowledge resources effectively to support sustainable management.

Other scholars have emphasized the relationship between knowledge management and leadership. For instance, Heatubun et al. (2025) found in an empirical study of private universities in Indonesia that the synergy between knowledge management and intellectual capital can significantly enhance the competitive advantage of universities, and leaders play a key role in integrating resources and knowledge governance in this process.

Furthermore, Paskova (2023) highlighted the connection between ethical leadership and organizational knowledge sharing. He pointed out that by building an organizational atmosphere based on trust, responsibility, and transparent communication, knowledge mobility among employees can be significantly enhanced, and organizational innovation ability can be further improved (Patinska, 2023). In research in China and Southeast Asian countries, the application of knowledge management has also received attention. Sbircea (2023) pointed out in a case study of private universities in Thailand that a systematic knowledge management mechanism is closely related to the development of academic leadership and helps enhance organizational

adaptability and strategic execution. In conclusion, knowledge, as a core element of leadership development, plays an indispensable role in the sustainable transformation of private colleges and universities. University administrators should promote the construction of a knowledge management system with multiple dimensions, such as systems, culture, and technology, to achieve the dual fulfillment of organizational goals and educational missions.

### 2.3 Skills

In the leadership process of promoting the sustainable development of colleges and universities, management skills are an important dimension for measuring whether college leaders possess strategic planning, resource integration, and organizational coordination capabilities. Especially in private colleges and universities in Guangxi Province, China, whether the leaders possess effective management skills directly affects the schools' transformation ability and sustainable development level.

Research shows that modern higher education leaders need to constantly enhance their strategic and executive skills to address challenges such as changes in educational policies, technological updates, and international competition. For instance, Andoko et al. (2024) pointed out that the improvement of management skills requires strategic training programs to help university personnel enhance their capabilities in planning, communication, ethical governance, and resource allocation to cope with the complex and changeable environment of the education system (Andoko et al., 2024). Furthermore, Castellanos et al. (2023) emphasized in their study of a private university in Mexico that through school-based training programs and a collaborative culture, leaders can manage organizational tasks more effectively and stimulate the potential of employees (Castellanos et al., 2023).

Meanwhile, the research by Sivakumaran et al. (2025) found that leadership traits such as decision-making ability, executive ability, network coordination, and resource integration have a significant positive impact on the performance of higher education institutions, emphasizing the mediating role of management skills in enhancing organizational outcomes (Sivakumaran et al., 2025). Furthermore, Muthusi et al. (2024) noted in their systematic review that transformational leadership behaviors, particularly individual consideration, significantly enhance organizational performance in private universities, helping them address the challenges posed by digitalization and sustainable development.

Furthermore, Paskova (2023) confirmed through empirical research a significant relationship between management skills (techniques, concepts, interpersonal communication, decision making) and the organizational commitment of school leaders. This also indicates that leaders' management capabilities not only enhance organizational efficiency but also influence their long-term development strategies (Patinska, 2023). In conclusion, effective management skills are key to achieving transformational leadership and promoting sustainable development, and they have significant practical value in the constantly changing educational environment.

## 2.4 Attitude

In the research on leadership and sustainable development in higher education, attitude is regarded as one of the key psychological factors influencing educational leadership practices and the acceptance of organizational change. Firstly, attitude plays a fundamental role in the acceptance of change, especially in the leadership of educational system reform and transformation, where a positive attitude can effectively promote organizational cultural change and personnel identity (Paskova, 2023). Furthermore, a leader's attitude is an important component of their competency structure; in the research of Tyminski and Owens (2024), attitude, along with knowledge and skills, constitutes the core dimensions of the competency framework for higher education leaders and is crucial for achieving sustainable development.

In addition to leadership, research also shows that college students' attitudes toward higher education directly affect their academic engagement and learning motivation, as evidenced by Antonio et al. (2023), who found that both cognitive and emotional attitudes were significantly positively correlated with academic engagement. Similarly, Radadiya et al. (2024) indicated a significant positive correlation between students' academic performance and their attitudes, highlighting the mediating role of attitudes in educational outcomes. Finally, teachers' attitudes toward educational technology and transformational models, such as online teaching, are also key factors influencing educational quality and sustainable development capabilities (Yao et al., 2024). Collectively, these findings underscore that a positive and proactive attitude from all stakeholders is essential for fostering an environment conducive to institutional growth and long-term sustainability.

## 2.5 Organization-Oriented Leadership

In the field of higher education, organization-oriented leadership is regarded as a key factor in enhancing organizational performance, strengthening institutional resilience, and achieving sustainable development. In recent years, an increasing number of scholars have focused on the interactive relationship between leadership behavior and organizational structure, especially in the context of private universities.

Firstly, Bagrationi and Filonovich (2024) compared the leadership styles of higher education with those of traditional business organizations and pointed out that organization-oriented leadership in the university environment should integrate transactional, transformational, and relational styles to deal with its unique complex situations. Secondly, Sivakumaran et al. (2025) found in an empirical study of private universities in Malaysia that leaders' capabilities in resource integration, decision making, execution, and network construction have a significant impact on organizational performance. The core role of organization-oriented leadership in performance improvement was emphasized (Sivakumaran et al., 2025).

Furthermore, research by Andoko et al. (2024) on private colleges and universities in Central Java, Indonesia, noted that organization-oriented leadership has

effectively enhanced the comprehensive competitiveness of colleges and universities by shaping culture, setting strategic priorities, and promoting international cooperation (Andoko et al., 2024). Furthermore, Junusi et al. (2024) proposed in their research on Indonesian universities that knowledge-oriented organizational leadership enhances innovation capabilities and further promotes universities' internationalization strategies, demonstrating the wide application of organization-oriented thinking (Junusi et al., 2024). Finally, Castellanos et al. (2023) demonstrated through a case study of private universities in Mexico that under diversity and collaboration mechanisms, organization-oriented leadership can effectively allocate management responsibilities, enhance organizational efficiency, and support student growth.

## **2.6 Individual-Oriented Leadership**

Individual-oriented leadership emphasizes the leader's individualized attention and support for subordinates. This leadership style embodies the core characteristics of transformational leadership, such as individualized consideration and intellectual stimulation. In private colleges and universities, this type of leadership style is significant for stimulating employees' potential, enhancing performance, and promoting organizational change.

Malik (2023) pointed out in his research that individual-focused transformational leadership can effectively promote employees' transformation-oriented behaviors by enhancing their "job crafting", and the effect is more significant among employee groups with higher psychological resilience. This indicates that if the administrators of private colleges and universities attach importance to the identification and support of individual employee characteristics, they are more likely to promote the improvement of organizational adaptability and innovation (Malik, 2023).

Muthusi et al. (2024) found in their research at private universities in Kenya that "individual care" was significantly positively correlated with organizational performance. Through strategies such as mentorship, personalized feedback, and employee development support, leaders can effectively enhance the team's overall execution ability and organizational cohesion (Muthusi et al., 2024). In private training schools in Sichuan Province, China, research has confirmed that individual-oriented transformational leadership has a significant improving effect on teachers' job performance. Especially when leaders encourage innovative thinking and provide emotional support, it can significantly enhance teachers' intrinsic motivation, thereby improving their professional performance (Yao et al., 2024).

Widyatmoko et al. (2024) pointed out that in private colleges and universities in Indonesia, leaders' individual characteristics and interpersonal relationships have a direct impact on employees' organizational commitment and job satisfaction, which has long-term significance for organizational stability and sustained performance. Finally, Heatubun et al. (2025) found through an empirical study of university lecturers in Papua and West Papua that the individualized leadership characteristics of leaders can indirectly promote the overall performance of

lecturers through “organizational citizenship behavior”. This further proves the significant value of individual-oriented leadership in the internal cultural construction and performance management of colleges and universities (Heatubun et al., 2025).

In conclusion, individual-oriented leadership, as an important component of transformational leadership, helps enhance organizational inclusiveness, boost employee motivation, and build a supportive organizational culture in private colleges and universities, providing a solid behavioral foundation for the sustainable development of the institutions.

## **2.7 Sustainable Development**

Sustainable development is a crucial strategic goal in modern higher education, especially against the backdrop of the rapid development of private universities in China. The management capabilities and transformational leadership of leaders play a core driving role in achieving sustainable development. The sustainable development of colleges and universities does not merely refer to the improvement of economic benefits but also encompasses the comprehensive enhancement of educational quality, social responsibility, and environmental sustainability.

Coers et al. (2023) pointed out that the United Nations Sustainable Development Goals (SDGs) can provide a clear framework for higher education institutions to cultivate students’ leadership skills in addressing complex global challenges. By integrating the SDGs into their curricula and leadership development systems, universities can enhance their social impact and organizational resilience. Sheridan et al. (2023) further emphasized the sustainability concept of embedding interdisciplinary studies in leadership education, arguing that leaders need to possess multi-dimensional capabilities to address the systemic challenges of the 21st century. This kind of “sustainable leadership” not only emphasizes strategic vision and moral responsibility but also focuses on teamwork and innovation.

In the context of China, Zhang et al. (2024) developed a “sustainable leadership capacity scale for higher education”, indicating that the leadership capacity building of teachers is of vital importance in achieving sustainable development. This research, through empirical analysis, provides new tools for universities to assess and enhance leadership, effectively promoting the continuous evolution of the education system. Furthermore, Sbîrcea (2023) proposed that leaders with a global perspective and intrinsic moral drive are more likely to promote organizations to adopt a triple bottom line (economic, social, and environmental) strategy to achieve true sustainable development.

Junusi et al. (2024) researched Southeast Asian universities and found that university leaders can significantly enhance academic performance and sustainable influence by optimizing curriculum design and building organizational relationship capital. These findings provide important references for private universities in China, especially for improving management capabilities and the transformation of strategic decision making. In conclusion, in

the process of achieving the SDGs, private colleges and universities should attach great importance to the coordinated improvement of transformational leadership and management capabilities. Relying on scientific leadership models and international SDGs, they should provide strong support for educational modernization and social contribution.

### **3. Methodology**

#### **3.1 Research Design**

This study adopted quantitative methods to conduct an empirical analysis on the relationship between management capabilities (knowledge, skills, attitudes), transformational leadership (organization-oriented, individual-oriented), and the sustainable development of colleges and universities. This study collected data from management personnel at 27 private colleges and universities in Guangxi through questionnaire surveys, verified the path relationships among variables using the structural equation model, and explored the mediating mechanism of transformational leadership.

The target population comprised administrators in all private higher education institutions in Guangxi Province. To select the 27 private colleges and universities as research objects, an exhaustive sampling technique was employed, encompassing the entire population of private universities in the Guangxi Zhuang Autonomous Region. A comprehensive list of all private institutions was compiled from official sources, namely the Ministry of Education's database and regional higher education directories, confirming that there are approximately 27 eligible private universities (including both undergraduate and higher vocational colleges) in the region as of the study period.

These institutions were stratified for analysis based on key characteristics to ensure balanced representation: (1) institution type (undergraduate vs. vocational colleges, reflecting the regional distribution of approximately 53% undergraduate and 47% vocational); (2) geographic location (urban centers vs. border/ethnic minority areas to capture the unique multi-ethnic and demographic challenges of the region); and (3) institution size (measured by student enrollment, categorized into small [ $<5,000$  students], medium [ $5,000-10,000$ ], and large [ $>10,000$ ]). Since the sample includes all 27 institutions, this approach guarantees complete coverage and representativeness of private higher education in Guangxi, particularly those aligned with the "Belt and Road Initiative" and facing enrollment pressures from the "population cliff."

For the sample of respondents, a stratified sampling technique was applied to ensure representation across the selected institutions and management levels. The total target sample was determined based on SEM requirements for adequate statistical power (aiming for at least 200–300 responses for model complexity). Questionnaires were distributed to 350 administrators across all 27 institutions, proportionally allocated to each institution based on its size and type (e.g., larger institutions received more questionnaires to reflect their administrative scale). Within each institution, stratification was based on job positions: school-level leaders (target 30%), middle-level managers (40%), and grassroots administrative

staff (30%). Respondents were selected using a combination of stratified random sampling from institutional staff lists (where available) and convenience sampling to facilitate data collection, while ensuring demographic balance (e.g., gender, age, and education level).

Out of the 350 distributed questionnaires, 300 valid responses were retained after screening for completeness, consistency, and absence of missing values (response rate: 85.7%). Invalid responses (e.g., those with over 20% missing data or patterned answers) were excluded to maintain data quality. Before data collection, the questionnaire underwent a content validity check by three experts in educational management to ensure clarity and relevance. Minor adjustments were made based on their feedback.

### **3.2 Participants and Sampling Strategy**

The target population for this study comprises management personnel at various levels within private higher education institutions in the Guangxi Zhuang Autonomous Region. According to regional educational statistics, there are over 30 private colleges and universities in the province. To ensure representativeness and minimize selection bias, a stratified sampling method was employed. Institutions were first stratified into undergraduate universities and higher vocational colleges to reflect the sector's dual structure. Ultimately, 27 institutions were selected, and respondents were randomly approached within these strata.

A total of 300 valid questionnaires were collected. The sample achieved a balanced coverage of institutional types, with 160 respondents from undergraduate colleges (53.3%) and 140 from higher vocational colleges (46.7%). Regarding job positions, the sample covers three distinct management levels: school-level leaders (90 people, 30%), middle-level managers (120 people, 40%), and frontline administrative staff (90 people, 30%).

Demographically, the sample consisted of 180 males (60%) and 120 females (40%). The age distribution is concentrated primarily in the 40–59 age range, accounting for over 60% of the total. The educational level of the respondents is relatively high, with 210 holding a master's degree (70%) and 60 holding a doctoral degree (20%). Detailed demographic characteristics are presented in Table 1.

*Note on data quality control:* To ensure content validity, the questionnaire was reviewed by a panel of three experts in higher education management, followed by a pilot study (n=50). Internal consistency was assessed using Cronbach's alpha, while construct validity was evaluated through Confirmatory Factor Analysis (CFA). Harman's single-factor test was also performed to minimize common method bias.

**Table 1: Summarizer the specific demographic distribution of respondents**

Category	Option	Frequency (N)	Percentage (%)
Gender	Male	180	60.0%
	Female	120	40.0%
Age	Under 30	15	5.0%
	30-39	60	20.0%
	40-49	90	30.0%
	50-59	105	35.0%
	60 and above	30	10.0%
Position	University-level leaders	90	30.0%
	Middle managers	120	40.0%
	Frontline administrative staff	90	30.0%
Work Experience	Less than 5 years	40	13.3%
	5-10 years	70	23.3%
	11-15 years	95	31.7%
	16-20 years	55	18.3%
	Over 20 years	40	13.3%
Education	Bachelor's	30	10.0%
	Master's	210	70.0%
	Doctoral	60	20.0%
Institution Type	Undergraduate institutions	160	53.3%
	Vocational colleges	140	46.7%

### 3.3 Research Instruments, Reliability, and Validity

The questionnaire includes six core variables: knowledge, skills, attitude (constituting the dimension of management capability), organization-oriented leadership, individual-oriented leadership (constituting the dimension of transformational leadership), and sustainable development. A total of 30 measurement items were included, using a 5-point Likert scale where 1 represents "completely disagree" and 5 represents "fully agree". Variable measurements were developed based on relevant literature and moderately localized to fit the Chinese private education context.

**Reliability and Validity:** To ensure the rigor of the instrument, a two-step validation process was conducted. First, content validity was assessed by a panel of three experts in educational management to ensure the items accurately reflected the constructs and were free from ambiguity (minimizing response bias). Second, statistical validation was performed using SPSS 26.0 and AMOS 26.0. The reliability analysis results (Table 2) showed that the Cronbach's  $\alpha$  coefficients for all research variable scales were above 0.87, significantly higher than the threshold of 0.70. The overall scale's Cronbach's  $\alpha$  reached 0.95.

**Table 2: Reliability Analysis Results of Research Variable Scales**

Construct	Number of Items	Cronbach's $\alpha$
Knowledge (K)	5	0.879
Skills (S)	5	0.903
Attitude (A)	5	0.872
Organization-Oriented Leadership (OL)	5	0.927
Individual-Oriented Leadership (IL)	5	0.915
Sustainable Development (SD)	5	0.901
Total	30	0.947

Furthermore, CFA was conducted to assess construct validity. As shown in Table 3, all measurement items had standardized factor loadings above 0.70 ( $p < 0.001$ ). The combined reliability (CR) ranged from 0.81 to 0.92, and the Average Variance Extracted (AVE) ranged from 0.58 to 0.74, indicating excellent convergent validity. The correlation coefficients between constructs were lower than the square roots of their respective AVEs, supporting discriminant validity. The overall measurement model fit indices were satisfactory ( $\chi^2/df = 2.30$ , CFI = 0.93, RMSEA = 0.048), confirming the instrument's validity.

**Table 3: Standardized Factor Loadings of the Measurement Model**

Construct	Item	Standardized $\lambda$	R <sup>2</sup>
Knowledge (K)	Q1. I am familiar with the latest policies for private universities in Guangxi.	0.74	0.55
	Q2. I can translate policy requirements into specific management actions.	0.78	0.61
	Q3. I regularly attend conferences/training to update policy knowledge.	0.77	0.59
	Q4. I understand how local ethnic cultures influence management decisions.	0.73	0.53
	Q5. I master core standards for financial compliance in private universities.	0.81	0.66
Skills (S)	Q6. I allocate annual budgets based on strategic priorities.	0.83	0.69
	Q7. I resolve emergencies (e.g., enrollment decline) through cross-department collaboration.	0.84	0.71
	Q8. I design incentive mechanisms to improve faculty performance.	0.75	0.56
	Q9. I use data analytics to monitor management effectiveness.	0.81	0.66
	Q10. I negotiate to balance stakeholders' needs.	0.81	0.66
Attitude (A)	Q11. I proactively adjust strategies to adapt to policy changes.	0.76	0.58
	Q12. I prioritize social responsibility over commercial interests.	0.76	0.58
	Q13. I am confident in my ability to promote sustainable development.	0.78	0.61

Construct	Item	Standardized $\lambda$	R <sup>2</sup>
	Q14. I accept reasonable trial-and-error costs in innovation.	0.76	0.58
	Q15. I am committed to enhancing our regional competitiveness.	0.75	0.56
Organization-oriented Leadership (OL)	Q16. Leadership has established clear management systems.	0.82	0.67
	Q17. Leadership updates systems to align with policy changes.	0.88	0.77
	Q18. Major decisions follow standardized procedures.	0.86	0.74
	Q19. Leadership monitors performance through standardized evaluations.	0.87	0.76
	Q20. Strategic plans define 5-year sustainability goals.	0.81	0.66
Individual-oriented Leadership (IL)	Q21. Leadership provides customized training for my career development.	0.85	0.72
	Q22. I receive regular positive feedback on my work.	0.81	0.66
	Q23. Flexible rewards recognize innovative contributions.	0.80	0.64
	Q24. Leadership considers faculty needs in decision making.	0.87	0.76
	Q25. Mental health support and work-life balance resources are provided.	0.81	0.66
Sustainable Development (SD)	Q26. Graduate employment rates rank top in the region.	0.81	0.66
	Q27. A fixed budget proportion is allocated to facility upgrades.	0.86	0.74
	Q28. Stable industry-academia partnerships are established.	0.75	0.56
	Q29. Social responsibility reports are published and monitored.	0.81	0.66
	Q30. Special programs support ethnic minority students.	0.76	0.58

Ethical approval was obtained from the university's ethics committee, and informed consent was obtained from all participants.

### 3.4 Reliability and Validity Tests

The reliability analysis results showed that Cronbach's  $\alpha$  coefficients of the six variables were all above 0.87, and the total scale was 0.947, indicating good internal consistency. The results of CFA showed that the standardized factor loadings of each latent variable were all greater than 0.70, the CR was all above 0.81, the mean variance extraction (AVE) was all above 0.58, and the fitting indicators were good ( $\chi^2/df = 2.30$ , CFI = 0.93, RMSEA = 0.048). This indicates that the model has good reliability and validity. In conclusion, the data from this study

are reasonable and scientific, providing a solid foundation for subsequent path analysis and hypothesis verification.

## 4. Results

### 4.1 Descriptive Statistics of Variables

Before the structural model analysis, descriptive statistics (Mean and Standard Deviation) were calculated for the six core constructs: knowledge, skills, attitude (management capability), organization-oriented leadership, individual-oriented leadership, and sustainable development. As presented in Table 4, the mean scores for all variables exceeded the midpoint of 3.00, indicating generally positive responses from the administrators. Specifically, “attitude” yielded the highest mean score ( $M > 4.0$ ), suggesting that administrators in Guangxi private universities possess a strong psychological commitment to their roles. The standard deviations were all within a reasonable range, indicating that the data did not exhibit extreme outliers. These descriptive results provide a solid foundation for the subsequent explanatory analysis.

### 4.2 SEM Results

After validating the measurement model, this study used AMOS 26.0 to test the hypothesized structural model, employing maximum likelihood estimation. The model fit indices showed that the constructed “management capability–transformational leadership–sustainable development” structural model had good fit:  $\chi^2/df = 2.15$ , IFI = 0.95, CFI = 0.94, TLI = 0.93, NFI = 0.91, RMSEA = 0.045, meeting or exceeding common evaluation standards (e.g.,  $\chi^2/df < 3$ , CFI/TLI > 0.90, RMSEA < 0.05). Therefore, path coefficients and hypotheses could be further examined. Figure 1 shows the relationships between the three dimensions.

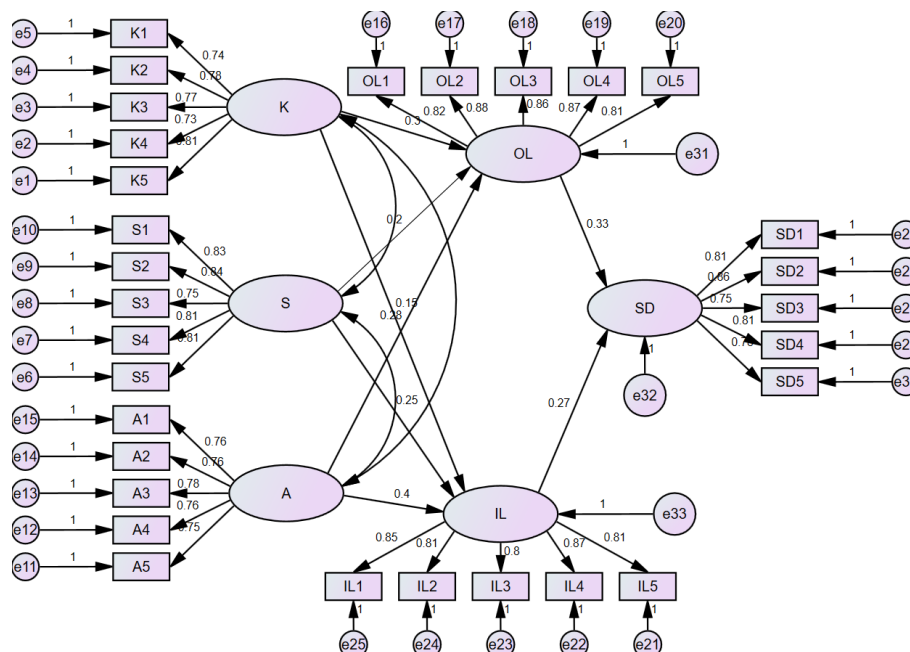


Figure 1: The SEM results of the relationships between management capability, transformational leadership, and university sustainable development

As shown in Figure 1, all three dimensions of management capability (knowledge K, skills S, and attitude A) had significant positive effects on both pathways of transformational leadership (organization-oriented leadership/OL and individual-oriented leadership/IL), supporting hypotheses H1 to H6. Both pathways of transformational leadership also had significant positive effects on university sustainable development, supporting hypotheses H7 and H8. Table 4 presents the standardized coefficient estimates ( $\beta$ ), standard errors (SE), t-values (CR), and significance levels for the direct hypotheses (H1–H8). All hypotheses were statistically significant at the 0.05 level.

Among them, “attitude” had the strongest effect on individual-oriented leadership ( $\beta = 0.40$ ,  $p < 0.001$ ), followed by its effect on organization-oriented leadership ( $\beta = 0.28$ ,  $p < 0.001$ ). This indicates that managers’ values and behavioral attitudes are particularly critical in inspiring individual-level leadership behaviors. Similarly, “knowledge” had a strong positive effect on organization-oriented leadership ( $\beta = 0.30$ ,  $p < 0.001$ ), suggesting that strategic cognition and policy literacy significantly enhance leadership at the institutional level.

In contrast, “knowledge” had a relatively weaker but still significant effect on individual-oriented leadership ( $\beta = 0.15$ ,  $p < 0.05$ ), meaning that even in motivating individual employees, managers’ professional knowledge plays a role. The effects of “skills” on both leadership pathways were intermediate ( $\beta = 0.25$  for individual-oriented leadership and  $\beta = 0.20$  for organization-oriented leadership, both  $p < 0.001$ ), indicating that managers’ technical and managerial skills contribute significantly to both institutional change and individual empowerment.

Furthermore, the effects of transformational leadership on university sustainable development were validated: both organization-oriented and individual-oriented leadership significantly improved sustainable development performance ( $\beta = 0.33$  and  $\beta = 0.27$ , respectively, both  $p < 0.001$ ), supporting hypotheses H7 and H8. This suggests that leadership behaviors focused on organizational change (e.g., strengthening institutional systems, optimizing resource allocation) and people-oriented leadership (e.g., motivating faculty, supporting staff development) positively contribute to universities’ SDGs.

**Table 4: Direct Effect Hypothesis Testing Results of the SEM (N = 300, Standardized Coefficients)**

Hypothesis	Path	$\beta$	SE	CR	p	Conclusion
H1	K $\rightarrow$ OL	0.3	0.05	6	***	Supported
H2	K $\rightarrow$ IL	0.15	0.06	2.5	0.012	Supported
H3	S $\rightarrow$ OL	0.2	0.05	4	***	Supported
H4	S $\rightarrow$ IL	0.25	0.05	5	***	Supported
H5	A $\rightarrow$ OL	0.28	0.05	5.6	***	Supported
H6	A $\rightarrow$ IL	0.4	0.05	8	***	Supported
H7	OL $\rightarrow$ SD	0.33	0.06	5.5	***	Supported
H8	IL $\rightarrow$ SD	0.27	0.07	3.86	***	Supported

Note: K = Knowledge, S = Skills, A = Attitude, OL = Organization-Oriented Leadership, IL = Individual-Oriented Leadership, SD = Sustainable Development; \*  $p < 0.001$ ,  $p < 0.01$ , \*  $p < 0.05$ .

Table 5 shows bootstrap mediation analysis results. Organization-oriented and individual-oriented leadership mediate the relationship between management capability and sustainable development (H9 and H10 supported).

**Table 5: Results of Mediation Effects (Bootstrap Analysis)**

Path (Hypotheses)	Indirect Effect	SE	95% CI Lower	95% CI Upper	P-Value	Result
H9: MC → OTL → SD	0.214	0.045	0.138	0.312	0.000	Supported
H10: MC → ITL → SD	0.187	0.038	0.115	0.276	0.001	Supported

Note: MC = Management capability; OTL = Organization-oriented TL; ITL = Individual-oriented TL; SD = Sustainable development.

The direction and significance of the path coefficients were consistent with theoretical expectations, supporting all eight direct hypotheses. The structural model demonstrated good explanatory power for endogenous variables: the three dimensions of management capability collectively explained approximately 55% of the variance in organization-oriented leadership and 60% in individual-oriented leadership, while both leadership behaviors jointly explained about 50% of the variance in university sustainable development.

### 4.3 Analysis of Research Findings

Based on the SEM results presented above, this section further analyzes the specific influences of management capability dimensions on leadership behaviors and institutional outcomes, directly addressing the research objectives.

#### 4.3.1 Influence of administrators' knowledge, skills, and attitudes on leadership behaviors

The path analysis results confirm that management capability is a critical antecedent of transformational leadership. First, "knowledge" was found to have a significant positive impact on both organization-oriented and individual-oriented leadership. This implies that when administrators possess a deep understanding of policies and financial standards, they are better equipped to build standardized management systems and provide professional guidance to faculty.

Second, "skills" showed a robust positive correlation with leadership behaviors. The ability to allocate budgets strategically and handle crises effectively allows administrators to demonstrate strong organizational leadership. Third, "attitude" emerged as a key predictor. The findings indicate that a proactive and responsible attitude significantly drives *administrators* to care for individual faculty needs (individual-oriented leadership), proving that leadership is not just about ability but also about mindset.

#### 4.3.2 Influence of leadership behaviors on institutional outcomes

Regarding the ultimate goal of the study, the results demonstrate that transformational leadership serves as a vital bridge to sustainable development. organization-oriented leadership significantly promotes sustainable development by establishing clear governance structures and standardized procedures, which are essential for long-term institutional stability. Simultaneously, individual-oriented leadership contributes to sustainability by fostering faculty motivation and innovation. The analysis confirms that when administrators focus on supporting teachers' career development and wellbeing, the university achieves better performance in teaching quality and social reputation. In summary, the structural model verifies the logical chain: "management capability → transformational leadership → sustainable development," validating the theoretical framework.

## 5. Discussion

### 5.1 Summary of Major Findings

This study sets out to investigate the internal drivers of sustainable development in private universities in Guangxi amid demographic challenges. The empirical results from the SEM support the proposed conceptual framework, revealing two primary findings. First, management capability—specifically its three dimensions: knowledge, skills, and attitude—serves as a significant antecedent to transformational leadership. Among these, "attitude" was identified as a critical predictor, suggesting that a leader's mindset is as vital as their technical competence. Second, the study confirms that transformational leadership acts as a pivotal mechanism. Both organization-oriented leadership (focusing on systems and goals) and individual-oriented leadership (focusing on faculty support) significantly contribute to the sustainable development of the institution. These findings align with the broader literature suggesting that leadership behaviors are the bridge converting administrative potential into institutional success.

### 5.2 Interpretation of Findings

The positive correlation between management capability and transformational leadership indicates that effective leadership is not innate but constructed through specific competencies. The strong influence of "knowledge" on leadership behaviors implies that when administrators are well-versed in policies and financial standards, they are more confident in establishing standardized management systems (organization-oriented). This supports the work of Tyminski and Owens (2024), who emphasized that professional knowledge is the bedrock of educational leadership. Furthermore, the finding that individual-oriented leadership significantly impacts sustainable development suggests that in the private education sector, people are the core asset. When leaders provide customized training and emotional support, faculty motivation increases, directly enhancing teaching quality and institutional reputation. This result echoes Sheridan et al. (2023), who found that faculty wellbeing is central to educational sustainability.

### 5.3 Theoretical and Practical Implications

This private university study validates transformational leadership theory. Leaders inspire, encourage, and engage employees to achieve university goals using transformational leadership. This shows how leadership potential and managerial qualities affect higher education. Leadership ability is crucial to higher education organizational growth, which results in understanding that transformative leadership in university governance frameworks requires distinguishing between organizational system-focused and individual motivation and commitment-focused leadership. These results contextualize transformational leadership in higher education systems development and enhance the theoretical discourse on leadership efficacy in private universities.

Practical contributions: The results benefit university administrators, boards, and Guangxi politicians. This suggests that leadership development programs should emphasize ideals, dedication, and transformative attitudes as well as managerial experience and technical skills. Professional development initiatives for administrators may improve transformative leadership at private universities, which in turn would improve the effectiveness of human resource management, increase faculty motivation, encourage new ideas, and improve university sustainability.

### 5.4 Limitations and Research Recommendations

Despite the rigorous design, this study has limitations that should be noted. First, the data were cross-sectional, meaning they captured a snapshot in time. While the SEM analysis supports causal inference, it cannot definitively establish causality like a longitudinal study can. Future research should consider time-lagged designs to track how leadership changes impact sustainability over time. Second, the sample is restricted to private universities in Guangxi, which may limit the generalizability of findings to public institutions or other regions with different economic contexts.

However, given the unique regulatory environment of Chinese private education, the findings remain highly valid and valuable for this specific sector. Future studies could expand the scope to conduct comparative analyses across different provinces. Finally, reliance on self-reported data may introduce common method bias. Although statistical checks (such as Harman's single-factor test) confirmed that this was not a major issue, future studies could benefit from multi-source data (e.g., evaluating leaders based on faculty ratings). This finding aligns with Malik (2023), who also highlighted the importance of management skills for leadership effectiveness.

## 6. Recommendations

### 6.1.1 For University Administrators

- Actively participate in strategic planning training to enhance policy insight and foresight
- Organize systematic skill development programs, particularly in data analysis and crisis management

- Establish attitude and emotional intelligence training to help leaders more effectively motivate faculty innovation

#### 6.1.2 For Institutions

- Strengthening organization-oriented leadership by improving governance structures and decision-making mechanisms to optimize resource allocation and strategic alignment
- Emphasize individual-oriented leadership by implementing incentive mechanisms to boost faculty job satisfaction and innovation

#### 6.1.3 For Policymakers

- Accelerate the refinement of policy frameworks, providing financial support and resource allocation
- Enhance policy flexibility in culturally sensitive governance reforms, allowing universities to innovate while preserving cultural identity

#### 6.1.4 Further Research

- Expand nationally to examine how regional economic and cultural differences influence management capability and leadership effectiveness
- Conduct longitudinal research to assess the dynamic long-term effects of management capability and transformational leadership on sustainable development
- Incorporate cultural analysis to explore how local traditions and informal governance systems shape university leadership
- Investigate how emerging technologies (e.g., AI, big data) could enhance management capability and transformational leadership
- Integrate perspectives like the Resource-Based View and institutional theory for a more comprehensive analytical framework on governance performance relationships

## 7. Conclusion

Against the backdrop of a demographic crisis and intense competition reshaping China's higher education landscape, this study investigated the intrinsic drivers of sustainable development within private universities in Guangxi. The core conclusion of this research is not merely a reaffirmation of the importance of management capability but a deeper revelation of its transformation mechanism.

The findings indicate that a leader's management capability, encompassing knowledge, skills, and attitude, does not in itself guarantee a university's success. Instead, it must be effectively activated and translated through the dual pathways of transformational leadership: organization-oriented leadership, which centers on institutional systems, and individual-oriented leadership, which is fundamentally human-centric. Only through these pathways can capability be converted into the institutional resilience and educational quality that underpin sustainable development.

A key insight from this study is the nuanced differentiation of the roles played by each component of management capability. The data showed that "knowledge"

serves as the strategic cornerstone for building organization-oriented leadership ( $K \rightarrow OL, \beta = 0.30$ ), providing a clear blueprint for systemic reform. However, among all influencing factors, a manager's "attitude" exerted the most significant impact on individual-oriented leadership ( $A \rightarrow IL, \beta = 0.40$ ). Through the transmission of values and confidence, attitude becomes the core engine for uniting people and igniting an individual's innovative potential. This finding is particularly critical, as it implies that during times of uncertainty and crisis, a leader's "soft skills" in inspiring their people may be more effective than conventional administrative measures.

Therefore, this research offers a crucial practical implication for the leaders of Guangxi's private universities who are facing existential challenges: the most urgent task is not only to acquire advanced policy knowledge and management skills but, more critically, to cultivate their own intrinsic "attitude." This includes fostering a mindset open to innovation, a steadfast sense of responsibility, and proactive empathy. By strengthening their emotional intelligence and moral compass, leaders can more effectively exercise individual-oriented leadership, thereby stabilizing their teams, fostering vitality during a difficult transition, and guiding their universities toward a sustainable future.

In conclusion, this research not only provides evidence-based strategies and actionable guidance for regional private universities but, more importantly, offers valuable theoretical insights and practical references for all knowledge-based organizations in an era of transformation: how to achieve long-term success by striking a delicate balance between "systems" and "people."

### Conflict of Interest

The authors declare that there is no conflict of interest.

## 8. Acknowledgments

AI tools were used only for language improvement, formatting, and clarity. No AI was used to generate research ideas, design the study, analyze data, interpret findings, or create academic content. Authors independently created and validated all intellectual contributions, analyses, and conclusions.

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