

A Study on the Multiple Driving Mechanisms of Educational Management Innovation from The Perspectives of Conceptual, Organizational, Model and Content Innovation

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Abstract

Against the background of China's efforts to build a strong education system and promote the connotative development of education, educational management innovation has become a crucial driver for deepening educational reform and improving governance effectiveness. However, existing studies mainly focus on the independent influence of a single innovation dimension and lack systematic integration and relational analysis of multiple driving factors, making it difficult to fully explain the multidimensional mechanisms of educational management innovation. To address this gap, this study constructs a four-dimensional analytical framework of concept, organization, mode and content innovation. Based on questionnaire data collected from 411 middle- and senior-level administrators at a vocational college in Inner Mongolia, empirical analysis was conducted using descriptive statistics, correlation analysis and multiple linear regression. The results show that all four innovation dimensions have significant positive effects on educational management innovation. The strength of influence ranks as follows: concept innovation ($\beta = 0.229$), content innovation ($\beta = 0.177$), mode innovation ($\beta = 0.164$) and organizational innovation ($\beta = 0.148$). These findings suggest that educational management innovation is a multidimensional and collaborative process in which conceptual innovation plays a leading role. This study provides an integrative perspective for understanding the mechanisms of educational management innovation and offers empirical evidence for improving innovation strategies and management effectiveness.

Keywords: Conceptual Innovation, Content Innovation, Educational Management Innovation, Model Innovation, Organizational Innovation.

Introduction

Guided by China's strategic objectives of building a robust education system and advancing Chinese-style modernization, the country's educational sector is undergoing a profound transformation, shifting focus from sheer expansion to connotative development. In the context of the deepening "double reduction" policy, the implementation of digital education strategies and the full adoption of core literacy principles in the new curriculum standards, the traditional educational management model—which primarily relies on administrative directives and empirical decision-making—faces an urgent need for systematic restructuring. Challenges inherent in this conventional model, including bureaucratic rigidity, limited data-driven decision-making capabilities, inadequate coordination mechanisms and the reliance on a single evaluation criterion, have become increasingly prominent (1). Against this backdrop, fostering educational management

innovation has emerged as a critical pathway for addressing developmental challenges, enhancing governance efficiency and ultimately realizing the goal of education modernization.

A review of current practices and research in educational management innovation reveals a common limitation: an overwhelming focus on single dimensions. Scholars and policymakers often concentrate on macro-level conceptual reforms (e.g., the "modernization of educational governance"), organizational restructuring at the school level, exploration of specific management models (such as "project-based learning management"), or the iterative improvement of curriculum and teaching content (2, 3). Similar trends are observable in international literature, where empirical studies frequently examine isolated aspects of innovation, such as the influence of leadership styles on school climate or the impact of data management systems on

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decision-making processes (4). While these contributions provide valuable conceptual and empirical insights, comprehensive frameworks that systematically integrate multiple innovation drivers within a single empirical model remain scarce.

Despite their contributions, existing studies exhibit notable perspective limitations. Most investigations analyze a single innovation dimension in isolation or focus on simple bivariate relationships (e.g., the effect of conceptual renewal on organizational adjustments) (5). Although this “divide-and-conquer” approach has generated meaningful findings within specific domains, it is insufficient for revealing the internal logic of the collaborative mechanisms through which multiple factors drive educational management innovation as a complex, systemic process. In practice, successful and sustainable educational management innovation is rarely attributable to any single factor (6). Instead, it emerges from the coordinated interplay of forward-looking conceptual guidance, flexible organizational support, methodical model implementation and high-quality content delivery. Without an integrative perspective, implementation risks disjointed outcomes, such as “advanced concepts but backward organizational structures” or “innovative models but outdated content.” This situation underscores the urgent need for an integrated analytical framework to systematically examine how multiple innovation dimensions collectively constitute the core engine driving educational management innovation. Notably, no prior study has positioned these four essential dimensions within a unified empirical framework to assess their parallel and interrelated impacts on overall educational management innovation.

To address these theoretical gaps and meet the demand for systematic innovation frameworks, this study develops a “four-dimensional driving” integrated analytical framework. The four dimensions—Conceptual, Organizational, Model and Content Innovation—are grounded in a process-oriented logic of management activity. This sequence progresses from guiding concepts (“why” and “where to”), through enabling structures (“how to organize”), to operational methods (“how to implement”) and finally to substantive outputs (“what to achieve”), forming a coherent, interdependent chain. Conceptual

Innovation represents the cognitive and strategic origin, setting the direction for change (7). Organizational Innovation serves as a structural enabler, translating strategic intent into institutional arrangements (8). Model Innovation functions as an operational bridge, converting abstract concepts into actionable management practices (9). Content Innovation embodies the substantive core, reflecting the quality, relevance and effectiveness of educational outputs (10).

The central proposition of this framework is that educational management innovation results from the joint and direct interplay of these four dimensions. Figure 1 visually depicts the proposed four-dimensional driving model, illustrating the direct effects of conceptual, organizational, model and content innovation on educational management innovation. Accordingly, this study investigates how these core antecedent variables collectively drive educational management innovation, operationalized as comprehensive improvements in management concepts, organizational structures, operational processes and outcomes. Specifically, the study addresses two research questions: (a) Do conceptual, organizational, model and content innovations each exert significant positive direct effects on educational management innovation? (b) How do the magnitudes of these direct effects compare? Empirical findings are intended to generate an evidence-based “innovation-driven force map.”

The theoretical contribution of this study lies in moving beyond the limitations of prior single- or two-dimensional research. For the first time, it empirically examines the parallel driving effects and relative effectiveness of four innovation dimensions within an integrated framework, advancing the theory of educational innovation and management from a fragmented perspective to a coherent, system-level understanding. This validated framework transcends a mere aggregation of isolated factors by articulating a logical, hierarchical architecture of innovation drivers—from conceptual guidance to structural support, methodological translation and substantive outputs—thereby providing a theoretically grounded lens for planning, diagnosing and evaluating educational management innovation initiatives.

The Study Offers a Scientifically Grounded “Innovation Lever” For Decision-Making,

Providing Actionable Guidance for Educational Policymakers and Administrators. These Insights Enable the Identification of Key Innovation Dimensions and Priorities, Support the Efficient Allocation of Limited Resources, Mitigate Potential

Blind Spots in Innovation Practice and Promote a Deep, Systemic, Collaborative and Sustainable Transformation of the Educational Management System.

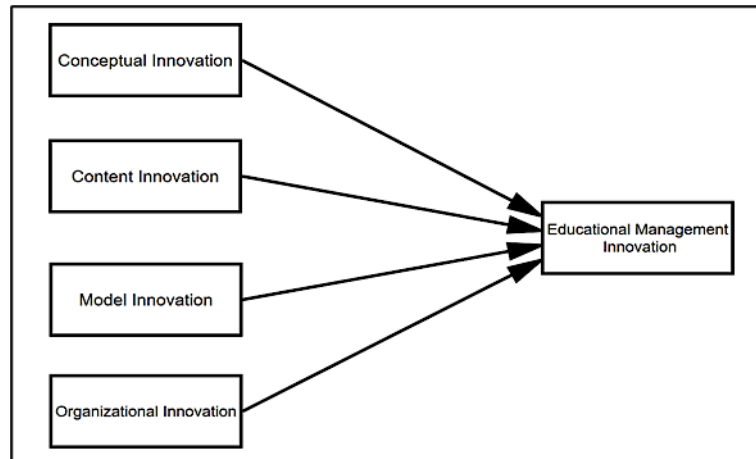


Figure 1: Conceptual Model of the Four-Dimensional Driving Mechanism of Educational Management Innovation At the Practical Level

Methodology

This section describes the research design and the operational steps used to empirically examine the relationships among four core dimensions—conceptual innovation, organizational innovation, model innovation and content innovation—and their effects on educational management innovation. A cross-sectional questionnaire survey was employed to collect first-hand data and multiple linear regression analysis based on latent variable scores was adopted as the primary analytical strategy to evaluate the direct effects of each dimension. The verification process followed a structured sequence, including measurement model assessment and structural model analysis.

Research Objects and Data Collection

This study selects all middle and senior managers of a vocational and technological college in the Inner Mongolia Autonomous Region (approximate GPS coordinates 111.71°E, 40.88°N) as the research sample. The selection of this group is based on the following two theoretical considerations: First, middle and senior managers are the core implementers of school strategic decisions, the overall managers of daily operations and even the planners, promoters and core evaluators of various innovation activities. Their work experience enables them to have the most direct and authoritative perception and judgment

on organizational-level innovation practices, which can accurately reflect the actual situation of innovation implementation. Second, focusing on the internal management team of a single college can maximize the control of interference from external macro-environmental variables of the school (such as regional education policies, student source structure, regional economic development level, etc.), which helps to more clearly observe the driving relationship between the four internal organizational innovation elements and educational management innovation and is consistent with the original intention of this study to focus on the core issue of "driving mechanism".

Data were collected using a standardized electronic questionnaire. Through the official collaboration channel of the school's administrative management department, anonymous questionnaire links were uniformly sent to all eligible middle and senior managers (including school-level leaders, heads of functional departments, heads of teaching departments and supervisors of core sections).

To provide a clearer profile of the sample composition, the respondents covered a range of administrative levels and functional areas. Specifically, the sample included:

a. Top Management (Strategic Level): School-level leaders (e.g., President, Vice Presidents) responsible for institutional strategy.

b. Middle Management (Operational Level): This group constituted the majority and was further divided into:

Heads of Academic/Teaching Departments: Responsible for specific schools, faculties, or teaching and research offices, directly engaged in teaching and curriculum management.

Heads of Functional/Administrative Departments: Responsible for offices such as Academic Affairs, Student Affairs, Human Resources, Finance and Information Technology, focusing on support services and administrative processes.

Supervisors of Core Units: Leaders of key service or research units within the college.

In terms of departmental representation, the sample ensured coverage from both academic/teaching line departments (which are directly involved in core educational content and pedagogical innovation) and administrative/functional line departments (which are more focused on organizational processes, resource allocation and support models). This composition allows the study to capture perspectives on educational management innovation from different vantage points within the organization.

A detailed research explanation, informed consent form and filling guidelines were attached to the front of the questionnaire, clearly informing participants of the research purpose, data usage, confidentiality principles and right to voluntary participation, guiding them to fill in the questionnaire truthfully. The survey period lasted for four weeks, with 450 questionnaires initially distributed. Subsequently, invalid questionnaires were strictly excluded (including incomplete filling, excessively short filling time and answers with obvious regular responses, such as linear and zigzag responses). Finally, 411 valid questionnaires were obtained, with an effective recovery rate of 91.3%. The effective sample size is far more than 10 times the number of independent variables in the multiple linear regression analysis, which fully meets the basic requirements of statistical analysis and provides a reliable guarantee for the stability of the research model (11).

Variable Measurement and Reliability and Validity Test

All core variables in this study were measured using mature scales with verified reliability and validity in domestic and foreign literature. At the same time, combined with the management context of Chinese vocational education, the scale items were translated, optimized and contextually revised to ensure the content validity of the items, which are unambiguous, easy to understand and consistent with the actual work of the respondents. The questionnaire adopted a 5-point Likert scale for scoring, with the scoring standards as follows: 1 = "Strongly Disagree", 2 = "Disagree", 3 = "Neutral", 4 = "Agree", 5 = "Strongly Agree".

A. Dependent Variable

Educational Management Innovation: Educational Management Innovation was measured using a 5-item scale adapted from previous work on organizational innovation (12) and recent research on educational management in the Chinese context (13). The original dimensions from the study were retained, but the item wordings were contextualized to fit the vocational college setting based on the insights from that later research. For example, the generic item "The organization frequently develops new administrative systems" was adapted to "Our school often optimizes and innovates internal management processes." In this study, the Cronbach's $\alpha = 0.912$, indicating that the scale has excellent internal consistency reliability and can be used for subsequent data analysis.

B. Independent Variables

Conceptual Innovation: Used to measure the degree of breakthrough renewal of the school's educational philosophy, educational goals and management philosophy. The scale was compiled with reference to research on the cognition of educational change, including 5 items (14). Specifically, items were adapted from the "School Improvement as Organizational Innovation" scale developed in that study. The core constructs measuring leaders' cognitive frameworks for change were retained, but the phrasing was tailored to reflect managerial perspectives in Chinese vocational education (e.g., emphasizing "leading new ideas for educational development"). An example item is: "The management of our school often puts forward leading new ideas for

educational development". The Cronbach's $\alpha = 0.894$, indicating good reliability.

Organizational Innovation: Used to measure the level of flexible changes in the school's organizational structure, power-responsibility system, collaboration mechanism and cultural atmosphere. The scale was adapted from an established Organizational Innovation Climate Scale, including 5 items (15). The adaptation involved translating the items and slightly modifying the referents to align with a college department context. For instance, an item pertaining to "team collaboration" from that scale was explicitly framed as "Cross-functional collaboration between departments in our school is very smooth and efficient. An example item is: "Cross-functional collaboration between departments in our school is very smooth and efficient". The Cronbach's $\alpha = 0.867$, indicating good reliability.

Model Innovation: Used to measure the innovation and application of specific management methods, management tools and work processes in the school. The scale was compiled with reference to research on management practices, including 5 items (16). The dimensions of management practices outlined in that study, particularly those related to data-informed decision-making and process redesign, were drawn upon. The items were developed to concretely reflect common management tools in educational settings, such as the use of data analysis for decision-making. An example item is: "Our school extensively uses data analysis to support precise decision-making". The Cronbach's $\alpha = 0.866$, indicating good reliability.

Content Innovation: Used to measure the substantive update of core educational outputs such as curriculum systems, teaching resources and learning projects in the school. The scale was designed with reference to relevant research, including 5 items (17). While inspired by that study's focus on educational outcomes, the items for this scale were primarily self-developed to directly capture the essence of curriculum and resource updating in vocational education. The key referent, "alignment with the latest technological trends in the industry," was constructed based on the distinctive mission of vocational colleges to serve industry needs. An example item is: "The professional curriculum content of our school can closely align with the latest technological trends in

the industry". The Cronbach's $\alpha = 0.876$, indicating good reliability.

Explanation of Control Variables

The core goal of this study is to test the pure theoretical relationship between the four theoretical variables (conceptual innovation, organizational innovation, model innovation and content innovation) and educational management innovation. Since all research samples in this study are from the same vocational and technological college, all respondents have a high degree of homogeneity in the external organizational environment, institutional background and school type. Moreover, the research focus is on the organizational-level driving mechanism, rather than the impact of individual differences on the research results. Therefore, to simplify the research model and more clearly reveal the theoretical correlation between core variables, no other control variables are introduced into the regression model. Subsequently, strict statistical diagnosis (such as multicollinearity test) will be conducted to further ensure the reliability and accuracy of the relationship between core variables.

Data Analysis Strategy

The data analysis in this study will use two statistical software: Data were analyzed using IBM SPSS Statistics for Windows, Version 26.0 (IBM Corp., Armonk, NY, USA) and IBM SPSS Amos, Version 24.0 (IBM Corp., Armonk, NY, USA). It will strictly follow the basic principle of "measurement model test prior to structural model test" and carry out the analysis step by step according to the following steps to ensure the scientific and rigor of the research conclusions.

A. Reliability, Validity and Common Method Bias Test

Reliability Analysis: Cronbach's α coefficient is employed as the primary indicator to assess the internal consistency reliability of each research scale. When the α coefficient exceeds 0.8, it suggests that the scale demonstrates a satisfactory level of reliability and is therefore appropriate for subsequent data analysis.

Validity Analysis: The validity assessment is conducted through a stepwise procedure. First, SPSS 26.0 software is applied to perform Exploratory Factor Analysis (EFA) to preliminarily examine the construct validity of each measurement scale. Subsequently, AMOS 24.0

software is utilized to conduct Confirmatory Factor Analysis (CFA). Convergent validity is evaluated by calculating Composite Reliability (CR) and Average Variance Extracted (AVE). When the CR value is greater than 0.8 and the AVE value exceeds 0.5, the scale is considered to demonstrate adequate convergent validity. Discriminant validity is further examined by comparing the square root of the AVE for each construct with the correlation coefficients among constructs. If the square root of the AVE for a given variable is larger than the correlation coefficients between that variable and all other variables, it indicates satisfactory discriminant validity.

During the validity testing process, several key model fit indices are used to evaluate the adequacy of the measurement model, including χ^2/df (the ratio of chi-square to degrees of freedom), CFI (Comparative Fit Index), TLI (Tucker-Lewis Index) and RMSEA (Root Mean Square Error of Approximation). Specifically, when the value of χ^2/df falls between 1 and 3, both CFI and TLI exceed 0.9 and RMSEA is below 0.08, the model is generally regarded as having a good fit (18, 19).

Control and Test of Common Method Bias: A dual approach of “ex-ante control + ex-post test” is adopted to avoid the impact of common method bias on the research results. At the procedural level, ex-ante control is carried out through anonymous surveys, reverse wording of some items and optimization of questionnaire filling guidelines; at the statistical level, Harman’s single-factor test is used for ex-post test. All research items are subjected to unrotated exploratory factor analysis. If the variance explained by the first factor does not exceed the critical standard of 40%, it indicates that there is no serious common method bias in this study.

B. Descriptive Statistics and Correlation Analysis

SPSS 26.0 software is used to calculate the Mean (M) and Standard Deviation (SD) of all core variables (conceptual innovation, organizational innovation, model innovation, content innovation and educational management innovation) to clarify the overall distribution of each variable; at the same time, Pearson product-moment correlation analysis is used to test the pairwise correlation between the five core variables, initially judge the degree of correlation between

each variable and lay the foundation for subsequent multiple linear regression analysis.

C. Structural Relationship Test: Multiple Linear Regression Analysis

Before conducting the multiple linear regression analysis, this study assessed multicollinearity by calculating the variance inflation factor (VIF) among the variables. The VIF values of all independent variables were well below the conventional critical value of 10, indicating that the model did not have a serious multicollinearity problem. The core method for testing the core hypotheses of this study is multiple linear regression analysis. The Confirmatory Factor Analysis (CFA) factor scores of the four independent variables (conceptual innovation, organizational innovation, model innovation and content innovation) are simultaneously included in the regression equation and the CFA factor score of educational management innovation is used as the dependent variable to construct a multiple linear regression model, so as to test the direct driving effect of the four independent variables on the dependent variable.

Overall Model Evaluation: Focus on the adjusted R^2 (adjusted coefficient of determination, i.e., explained variance) of the regression model and the significance of its F-test. If the F-test result is significant ($p < 0.05$) and the adjusted R^2 value is relatively high, it indicates that the four independent variables have significant explanatory power for educational management innovation and the overall fitting effect of the model is good.

Direct Effect Test (corresponding to research hypotheses H1-H4): The analysis focuses on examining the standardized regression coefficient (β) of each independent variable as well as the significance level (p-value) associated with its corresponding t-test. When the β coefficient is positive and the p-value is less than 0.05 ($p < 0.05$), it indicates that the independent variable exerts a significant positive direct effect on educational management innovation and the corresponding research hypothesis is therefore supported. Conversely, if the p-value is greater than or equal to 0.05 ($p \geq 0.05$), the effect is considered statistically non-significant and the corresponding research hypothesis is not supported.

Relative Importance Comparison (corresponding to research hypothesis H5): On the basis of the significant direct effect test of each independent variable, through directly comparing the absolute values of the standardized regression coefficients (β) of the significant independent variables, a descriptive comparison and systematic discussion are conducted on the relative strength of the four independent variables affecting educational management innovation, so as to clarify the core priority of the four innovation dimensions in driving educational management innovation.

Regression Diagnosis: To ensure the robustness and accuracy of the regression analysis results, two key diagnostic procedures will be conducted. A) Multicollinearity Diagnosis: The Variance Inflation Factor (VIF) for each independent variable will be calculated to examine potential multicollinearity issues. When the VIF values of all independent variables are below 10 (and preferably below 5), it indicates that no serious multicollinearity problem exists within the regression model. B) Residual Analysis: The assumptions of normality and homoscedasticity of the residuals will be visually assessed by plotting standardized residual graphs. In addition, the Durbin-Watson statistic will be computed to determine whether the residuals are independent. When the Durbin-Watson value is close to 2, it suggests that the residuals are independent and that the model demonstrates an acceptable level of fit.

Research Ethics

This study strictly follows various ethical norms of social science research and ensures the legitimate rights and interests of research participants throughout the process, which is specifically reflected in the following two points: First, adhere to the principle of informed consent. Before filling in the questionnaire, all participants can clearly know the research purpose, research content, data usage and right to participate through the research explanation at the front of the questionnaire. They participate in this study voluntarily and can withdraw at any time without any adverse impact after withdrawal. Second, abide by the principles of confidentiality and non-harm. The entire data collection and analysis process is completely anonymous. All information that can identify individuals or schools is strictly stripped. The research data is only used for this academic

research and will never be disclosed, lent, or used for other purposes to ensure that the privacy and rights of participants are not damaged in any way. The research plan has passed the relevant academic ethics review and meets the ethical requirements of academic research.

Results

This section systematically presents the empirical analysis process and findings of the study. Based on 411 valid questionnaire responses collected from Inner Mongolia Vocational College of Industry Youth Technology, this section will sequentially report descriptive statistics and correlation analysis, reliability and validity tests of the measurement instruments, common method bias tests and finally, examine the direct effects of Conceptual Innovation (CI), Organizational Innovation (OI), Model Innovation (MI) and Content Innovation (CN) on Educational Management Innovation (EMI) through multiple linear regression analysis.

Descriptive Statistics and Correlation Analysis

The means, standard deviations and Pearson product-moment correlation coefficients for the main variables are presented in Table 1. The descriptive statistics results indicate that respondents' perceptions of the four innovation dimensions and Educational Management Innovation (EMI) are at a moderately high level (means ranging from 3.62 to 3.76 on a 1-5 scale). Among them, the perceived level of Model Innovation (MI) is the highest ($M = 3.76$, $SD = 0.89$), while Conceptual Innovation (CI) is relatively the lowest ($M = 3.62$, $SD = 1.03$). The standard deviations of each variable suggest reasonable data variation, meeting the conditions for further statistical analysis.

In Table 1, the correlation analysis results show that all four independent variables have a significantly positive correlation with the dependent variable "Educational Management Innovation (EMI)" ($p < 0.01$), with correlation coefficients ρ ranging from 0.317 to 0.396, indicating low-to-moderate correlations. This provides preliminary support for the subsequent regression analysis. Among them, Conceptual Innovation (CI) shows the highest correlation with Educational Management Innovation ($r = 0.396$). The correlation coefficients among the

independent variables range from 0.270 to 0.406, showing low-to-moderate correlations and it is

preliminarily judged that there is no severe multicollinearity issue.

Table 1: Descriptive Statistics and Inter-variable Correlation Matrix (N = 411)

Variable	Mean	Standard Deviation	1	2	3	4	5
Conceptual Innovation	3.620	1.0271	1				
Organizational Innovation	3.700	0.9539	0.285	1			
Model Innovation	3.761	0.8888	0.406	0.342	1		
Content Innovation	3.725	0.9313	0.331	0.270	0.379	1	
Educational Management Innovation	3.717	0.9473	0.396	0.317	0.375	0.354	1

Reliability and Validity Tests

To ensure the reliability and validity of the measurement instruments, this study first conducted reliability and validity tests on the scales.

Reliability Analysis

Cronbach's alpha coefficient was used to assess the internal consistency of each scale. The results

show that the alpha coefficient for the Conceptual Innovation (CI) scale was 0.894, Organizational Innovation (OI) was 0.867, Model Innovation (MI) was 0.866, Content Innovation (CN) was 0.876 and Educational Management Innovation (EMI) was 0.882. All coefficients exceeded the acceptable threshold of 0.70, indicating excellent reliability for all scales, with results presented in Table 2.

Table 2: Reliability and Confirmatory Factor Analysis

Variable	Items	Factor Loading Range	CR
Conceptual Innovation	CI1 - CI5	0.865-0.878	0.894
Organizational Innovation	OI1 - OI5	0.832-0.85	0.867
Model Innovation	MI1-MI5	0.831-0.846	0.866
Content Innovation	CN1-CN5	0.846-0.855	0.876
Educational Management Innovation	EMI1-EMI5	0.85-0.867	0.882
Model Fit Indices	$\chi^2/df = 4.264$, CFI = 0.829, TLI = 0.811, RMSEA = 0.059, SRMR = 0.072		

Note: CI = Conceptual Innovation; OI = Organizational Innovation; MI = Model Innovation; CN = Content Innovation; EMI = Educational Management Innovation; CR = Composite Reliability; χ^2/df = Normed Chi-square; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Square Residual.

Confirmatory Factor Analysis

Prior to testing the structural relationships, a Confirmatory Factor Analysis (CFA) was conducted using AMOS 24.0 to assess the validity of the measurement model for the five latent constructs: Conceptual Innovation (CI), Organizational Innovation (OI), Model Innovation (MI), Content Innovation (CN) and Educational Management Innovation (EMI). The purpose was to confirm that the observed indicators reliably measured their intended theoretical constructs.

The initial model showed an acceptable but improvable fit to the data. After incorporating modifications based on theoretical justification and modification indices (e.g., allowing correlation between error terms of items within the same construct that shared similar wording), the final measurement model demonstrated a reasonable fit. The fit indices were as follows: $\chi^2/df = 4.264$, Comparative Fit Index (CFI) = 0.829, Tucker-Lewis Index (TLI) = 0.811, Root Mean Square Error of Approximation (RMSEA) = 0.059 and Standardized Root Mean Square Residual (SRMR) = 0.072. Although the CFI and TLI values were slightly below the ideal threshold of 0.90, the RMSEA and

SRMR met the acceptable criterion of below 0.08 and 0.08 respectively. Considering the complexity of the model and sample size, the overall fit was deemed adequate for proceeding with further analysis.

Crucially, factor scores for each latent variable were saved using the Regression Method (Thomson's method) in AMOS. These scores, which represent each respondent's standing on the construct while accounting for measurement error, were then exported and used as the input data for the subsequent multiple linear regression analysis to test the research hypotheses.

Hypothesis Testing: Multiple Linear Regression Analysis

To examine the direct effects of conceptual, organizational, model and content innovation on educational management innovation, multiple linear regression analysis was employed. The four independent variables were simultaneously entered into the regression equation.

Table 3 presents the overall model fit. As shown in Table 3, the regression model was significant ($F[4,406] = 36.021$, $p < 0.001$), with an adjusted R^2 of 0.255. This indicates that the four innovation

dimensions collectively explain 25.5% of the variance in educational management innovation. The Durbin-Watson statistic of 1.857 suggests no autocorrelation in the residuals.

The regression coefficients for each independent variable are displayed in Table 4. Conceptual Innovation ($\beta = 0.229$, $p < 0.001$), Organizational Innovation ($\beta = 0.148$, $p = 0.002$), Model Innovation ($\beta = 0.164$, $p = 0.001$) and Content Innovation ($\beta = 0.177$, $p < 0.001$) all had significant positive effects on educational management innovation. To further confirm the robustness of the analysis, Variance Inflation Factor (VIF) values were examined. As presented in Table 4, all VIF values were below 1.5, indicating that multicollinearity is not a concern.

a) Overall Significance of the Regression Model

The analysis of variance (ANOVA) results for the regression model was significant ($F(4, 406) = 36.021$, $p < 0.001$), indicating that the overall regression equation is valid. As shown in Table 3, the multiple correlation coefficient R for the model was 0.512, the coefficient of determination (R^2) was 0.262 and the adjusted R^2 was 0.255. This means the four innovation dimensions collectively explain 25.5% of the variance in educational management innovation, representing a moderate level of explanatory power in social science research. The Durbin-Watson test statistic was 1.857, very close to 2, indicating no autocorrelation in the model residuals and satisfying the assumption of independence for regression.

Table 3: Summary of Overall Model Fit for Regression

R	R ²	Adjusted R ²	Std. Error of the Estimate	F Change	df1	df2	p	Durbin-Watson
0.512	0.262	0.255	0.8178	36.021	4	406	0.000	1.857

Note: R = Multiple Correlation Coefficient; R² = Coefficient of Determination; Adjusted R² = Adjusted R²; Std. Error = Standard Error of the Estimate; F Change = F-statistic for the Model; df1, df2 = Degrees of Freedom (numerator, denominator); p = Significance Level of the F-test; Durbin-Watson = Durbin-Watson statistic for testing autocorrelation.

b) Direct Effects Tests (H1-H4)

The regression coefficients and significance test results for each variable are shown in Table 4 and Figure 2. While controlling for the other variables:

- i) The standardized regression coefficient for Conceptual Innovation (CI) was $\beta = 0.229$ ($t = 4.753$, $p < 0.001$), indicating a significantly positive effect on Educational Management Innovation. Hypothesis H1 was supported.
- ii) The standardized regression coefficient for Organizational Innovation (OI) was $\beta = 0.148$ ($t =$

3.194, $p = 0.002$), indicating a significantly positive effect. Hypothesis H2 was supported.

iii) The standardized regression coefficient for Model Innovation (MI) was $\beta = 0.164$ ($t = 3.291$, $p = 0.001$), indicating a significantly positive effect. Hypothesis H3 was supported.

iv) The standardized regression coefficient for Content Innovation (CN) was $\beta = 0.177$ ($t = 3.717$, $p < 0.001$), indicating a significantly positive effect. Hypothesis H4 was supported.

Dependent Variable: Educational Management Innovation (EMI).

Table 4: Multiple Linear Regression Coefficient Analysis

Variable	B	SE	β	t	Sig.	Tolerance	VIF
(Constant)	1.081	0.228		4.744	<.001		
CI	0.211	0.044	0.229	4.753	<.001	0.783	1.278
OI	0.147	0.046	0.148	3.194	0.002	0.843	1.187
MI	0.175	0.053	0.164	3.291	001	0.732	1.366
CN	0.180	0.048	0.177	3.717	<.001	0.805	1.242

Note: CI = Conceptual Innovation; OI = Organizational Innovation; MI = Model Innovation; CN = Content Innovation; B = Unstandardized Regression Coefficient; SE = Standard Error; β = Standardized Regression Coefficient; t = t-statistic; Sig. = Significance Level; Tolerance = Tolerance statistic; VIF = Variance Inflation Factor.

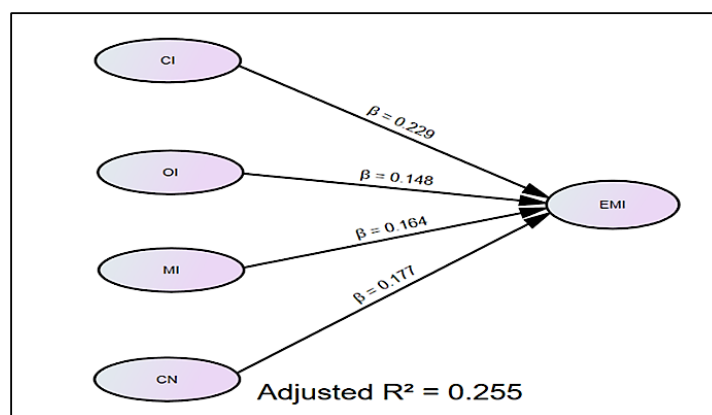


Figure 2: The Four-Dimensional Driving Model of Educational Management Innovation with Standardized Path Coefficients (CI = Conceptual Innovation; OI = Organizational Innovation; MI = Model Innovation; CN = Content Innovation; EMI= Educational Management Innovation)

C) Comparison of Effect Strengths (Hypothesis H5)

Based on the magnitude of the standardized regression coefficients (β values), the order of influence strength of the four independent variables on Educational Management Innovation is as follows: Conceptual Innovation ($\beta = 0.229$) > Content Innovation ($\beta = 0.177$) > Model Innovation ($\beta = 0.164$) > Organizational Innovation ($\beta = 0.148$). This indicates that, in the process of driving educational management innovation, conceptual innovation contributes relatively the most and there are significant differences in the influence strengths among the dimensions. Therefore, Hypothesis H5 is supported.

d) Model Diagnostics: Multicollinearity and Residual Analysis

To ensure the robustness of the regression results, rigorous model diagnostics were conducted.

Multicollinearity Diagnostics: As shown in Table 4, the Variance Inflation Factor (VIF) for all independent variables ranges from 1.187 to 1.366 and the Tolerance values are all far greater than 0.1, well below the critical thresholds of $VIF > 10$ and $Tolerance < 0.1$. Further collinearity diagnostics show that the maximum Condition Index is 14.075 (< 30). All indicators consistently indicate the absence of severe multicollinearity issues among the independent variables and the regression coefficient estimates are stable and reliable.

Residual Analysis: The mean of the standardized residuals is 0, with a standard deviation of 0.995, approximately following a standard normal distribution. The maximum absolute value is 3.294 and the minimum is -3.294. Although a few

extreme values slightly exceed ± 3 , this is generally acceptable for a large sample ($N=411$) and no obvious patterns of heteroscedasticity or non-linearity were detected.

This section systematically reports the empirical analysis results of the study. First, the correlation analysis provided preliminary support for the research hypotheses. Second, the reliability and validity tests confirmed that the measurement instruments are reliable and valid. Finally, the results of the multiple linear regression analysis support all five research hypotheses (H1-H5): Conceptual, Organizational, Model and Content Innovation all have independent, significant and positive direct effects on Educational Management Innovation. Among these, the driving effect of conceptual innovation is the most prominent, revealing the core value of conceptual leadership in driving innovation within the educational management of vocational colleges. These findings provide solid empirical evidence for understanding the multiple parallel driving mechanisms of educational management innovation.

Discussion

Rooted in the contemporary context of China's education development moving towards connotation-based growth and modernization of governance, this study addresses the "fragmented" limitations in existing research on the driving mechanisms of educational management innovation by proposing an integrated "Four-Dimensional Drive" analytical framework. Through a questionnaire survey and empirical analysis using administrators from a vocational

college in Inner Mongolia Autonomous Region as the sample, this research systematically examined the parallel direct effects and relative importance of conceptual, organizational, model and content innovation on educational management innovation. This section aims to summarize the core findings, delve into their theoretical implications and practical insights and reflect on the study's limitations to outline directions for future research.

Major Research Findings

Through rigorous empirical analysis, this study arrived at the following core conclusions, with all five research hypotheses being supported:

All Four Dimensions of Innovation Have Independent Driving Effects: Multiple linear regression analysis confirmed that conceptual innovation, organizational innovation, model innovation and content innovation all have significant positive direct effects on educational management innovation. This finding robustly supports the core argument of this study: educational management innovation is a systematic project driven by multiple dimensions in synergy; no single dimension of innovation is sufficient to explain its entirety. Together, these four innovation dimensions explain 25.5% of the variance in educational management innovation, constituting a significant set of antecedent variables.

Relative Strength of the Four-Dimensional Drive Varies: The research further revealed that the influence strength of the four driving dimensions is not equal. Their order of contribution is: Conceptual Innovation ($\beta = 0.229$) > Content Innovation ($\beta = 0.177$) > Model Innovation ($\beta = 0.164$) > Organizational Innovation ($\beta = 0.148$). This ranking indicates that, within the management context of vocational colleges, innovation at the level of ideas and cognition (conceptual innovation) serves as the most powerful engine for initiating and guiding overall management innovation.

Discussion of Theoretical Contributions

The study moves beyond a simple aggregation of factors by offering a parsimonious yet comprehensive architecture for understanding educational management innovation. It integrates four previously studied but often isolated dimensions—conceptual, organizational, model

and content innovation—into a coherent, testable framework (20). This “Four-Dimensional Drive” model enhances current innovation theories in several keyways:

Constructed and Validated an Integrated Driving Model: This study transcends the limitations of previous research that explored single innovation dimensions in isolation. For the first time, it places four key dimensions—conceptual, organizational, model and content—within the same empirical framework and validates their roles as parallel driving factors. This provides a more systematic and comprehensive analytical tool for understanding the complex phenomenon of educational management innovation, promoting the evolution of related theories from “discrete analysis” towards an “integrative framework. “Furthermore, the validated ‘Four-Dimensional’ framework moves beyond a simple aggregation of isolated factors. It posits a logical, system-level architecture of innovation drivers—from cognitive guidance(concept) to structural support (organization), to methodological translation(model) and finally to substantive output (content). This architecture provides a more theoretically grounded and operationally clear lens than alternative, potentially overlapping or less distinct sets of factors, for diagnosing and planning management innovation initiatives.

Revealed the Primacy of “Conceptual Leadership,” Deepening Understanding of the Innovation Process: The finding that conceptual innovation has the strongest driving effect holds significant theoretical importance. It supports and deepens the “cognition-first” theory of organizational change, suggesting that within the educational organizational field, shifts in managers’ values, strategic thinking and goal paradigms serve as the foundational impetus for subsequent structural and operational changes. This insight suggests future research should pay closer attention to the core role of leaders’ cognitive frameworks and sense-making processes during the initiation phase of innovation.

Clarified the Functional Positioning and Sequence of Effects for Different Innovation Dimensions: The results show that, in terms of direct effects, the influence of content and model innovation is slightly higher than that of organizational innovation. This might imply that in

the current context of vocational colleges pursuing high-quality development, updating “content” directly related to teaching quality and educational outcomes and innovating “models” to enhance management efficiency (21), are perceived as more urgent and their visible results are more readily translated into improvements in management effectiveness. In contrast, the impact of deeper-level changes, such as organizational structure and culture, might be more indirect or require a longer timeframe to manifest. This provides empirical clues for understanding the short-term utility of different types of innovation.

Providing a Systematic Diagnostic and Analytical Lens: Traditional theories often examine these drivers in silos (e.g., leadership theories focus on concepts, structural theories on organization) (22). Our integrated model allows researchers and practitioners to diagnose an institution’s innovation status simultaneously across all four core domains, identifying potential misalignments (e.g., advanced concepts with outdated models) that single-dimension perspectives would miss. It shifts the question from “Is there innovation in leadership?” to “How is innovation balanced and synergistic across the conceptual, structural, procedural and substantive core of management?”

Clarifying Functional Sequence and Interdependence: The model posits a logical, process-oriented sequence from guiding ideas (Conceptual) to enabling structures (Organizational), to operational methods (Model) and finally to core outputs (Content). This theorized progression enhances innovation theory by suggesting not just what drivers exist, but how they might logically interact and feed into one another in a value chain of innovation implementation. It provides a testable hypothesis for the flow of innovation within organizations.

Empirically Validating Relative Weights within an Integrated System: While previous research might hypothesize the importance of, say, conceptual leadership, our model allows for the empirical comparison of the relative strength (β values) of parallel drivers within the same system. The finding that conceptual innovation exerts the strongest direct effect ($\beta=0.229$) within the integrated model provides nuanced, evidence-based support for “cognition-first” or paradigm-driven theories of change, while simultaneously

contextualizing the role of other necessary drivers like content and model innovation. This moves theory from debating which single factor is most important towards understanding how much each contributes within a multi-factor ecosystem.

Therefore, achieving the transition “from fragmentation to integration” necessitates providing a unified framework, which marks a step towards a more comprehensive and actionable theory of educational management innovation.

Practical Implications

Based on the above conclusions, this study offers the following practical implications for vocational colleges and broader educational management institutions:

Adhere to “Concept First,” Strengthen Strategic Consensus: Institutional leaders should prioritize shaping forward-thinking educational philosophies and management ideologies at the forefront of innovation efforts (23). Through continuous learning, discussion and communication, a high degree of consensus on the direction of reform and innovation should be fostered within the management team and even the entire institution. This clears cognitive barriers for subsequent change initiatives and provides powerful “soft” driving force.

Implement an Innovation Strategy of “Differential Focus and Coordinated Advancement”: Managers can refer to the “influence ranking” identified in this study to establish priorities for innovation strategy when resources are limited (24). Priority should be given to ensuring and investing in conceptual innovation activities that can lead the direction, focusing on deploying content and model innovation projects directly related to core operations, while simultaneously planning supportive organizational innovations. This helps create a virtuous cycle of “concept leading – operational breakthrough – organizational support,” maximizing the effectiveness of innovation-driven efforts.

Establish a “Four-Dimensional Linkage” Normalized Innovation Mechanism: Institutions should avoid piecemeal, ad-hoc innovation (“treating the head when the head aches and the foot when the foot hurts”) and strive to build a governance mechanism that enables the four dimensions of innovation to mutually stimulate and co-evolve. For example, establishing cross-

departmental innovation incubation teams (organizational innovation) specifically tasked with translating new educational ideas (conceptual innovation) into concrete curriculum projects (content innovation) and management systems (model innovation) can systematize and institutionalize the driving force of innovation (25).

Research Limitations and Future Directions

While this study strives for rigor, it has certain limitations, which point the way for future research:

Limitations of Research Design: First, this study employs cross-sectional data. While it can examine correlations and direct effects between variables, it cannot conclusively establish the temporal sequence of causality (26). Second, the sample is drawn from a single institution in a single region. Although this helps control for external variables, the generalizability of the findings needs to be tested in different types of educational organizations across various regions.

Limitations in Variable Measurement and Mechanisms: This study primarily focuses on the direct effects of the four dimensions. However, complex interactions likely exist among them (e.g., conceptual innovation influencing organizational culture, which in turn promotes model innovation), or they might be moderated by other contextual variables (e.g., principal leadership, policy pressure). These mediating and moderating mechanisms constitute a “black box” yet to be opened.

Based on this, future research can delve deeper in the following areas:

- a) Employ longitudinal research designs or comparative case studies to more rigorously infer causality and explore the dynamic processes of innovation driving.
- b) Expand the diversity and representativeness of the sample to test the robustness of this model across different educational stages and institutional management systems.
- c) Deeply explore the driving mechanisms: Introduce mediating variables (e.g., organizational learning, commitment to change) and moderating variables (e.g., environmental uncertainty, resource availability) to construct and test more complex chain or contextualized models, thereby fully revealing the internal pathways and

boundary conditions of the “Four-Dimensional Drive.”

Limitations Regarding Explanatory Power and Untested Variables: While the four-dimensional model explains a substantial and statistically significant portion of the variance in educational management innovation ($\text{Adj. } R^2 = 0.255$), it also implies that a considerable proportion of variance remains unaccounted for. This study intentionally focused on a parsimonious set of core internal organizational drivers. However, acknowledging this boundary, we propose that future research could significantly enhance the model’s explanatory power by integrating additional contextual and contingent factors. Specifically, variables such as leadership style, the availability of institutional resources (financial, human and time resources dedicated to innovation) and the maturity of digital infrastructure are potent candidates (27). These factors likely do not act in isolation but may function as critical moderating or mediating variables. For instance, a transformational leadership style might strengthen the relationship between conceptual innovation and its implementation, or ample resources may be a necessary condition for organizational and content innovation to flourish. Investigating how these external and internal contingency factors interact with the four core dimensions proposed here would paint a complete and more nuanced picture of the innovation ecosystem in educational institutions.

Limitation Regarding the Comparison of Effect Sizes: This study employed the comparison of standardized regression coefficients (β) to infer the relative importance of the four innovation dimensions, which is a conventional and interpretable approach in multiple regression. However, as noted in the literature on relative importance analysis, comparing β values, while informative, has certain limitations. The β coefficients can be sensitive to model specification and the correlations among predictors. To provide more robust and nuanced insights into the “dominance” of one driver over another, future research could employ more advanced statistical techniques. For instance, Dominance Analysis or Johnson’s Relative Weights Analysis could be used to decompose the total R^2 and quantify the unique and joint contribution of each predictor in a more partitioned manner. Additionally, formal statistical

tests for comparing standardized coefficients (e.g., using bootstrapping to establish confidence intervals for the differences between β) could offer stronger inferential grounds for ranking the drivers. Adopting these methods in future studies would further solidify the conclusions regarding the hierarchy of influences within the four-dimensional driving model.

Conclusion

This study aims to investigate the core driving mechanisms of educational management innovation by constructing and empirically testing an integrated “four-dimensional driving” analytical framework. Through an empirical analysis of a vocational college, the study systematically verifies that innovations in conceptual, organizational, model and content dimensions all exert significant positive effects on educational management innovation, confirming the inherently multidimensional and synergistic nature of this process. Among these dimensions, conceptual innovation demonstrates the strongest driving effect, empirically establishing the fundamental guiding role of shifts in ideas and paradigms in initiating systemic innovation.

From a theoretical perspective, this study advances the field by integrating four dimensions—often examined in isolation—into a unified empirical model, thereby transcending the limitations of single-dimensional research. The proposed “Concept–Organization–Model–Content” framework offers a logically coherent, system-level perspective for understanding educational management innovation and promotes a more integrated analytical approach within the field.

Practically, the findings provide evidence-based guidance for educational managers, emphasizing the strategic priority of “conceptual leadership and systemic coordination.” Specifically, the results suggest that educational organizations should first cultivate and consolidate forward-looking management consensus, which can then guide coordinated innovations in content, model and organizational structures, ultimately fostering a sustainable mechanism for collaborative evolution.

Several limitations should be acknowledged. The use of cross-sectional data restricts the ability to draw definitive causal inferences and the reliance

on a single-institution sample may limit the generalizability of the findings. Furthermore, this study focuses primarily on the direct effects of the four dimensions, leaving potential complex interactions and boundary conditions among them to be explored in future research.

These limitations provide clear directions for subsequent studies. Future research could employ longitudinal designs to trace causal dynamics among variables and test the generalizability of the model across different types and regions of educational institutions. Moreover, incorporating factors such as organizational learning, leadership style, or environmental uncertainty could help uncover the specific pathways and contextual conditions through which the “four-dimensional driving” framework influences management innovation, thereby opening the “black box” of its underlying mechanisms.

In summary, this study empirically establishes a four-dimensional integrated driving model of educational management innovation and highlights the central role of conceptual innovation. It not only deepens the systematic understanding of the mechanisms underlying innovation but also provides a solid theoretical foundation and actionable guidance for educational organizations seeking to plan and implement effective and sustainable innovation practices.

Abbreviations

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All work presented in this paper was completed independently by the authors, who take full responsibility for its content.

Author Contributions

Yang Shoubin: conceptualization, experimental design, data collection, data analysis, manuscript writing, ALi Khatibi: supervision of the research.

Conflict of Interest

The authors declare no conflicts of interest, including but not limited to financial funding, collaborative relationships, employment, or any other potential conflicts that may affect the objectivity and independence of this study.

Data Availability

The datasets used in this study are fully described in the article. The raw and processed data are available from the first author Yang Shoubin upon reasonable request.

Declaration of Artificial Intelligence (AI) Assistance

Artificial intelligence tools were used to assist with language polishing during the writing and revision of this manuscript. These tools were only used as auxiliary means. All research ideas, experimental design, content writing, academic viewpoints and the final version of the manuscript were completed independently by the authors, who bear full academic responsibility.

Ethics Approval

This study conducted an anonymous survey of educational administrators regarding their institutional management practices. According to Chinese regulations and current norms for social behavior research in the region, this type of research does not require formal review and approval by an institutional ethics committee because it meets the following exemption criteria:

- A. The risk to participants is extremely low.
- B. The study does not involve vulnerable groups or sensitive personal topics.
- C. Participation is entirely voluntary and anonymous; no personally identifiable information was collected at any stage.

Nevertheless, this study strictly adheres to the ethical principles outlined in the Declaration of Helsinki. Prior to participation, all respondents received a detailed information form outlining the purpose of the study, procedures and their rights. All participants signed informed consent forms; completion and return of the questionnaire constituted consent to participate. All data were analyzed and reported in aggregated form to ensure confidentiality.

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