

# The Digital Leadership Model for Administrators of Vocational Education in Kaifeng City Under Henan Province

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## Abstract

As the digital transformation of higher education in China continues to deepen, traditional leadership urgently needs to expand and shift towards digital leadership. As vocational education is a vital part of higher education, there is an urgent need to enhance the digital leadership capabilities of its administrators. In Kaifeng City, Henan Province, vocational education administrators struggle with integrating digital technologies, which limits their ability to lead and innovate in a fast-changing digital environment.

The objectives of this research were to: (1) Determine the components and sub-components of digital leadership for administrators of vocational colleges in Kaifeng City, Henan Province. (2) Propose a digital leadership model for these administrators.

The study's population comprised 4,576 principals, deans, student counselors, and teachers from vocational colleges in Kaifeng City, Henan Province, China. A stratified random sampling method was employed, resulting in a sample of 363 participants. Data were collected using a questionnaire, and analyzed with descriptive statistics (percentage, arithmetic mean, standard deviation), Exploratory Factor Analysis (EFA), and Confirmatory Factor Analysis (CFA) using statistical software.

The research findings revealed: (1) Four key components and 13 sub-components of digital leadership, derived from the conceptual framework, were identified. The four components are digital communication, digital vision, digital innovation, and digital collaboration. (2) The proposed digital leadership model for administrators of vocational colleges was consistent with the empirical data: Chi-square ( $\chi^2$ ) = 103.97, Relative Chi-square ( $\chi^2/df$ ) = 2.00, Degrees of Freedom (df) = 52, Statistical Significance (p) = 0.00, Goodness of Fit Index (GFI) = 0.96, Adjusted Goodness of Fit Index (AGFI) = 0.92, and Root Mean Square Error of Approximation (RMSEA) = 0.05. Components ranged from 0.82 to 0.98, while the sub-components/sub-components ranged from 0.65 to 0.87.

The study presents a validated digital leadership model specifically designed for vocational education administrators in Kaifeng City, Henan Province. By pinpointing and validating the essential components and sub-components of digital leadership, this research offers a practical framework that administrators can use to enhance their digital skills and lead their institutions more effectively in the digital era. This model provides a foundation for creating targeted professional development programs and strategic initiatives to promote digital leadership within vocational education settings.

**Keywords:** Digital Leadership Model; Administrator; Vocational Education

## Introduction

With China's rapid digital economy development, optimizing educational resources through digital transformation is crucial for modernization. The 20th National Congress of the Communist Party emphasized accelerating the digital economy and digitizing education. Yuan (2023) argued that promoting digital transformation is essential for high-quality, balanced development in vocational education. However, digital transformation in organizations is complex (Fenwick et al., 2021), requiring a shift from traditional to digital leadership. COVID-19 significantly impacted global education, accelerating digital transformation but revealing deficiencies in technology skills, digital literacy, vision, and innovation among university administrators. These gaps exposed the need for further research and development (Tigre et al., 2023). Despite the importance of digital leadership, its development among administrators often lags (Xie et al., 2019). The Chinese government recognizes the importance of digitization in education and has implemented policies such as the "14th Five-Year Plan for National Informatization" and the "14th Five-Year Plan for Educational Informatization Development in Henan Province." These emphasize building the capacity of educational administrators and reforming governance concepts. The World Digital Education Conference on February 13, 2023, underscored these changes, marking significant shifts in vocational colleges.

Exploring a digital leadership model for vocational education administrators is valuable. Current research on digital leadership focuses on digital technology applications in industries, with limited attention to educational administrators. This study examines vocational college administrators to construct and verify a digital leadership model, identifying key factors and sub-components. This research advances digital leadership in vocational education, particularly in Kaifeng City, Henan Province. Prominent Chinese scholars like Huo Guoqing (2008), Sun Zhenxiang (2013), and Zhao Leilei (2016) have studied informatization leadership, providing a foundation for this study. Building on existing research, this paper examines administrators of vocational colleges in Kaifeng City under Henan Province to explore the role of digital leadership in their transformation. This study aims to understand the internal logic of the digital leadership model for vocational education administrators and address two fundamental research problems: (1) What are the key factors and sub-components of digital leadership for vocational education administrators in Kaifeng City? (2) How is the digital leadership model for these administrators constructed and verified?

This study significantly advances the field of digital leadership in vocational education within Kaifeng City by identifying key components and sub-components and developing a focused model. By aligning with Kaifeng's digital transformation realities, the research offers practical insights with substantial potential to drive effective change. It highlights the critical need for administrators to develop digital leadership skills to address evolving demands. Kaifeng, as a smart city in Henan Province, provides an ideal context for this study, underscoring its urgency and relevance.

## Research Objectives

1. Determining the components and sub-components of digital leadership for administrators of vocational colleges in Kaifeng city under Henan province.
2. Proposing the digital leadership model for the administrators of vocational colleges in Kaifeng city under Henan province.

## Research Methodology

This study is structured into two distinct phases:

**Phase 1:** Identifying the components and sub-components of digital leadership for administrators in vocational education in Kaifeng, to address Research Objective 1.

**Phase 2:** Developing and testing a digital leadership model for vocational education administrators in Kaifeng City, and assessing its alignment with empirical data to meet Research Objective 2.

The research methodology for each phase is outlined below:

### **1. Determining the components and sub-components of the digital leadership model for vocational education administrators in Kaifeng city under Henan province for research objective 1**

#### **1.1 Research Design**

In phase 1 this research, qualitative methods were employed: 1) researcher reviewed relevant literature to study concepts, principles, and theories related to digital leadership. 2) Relevant digital leadership research was synthesized to develop a questionnaire for the phase 2 research. 3) In-depth interviews were conducted with experts using a “bottom-up” construction method and coded to identify key second-level sub-components of digital leadership. These sub-components were then clustered to synthesize first-level elements, forming the second-level model of digital leadership.

In-depth interviews were conducted with 7 Key informants, including 4 men and 3 women. Among them, 4 principals and 3 deans have online education experience, leadership experience, and more than five years of experience from vocational colleges in Henan province. According to the above criteria, the interviewed experts were selected by purposeful sampling. Five educational administrators were selected to test interview scenarios, and the rationality of the interview outline was verified, and the validity of the interview outline was verified.

#### **1.2 Research Instrument**

This research adopted semi-structured interviews, adjusting the order of interview questions according to the actual situation, and interrogated the interviewees (Brinkmann & Kvale 2015). Since the interviewees came from different regions, the researcher used telephone and face-to-face interviews.

#### **1.3 Data Collection**

Data collection was conducted by the researcher according to the following steps: 1) Researcher gathered relevant information from university libraries and conducted internet searches; 2) This information was organized into a table matrix classified by citations; 3) Content analysis was performed on the gathered data; 4) Conclusions were validated by the 5 key informants involved in the study. Data collection was carried out by the researcher themselves.

#### 1.4 Data Analysis

The researcher adopted content analysis method (Patton 2015) to deeply process the data, studied and analyzed relevant research works related to digital leadership. To conduct interviews with experts or key informants on digital leadership in vocational colleges in Henan province.

### Conceptual Framework

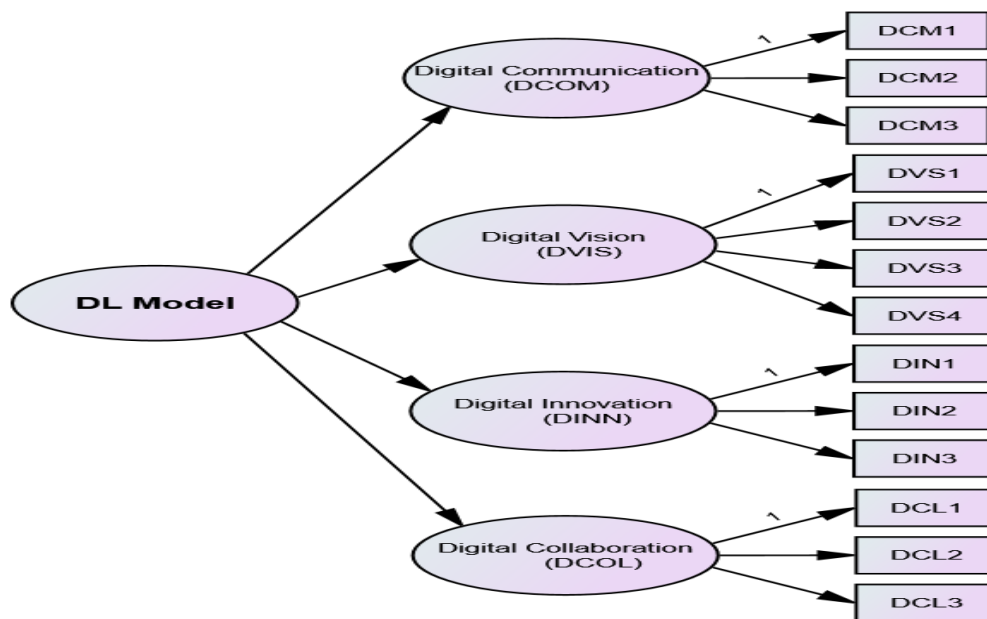


Figure 1: The Conceptual Framework

## 2. Proposing the digital leadership model for vocational education administrators in Kaifeng city under Henan province for research objective 2

### 2.1 Research Design

In this phase, researchers thoroughly analyzed digital leadership literature and integrated expert insights to refine their conceptual framework. They identified key research variables and developed a questionnaire focusing on four primary dimensions: digital communication, vision, innovation, and collaboration, with thirteen specific sub-components to guide data collection. The questionnaire collected sample data for evaluating the digital leadership model among vocational education administrators. Following iterative refinements based on this data, a second-order model with four primary components and thirteen secondary sub-components was developed. The model's reliability and scientific rigor were validated through expert consultations, leading to its final confirmation.

The population and sample used in this phase consisted of administrators, staff, and teachers from five vocational colleges in Kaifeng city, totaling 4576 individuals. The sample group was selected using proportional stratified random sampling with G\*Power program version 3.1 (set as Chi-square test at: Df = 60,  $\alpha$  err prob = .05, effect size  $w = 0.3$ , power = 0.8), resulting in at least 363 individuals.

## 2.2 Research Instruments

The researcher used a two-part questionnaire as follows:

Part 1: Demographic variables (gender, age range, education level, current position, experience in vocational educational administration, and attitude).

Part 2: Digital leadership variables will be assessed using a 5-point Likert rating scale, evaluating key informants' perceptions from seven vocational colleges in Henan province. This section contains a total of 13 sub-items.

Creation and quality inspection of the instrument

1) Reviewed existing academic literature and research to identify key components and sub-components relevant to the research.

2) Created a table to establish logical content relationships between the main components, sub-components, and operational definitions identified in step 1. This helped ensure that each indicator aligned with its corresponding component and operational definition.

3) Converted these sub-components into questions that were included in the questionnaire. Each indicator may have generated one or more questions.

4) Developed a questionnaire conformity check form that included the sub-components and their objective definitions.

## 2.3 Data Collection

Data collection was carried out by researcher who communicated with the interviewee and explained their identity and intention. Questionnaires were sent by email, in person, or by other means.

In this research, questionnaire is applied in regarding to identify the digital leadership sub-components, in detail :

(1) Submit a formal request for data collection approval to the Faculty of Education at Bangkokthonburi University (BTU).

(2) Request a formal letter of recommendation from the Faculty of Education at BTU, supporting the researcher and the study.

(3) Identify teachers within each vocational college who can act as coordinators for the data collection process. Provide detailed instructions and materials to ensure consistency

and accuracy in data collection.

(4) A structured questionnaire designed using Wenjuanxing (a Chinese online survey tool) will be the primary instrument for data collection.

(5) Upon receiving the completed questionnaires, enter the data into a statistical software package for analysis by SPSS.

## 2.4 Data Analysis

Step 1. Descriptive Statistics for Demographic Variables

To calculate frequency and percentage for demographic variables to understand their distribution.

Step 2. Descriptive Statistics for Digital Leadership Variables

Average data analysis, Standard deviations and coefficients distribution to determine the suitability of the sub-components for the selection of sub-components in the model. The criteria specified were mean values equal to or greater than 3.00 and a coefficient of variation (CV) equal to or less than 20%.

### Step 3. Assessing the reliability and validity of a questionnaire

In the research process, it's crucial to first ensure that the prerequisites for confirmatory factor analysis (CFA) were met before assessing validity. Pearson correlation coefficients were analyzed to assess the suitability of variables for further component analysis. Variables with no correlation were excluded from the common component analysis (Hair et al., 2010). Bartlett's test of sphericity and the Kaiser-Meyer-Olkin (KMO) index were used to evaluate the appropriateness of the correlation matrix for component analysis, with a KMO value  $> .80$  indicating very good suitability and  $< .50$  indicating unsuitability (Hair et al., 2010; Kim et al., 2015).

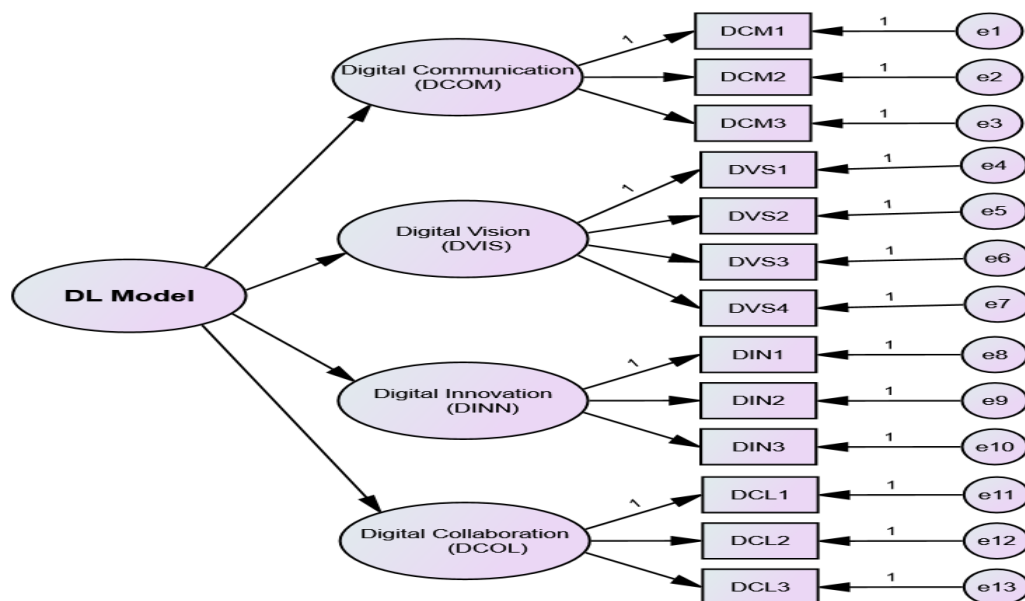
### Step 4. Check Consistency Between the Model and Empirical Data

The CFA tested the conformity of the structural correlation model and weighted the sub-variables to generate empirical data sub-components. This second-order CFA examined the coherence of the research model with empirical data. If initial results did not meet specified criteria, model adjustments were made based on references such as Schumacker & Lomax (2010), Jöreskog & Sörbom (2012), Kelloway (2015), Hair et al. (2021), and Poonpong Sooksawang (2021). The statistical values used as audit criteria included Chi-square, GFI, AGFI, CFI, TLI, and RMSEA. These values meet the criteria for fit indices, as presented in Table 1.

**Table 1:** The typical accepted values for statistic

Value	$\chi^2/df$	GFI	AGFI	CFI	TLI	RMR	RMSEA
Criteria index	$2.00 < \chi^2/df \leq 3.00$	$0.90 < GFI \leq 1.00$	$0.90 \leq AGFI \leq 1.00$	$0.95 \leq CFI \leq 1.00$	$0.90 \leq TLI \leq 1.00$	$0.00 \leq RMR \leq 0.08$	$0.00 \leq RMSEA \leq 0.08$

### 5.2.5 Conceptual Framework



**Figure 2:** The Conceptual Framework of Digital Leadership Model

## Research Findings

### 1. The components and sub-components of administrators of vocational colleges in Kaifeng city under Henan province. Found that 4 components and 13 sub-components.

Because the researcher conducted literature research and the analysis of high-frequency components and sub-components, 4 components and 13 sub-components were obtained.

There were four components of the digital leadership model for administrators of vocational education in Kaifeng City under Henan province, which consisted of (1) Digital communication, (2) Digital vision, (3) Digital innovation, (4) Digital collaboration.

(1) Digital Communication (DCOM), it consisted of the following sub-components: share content, digital technology, and collaborate online.

(2) Digital Vision (DVIS), it consisted of the following sub-components: technology vision, motivating inspiration, strategic plan, and implementation.

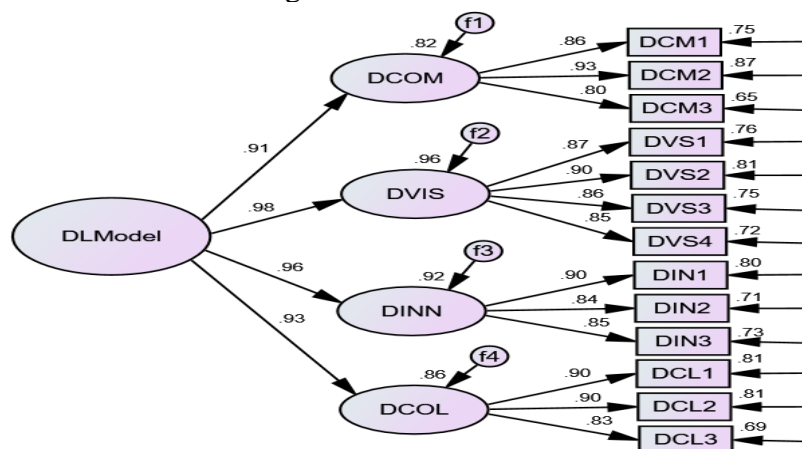
(3) Digital Innovation (DINN), it consisted of the following sub-components: digital resource, technical competence, and innovation climate.

(4) Digital Collaboration (DCOL), it consisted of the following sub-components: data sharing, interaction, and teamwork.

### 2. The proposing the digital leadership model for vocational education administrators in Kaifeng city under Henan province. Found that digital leadership model. Details were as follows:

Model validation was performed by confirmatory factor analysis using quantitative studies. The 65 variables of the four components were identified and the model fit with empirical data for all sub-components. The findings are as follows:

The Second Order Confirmatory Factor Analysis (CFA) model demonstrated consistency with the empirical data. The model fit indices indicated acceptable fit: Chi-square ( $\chi^2$ ) = 103.97, Relative Chi-square ( $\chi^2/df$ ) = 2.00, Degrees of Freedom (df) = 52, Goodness of Fit Index (GFI) = 0.96, Adjusted Goodness of Fit Index (AGFI) = 0.92, and Root Mean Square Error of Approximation (RMSEA) = 0.05. These values meet the specified criteria for model fit. The research results as shows in Figure and Table below:



Chi-square =103.974, Relative Chi-square =2.000, Df =52. p =.000  
GFI =.956, AGFI =.923, TLI =.984, RMR = .002, RMSEA =.053

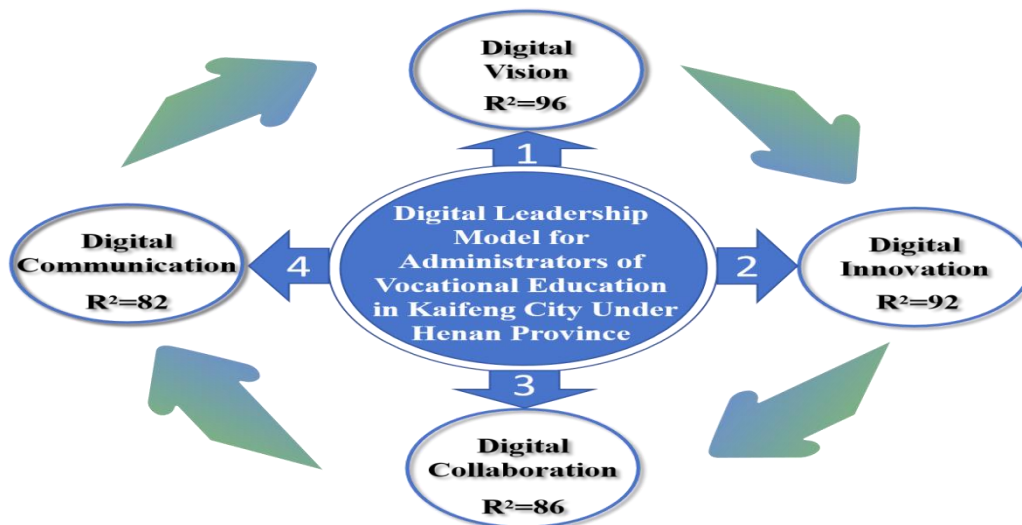
**Figure 3:** Second Order CFA of Digital Leadership Model for Administrators of Vocational Education in Kaifeng City Under Henan Province after Completed Modification Indices

**Table 2:** Show the Important Statistical Value of Second Order CFA Model for Administrator's Digital Leadership of Vocational Education in Kaifeng City

Path of variable in the model			Maximum Likelihood Estimates Regression Weights:		
			Unstandard	Standard	R <sup>2</sup>
1. Digital communication	<---	Digital Leadership	1.000	.908	.824
DCM1	<---	DCOM	.909	.863	.745
DCM2	<---	DCOM	1.000	.933	.871
DCM3	<---	DCOM	.803	.804	.646
2. Digital Vision	<---	Digital Leadership	.985	.982	.964
DVS1	<---	DVIS	.943	.873	.763
DVS2	<---	DVIS	1.000	.900	.810
DVS3	<---	DVIS	.893	.864	.747
DVS4	<---	DVIS	.940	.848	.718
3. Digital innovation	<---	Digital Leadership	.938	.957	.916
DIN1	<---	DINN	1.000	.897	.804
DIN2	<---	DINN	.916	.841	.708
DIN3	<---	DINN	.910	.852	.727
4. Digital collaboration	<---	Digital Leadership	.868	.927	.859
DCL1	<---	DCOL	1.000	.899	.808
DCL2	<---	DCOL	.955	.901	.811
DCL3	<---	DCOL	.870	.829	.687

From Figure/ Table above, shown that both of four components and 13 sub-components had predictive power at high level (R2 between 0.646 to 0.964). These ranked in descending were the component of (1) Digital Communication (DCOM), it consisted of the following sub-components: share content, digital technology, and collaborate online. (2) Digital Vision (DVIS), it consisted of the following sub-components: technology vision, motivating inspiration, strategic plan, and implementation. (3) Digital Innovation (DINN), it consisted of the following sub-components: digital resource, technical competence, and innovation climate. (4) Digital Collaboration (DCOL), it consisted of the following sub-components: data sharing, interaction, and teamwork. An important components and sub-components of this administrators' digital leadership model for vocational colleges in Kaifeng city under Henan province by rank order 1, 2, 3, and 4 was shown this Figure.





**Figure 4:** Show Digital Leadership Model for Administrators of Vocational Education in Kaifeng City

## Discussion

### 1. Discussion about Major Findings of Objective 1

The digital leadership model identified in this study encompasses four essential components. Each component plays a crucial role in fostering effective leadership practices enhanced by digital technologies.

(1) Digital Communication. This foundational component facilitates effective sharing of opinions and ideas (Share Comment), leveraging digital tools (Digital Technology), and promoting collaboration through online platforms (Collaborate Online). The findings align with previous studies (Liu et al., 2018; Roman et al., 2019; Cortellazzo et al., 2019), which emphasize the importance of clear and effective communication in digital leadership.

(2) Digital Vision. This component focuses on establishing a clear technological vision (Technology Vision), inspiring and motivating stakeholders (Motivating Inspiration), strategizing for technological integration (Strategic Plan), and ensuring effective implementation (Implementation). Consistent with prior research (Liu et al., 2018; Roman et al., 2019; Hafiza et al., 2021), this component underscores the significance of vision leadership in driving digital transformation in educational settings.

(3) Digital Innovation: This component emphasizes the utilization of digital resources (Digital Resource), development of technical competence (Technical Competence), and fostering an innovation-friendly climate (Innovation Climate). Supported by existing literature (Liu et al., 2018; Roman et al., 2019; Promsri, 2019), this component highlights the role of innovation in leveraging technology to enhance educational practices and outcomes.

(4) Digital Collaboration: Digital collaboration focuses on enhancing teamwork through data sharing (Data sharing), interactive digital platforms (Interaction), and fostering cohesive teamwork (Teamwork). Aligned with previous findings (Roman et al., 2019; Yusof et al., 2019; Daud et al., 2021), this component stresses the importance of collaborative digital environments in promoting effective educational leadership.

The findings underscore the importance of integrating theoretical frameworks with empirical data to develop robust digital leadership models. This approach ensures that the identified components and sub-components are not only theoretically sound but also practically applicable in educational contexts.

## **2. Discussion about Major Findings of Objective 2**

The research confirms a robust digital leadership model tailored for administrators in vocational education within Kaifeng city under Henan province. This model comprises four essential components: (1) digital communication, (2) digital vision, (3) digital innovation, and (4) digital collaboration. Through extensive literature analysis and empirical data processing, the model incorporates 65 key variables across these components, each carefully selected and analyzed to construct a structural equation model. Each component is critical in shaping effective leadership practices that leverage digital technologies to enhance educational outcomes.

The study employed rigorous methodologies, including confirmatory factor analysis (CFA), to validate the measurement model of each component. The results indicated strong reliability and validity, with factor loadings exceeding recommended thresholds ( $\geq 0.70$ ) and demonstrating statistical significance ( $p < 0.01$ ). Additionally, Bartlett's test of sphericity and Kaiser-Mayer-Olkin measures of sampling adequacy (MSA) confirmed the appropriateness of the correlation matrix for CFA, with MSA values ranging from 0.908 to 0.982, indicating high inter-correlations among variables.

The model development process involved a rigorous integration of theoretical frameworks and empirical data. Extensive literature analysis provided insights into best practices and theoretical underpinnings, while empirical data from surveys and interviews with educational administrators validated the relevance and importance of identified variables.

The study validates the measurement model for each main component: (1) digital communication (KMO = 0.961), (2) digital vision (KMO = 0.953), (3) digital innovation (KMO = 0.955), and (4) digital collaboration (KMO = 0.955), which based on theoretical foundations and empirical data. The validation process ensured that all selected sub-components were theoretically grounded and empirically significant. Through confirmatory factor analysis (CFA), the study demonstrated strong reliability and validity of the model, with factor loadings exceeding the recommended thresholds and composite reliability values indicating robust internal consistency.

A second-order CFA was conducted on the 13 sub-components derived from the components. Utilizing the data, the study established a second-order model that encapsulates the interrelationships among the 13 key sub-components across the four components. The model fit statistics, including the chi-square test, relative chi-square, and p-values, confirmed the model's adequacy in explaining the observed data, thereby supporting its utility as a tool for assessing digital leadership. The results indicate a strong alignment with empirical data, supported by a chi-square value ( $\chi^2$ ) of 103.975 with a significant p-value of 0.00. The Relative chi-square value of 2.000 further supports the model's fit.

The factor weights of the 13 sub-components meet the threshold, with composite reliability values above 0.70 and factor loadings equal to or exceeding 0.30. This signifies robustness in the structural relationship model, ensuring that the selected sub-components effectively measure digital leadership attributes. This research provides a validated framework that integrates theoretical insights with empirical findings, offering a reliable approach to assessing and developing digital leadership in vocational education contexts.

## **Recommendation**

### **1. Theoretical Recommendations**

1) Future studies should delve deeper into the theoretical foundations of digital leadership, particularly within vocational education contexts, refining and expanding the current model by integrating emerging trends and technological advancements while conducting comparative studies across different regions and educational levels to gain broader insights into the model's applicability and adaptability.

2) Create more comprehensive theoretical frameworks that integrate digital leadership with other leadership theories, such as transformational and transactional leadership, to provide a more holistic view of leadership in the digital age and offer a richer foundation for empirical research, while considering the cultural and contextual factors that influence digital leadership practices in various educational settings.

3) Promote interdisciplinary research that combines insights from education, technology, management, and organizational behavior to develop robust theories of digital leadership, enhancing our understanding of its multifaceted nature and its impact on educational outcomes and institutional effectiveness.

### **2. Policy Recommendations**

1) The vocational colleges in Kaifeng City should use the digital leadership and these sub-components for vocational college administrators, as a result of this research, to plan and develop the digital leadership of vocational college administrators. This will enable vocational college administrators to be developed into professional executives in line with digital leadership in the vocational education digital transformation.

2) The Ministry of Education and Office of the Education Commission should take the digital leadership for administrators of vocational college as a result of this research, as a result of this research. This policy should aim to develop colleges administrators' knowledge and understanding of the value of leadership. Especially the digital leadership for executives, which are capabilities that need to be strengthened in the digital leadership at various levels.

### **3. Practical Recommendations**

1) The research findings affirm the validity of the proposed digital leadership model, which provides a comprehensive framework for enhancing digital leadership among vocational college administrators in Kaifeng City. Policymakers and educational leaders can leverage these findings to advocate for the adoption of this model, ensuring it is grounded in empirical evidence and effectively impacts educational leadership and management. The model emphasizes key components, sub-components, and indicator levels validated by the data. Prioritization should follow the research's identified weight values: digital vision should be prioritized first, followed by digital innovation, digital collaboration, and digital communication.

2) The vocational colleges should implement a comprehensive training and development system for administrators, providing them with opportunities and resource support for professional growth. This system should be designed to align with the digital leadership model, offering targeted programs that enhance capabilities in digital vision, innovation, collaboration, and communication. By investing in administrator development, vocational colleges can improve efficiency and fostering innovation and ensure leadership excellence and organizational effectiveness.

3) Promote initiatives within vocational education institutions that aim to: (1) Implement the digital leadership model to foster innovation and improve educational outcomes. (2) Enhance teaching and management practices through the application of digital technologies. (3) Facilitate vocational digital transformation by integrating new technologies to enhance educational quality and efficiency.

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