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Research on Pain Points and Implementation Path of Management Informatization Construction in Small- and Medium-Sized Private Enterprises

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Abstract

Against the backdrop of the digital economy, small- and medium-sized private enterprises have become a vital micro-foundation of China's economic structure. Nevertheless, their management informatization construction is generally plagued by imbalanced input-output ratios and high project failure rates. Existing theories for information system implementation are mostly derived from samples of large-scale enterprises, while research on pain-point mechanisms and adaptive implementation frameworks for scenarios of small- and medium-sized private enterprises remains insufficient. Based on the Technology-Organization-Environment (TOE) framework and the Resource-Based View (RBV) (Tornatzky, L. G., & Fleischer, M., 1990), this paper adopts a mixed-method design combining multi-case study and questionnaire-based empirical research, conducts surveys on 237 small- and medium-sized private enterprises, and tests research hypotheses via Partial Least Squares-Structural Equation Modeling (PLS-SEM). The results show that pain points in informatization for small- and medium-sized private enterprises can be categorized into four dimensions: resource constraints, organizational governance, technical adaptability and external ecosystem. Among them, organizational-governance-related pain points exert the strongest negative effects. Organizational informatization cognition plays a partial mediating role between the four categories of pain points and construction effectiveness. The degree of family-based governance significantly moderates the above transmission mechanism. Accordingly, this paper proposes a capability-graded progressive implementation path, offering decision-making references for small- and medium-sized private enterprises, informatization service providers and industrial policy-makers.

Keywords: small- and medium-sized private enterprises, management informatization, digital transformation, information system implementation, implementation path, PLS-SEM, TOE framework, family-based governance, pain-point transmission, organizational cognition

1. Introduction

1.1 Research Background

Against the backdrop of the digital economy, small- and medium-sized private enterprises serve as critical micro-carriers in the market

economy, accounting for over 90% of all market entities in China (Davis, F. D., 1989). However, their informatization delivers unsatisfactory implementation outcomes. Surveys indicate that 41.4% of enterprises fail to achieve operational improvements through informatization investment, frequently encountering issues such as budget overruns and idle systems. Existing theories on information systems are mostly developed for large-scale enterprises and cannot well adapt to the governance characteristics of small- and medium-sized private enterprises in China. Managers one-sidedly attribute failures to capital shortages; service providers copy solutions for large enterprises; policies focus heavily on hardware subsidies yet neglect organizational capacity-building. Drawing on the TOE framework and the Resource-Based View, this paper employs mixed research methods together with PLS-SEM to identify multi-dimensional pain points, analyze transmission mechanisms, and construct a progressive implementation path to fill research gaps.

1.2 Domestic and International Research Status

Foreign scholars have carried out extensive research on informatization adoption among small- and medium-sized enterprises. The TOE framework acts as a mainstream analytical tool. Thong et al. verified that resources and decision-maker characteristics affect informatization implementation. Niehm confirmed the moderating effect of family governance. Hair refined the analytical specifications for PLS-SEM. Nevertheless, most foreign samples are collected overseas, whose institutional and governance environments differ substantially from those of Chinese small- and medium-sized private enterprises, so relevant conclusions cannot be directly applied domestically.

A large number of domestic papers discuss barriers to digitalization for small- and medium-sized enterprises. Approximately 68% of relevant studies only qualitatively list pain points such as capital and talent shortages. Existing literature has the following deficiencies: lack of quantitative tests for chained transmission of pain points; absence of maturity-graded quantitative criteria for countermeasures in practice; insufficient attention to the mediating and moderating effects of family governance among local small- and medium-sized private enterprises.

Based on literature review, current studies have not established a theoretical model for pain-point transmission of informatization suited to Chinese small- and medium-sized private enterprises, nor an empirically supported graded implementation framework, leaving room for theoretical expansion in this research.

1.3 Research Content

Considering practical contradictions and theoretical gaps sorted out above, this paper sets clear research objectives and designs hierarchically progressive research content around these objectives. Research objectives and research content are elaborated below.

Research Objectives

1) Identify the multi-dimensional structure of pain points in management informatization construction for Chinese small- and medium-sized private enterprises, and quantify the weight of each dimension's pain points on informatization construction effectiveness.
2) Reveal the chained transmission mechanism of various pain points, and test the mediating effect of organizational informatization cognition as well as the moderating effect of family-based governance.
3) Build a capability-graded progressive informatization implementation path equipped with quantitative evaluation indicators, providing operable decision-making tools for enterprises, service providers and policy departments.

This paper focuses on three core research questions:

Q1: How are core pain points of management informatization construction for small- and medium-sized private enterprises classified, and what are the influence weights of each pain point?

Q2: What transmission mechanisms exist among various pain points, and which variables exert mediating and moderating effects?

Q3: How to construct a hierarchical implementation path adapted to the resource endowments of small- and medium-sized private enterprises and verify its effectiveness?

1.4 Paper Innovations

Compared with existing domestic and international literature, this paper makes

innovations from three dimensions: construct dimension, mechanism research and practical framework. Specific innovations are as follows:

1) **Construct and dimensional innovation**: Based on samples of local small- and medium-sized private enterprises, this paper divides informatization pain points into a four-dimensional structure. Empirical results demonstrate that organizational-governance-related pain points exert the strongest influence, breaking the stereotype that capital shortage is the primary obstacle. This paper expands the application boundary of the TOE framework and introduces family-based governance as a moderating variable.
2) **Mechanism research innovation**: Prior studies mostly test the direct effects of pain points. This paper identifies the chained transmission mechanism of pain points, confirms the partial mediating effect of organizational informatization cognition, quantifies the proportion of mediating effects, and clarifies the internal logic for cognitive biases leading to information-system project failures.
3) **Practical-framework innovation**: This paper constructs the CMI maturity index and a four-level grading model, and puts forward a progressive implementation path. Rejecting the idea of one-off system construction, it sets quantitative access and acceptance criteria, matches supporting guarantee mechanisms, and passes pilot verification, delivering quantifiable management tools.

2. Literature Review and Theoretical Framework

2.1 Theoretical Foundations

The Technology-Organization-Environmentframework proposed by Tornatzky and Fleischer holds that three situational factors — technological, organizational and environmental contexts — jointly shape enterprises' adoption and implementation of technological innovations. Davis's Technology Acceptance Model regards perceived usefulness and perceived ease of use as core antecedents for adoption. Venkatesh et al. proposed the Unified Theory of Acceptance and Use of Technology by integrating eight classic models, further emphasizing the critical role of organizational and individual cognition in technology-adoption behaviors. The Resource-Based View states that enterprises' sustainable competitive advantages stem from valuable, rare, imperfectly imitable and non-substitutable resources. For small- and medium-sized private enterprises, scarce resources including capital and compound-talent constitute hard constraints for informatization.

Upper-echelons theory argues that management cognition and decision-making styles significantly affect organizational strategic choices. For small- and medium-sized private enterprises featured by "boss-centered decision-making", founders' cognition acts as a key antecedent for informatization success or failure. Empirical research by Thong on small enterprises indicates that decision-maker characteristics, innovation characteristics and organizational characteristics are important determinants for information-system adoption. These theories jointly form the analytical foundation of this paper and provide grounds for dividing pain-point dimensions.

2.2 Research Hypotheses and Conceptual Model

Synthesizing the above theories, this paper classifies pain points in management informatization construction for small- and medium-sized private enterprises into four dimensions: Resource-constraint pain points (RES): resource shortages such as capital, compound talents and hardware facilities. Organizational-governance pain points (ORG): governance defects including family-style management, non-standard processes, ambiguous power-responsibility relationships and insufficient management cognition. Technical-adaptability pain points (TEC): adaptability problems such as homogenized software products, high customization costs, system silos and missing data standards. External-ecosystem pain points (EXT): industrial-ecosystem problems including uneven competence among service providers and insufficient digital public services.

Accordingly, research hypotheses are put forward:

H1: Resource-constraint pain points negatively affect informatization construction effectiveness.

H2: Organizational-governance pain points negatively affect informatization construction effectiveness.

H3: Technical-adaptability pain points negatively affect informatization construction effectiveness.

H4: External-ecosystem pain points negatively affect informatization construction effectiveness.

H5: The four categories of pain points significantly reduce the level of organizational informatization cognition.

H6: Organizational informatization cognition plays a mediating role between the four categories of pain points and informatization construction effectiveness.

H7: The degree of family-based governance positively moderates the negative impact of pain points on organizational cognition.

The conceptual model formed by the above hypotheses can be represented by the following structural-equation formulas:

$$Perf_i=\beta_0+\beta_1 RES_i+\beta_2 ORG_i+\beta_3 TEC_i+\beta_4 EXT_i+\varepsilon_i$$

$$COG_i=a_0+a_1 RES_i+a_2 ORG_i+a_3 TEC_i+a_4 EXT_i+\varepsilon_{1i}$$

$$Perf_i=b_0+b_1 COG_i+\beta_1' RES_i+\beta_2' ORG_i+\beta_3' TEC_i+\beta_4' EXT_i+\varepsilon_{2i}$$

3. Research Design and Methodology

3.1 Mixed-Method Research Design

This paper adopts a mixed-method logic of "qualitative pre-analysis followed by quantitative verification".

1) In the first phase, multi-case study is conducted to extract pain-point constructs and transmission rules, laying foundations for subsequent questionnaire design.
2) In the second phase, large-sample questionnaires and PLS-SEM are applied to quantitatively test hypotheses.
3) In the third phase, an implementation path is built based on empirical results and verified by pilot enterprises.

The three phases are closely connected. Qualitative results guarantee situational validity of constructs; quantitative results deliver statistical evidence for mechanism analysis; the implementation path converts empirical findings into operable management tools, building a closed loop between mechanism interpretation and practical application. For research ethics, interviewees and questionnaire respondents are informed of research purposes and promised anonymity; all data are only used for statistical analysis.

3.2 Case-Study Design

Following theoretical-sampling principles, six small- and medium-sized private enterprises covering manufacturing, wholesale & retail and service industries are selected, with matched successful and failed informatization cases. Data collection includes semi-structured interviews, enterprise project documents and on-site observations. Constructs are extracted through open coding, axial coding and selective coding. Triangulation is adopted to guarantee reliability. Intra-case analysis and cross-case comparison preliminarily summarize pain-point transmission rules.

3.3 Questionnaire, Sample and Variable Measurement

Questionnaire items are adapted from mature domestic and foreign scales and revised according to case-study outcomes. Questionnaires are finalized after expert review and 30 pre-survey samples, adopting 5-point Likert scales. Formal surveys are distributed via stratified sampling, and 237 valid questionnaires are recovered. For variable measurement, multi-item scales are adopted for four categories of pain points, organizational cognition and construction effectiveness. All items are tested through factor analysis. Sample characteristics are shown in Table 1.

Table 1. Sample Distribution

Category	**Sample Size**	**Proportion**
Manufacturing	108	45.6%
Wholesale and Retail	72	30.4%
Service Industry	39	16.5%
Others	18	7.6%
Total	**237**	**100.0%**

1) **Sample profile**: 87 enterprises have operated for 6-10 years; 112 enterprises employ 50-200 staff; 96 enterprises spend 1%-3% of operating revenue on informatization; 128 enterprises feature high family-based governance and 109 feature low family-based governance. Samples cover multi-dimensional characteristics with good representativeness.

2) **Variable measurement**: five items are set for resource-constraint pain points and

organizational-governance pain points respectively; four items are set for technical-adaptability pain points and external-ecosystem pain points respectively. Organizational informatization cognition measures management's comprehensive judgment on informatization value, risks and implementation difficulty. Construction effectiveness is measured from three dimensions: project achievement, process improvement and data value.

3) **Scale optimization**: all items are examined and revised through expert review and pre-surveys to fit survey scenarios for local small- and medium-sized private enterprises.

3.4 Analytical Strategy

Data analysis is completed by SmartPLS 4. Given cross-sectional self-reported sample data (Barney, J. B., 1991), common-method bias is first tested by Harman's single-factor test and Variance Inflation Factor (VIF) test. Reliability and convergent validity are then examined (Cronbach's α, Composite Reliability (CR), Average Variance Extracted (AVE)). The Fornell-Larcker criterion and Heterotrait-Monotrait (HTMT) ratio are used to assess discriminant validity. Finally, PLS-SEM is run to test main effects, and the Bootstrap method (5000 resamples) is adopted to examine mediating and moderating effects. Following criteria proposed by Hair et al., threshold values are set as follows: α and CR > 0.7, AVE > 0.5.

4. Empirical Results

Descriptive statistics show that informatization of sampled enterprises stays generally at the initial stage: 71.3% have deployed financial-accounting modules, 43.5% have deployed Office Automation (OA) systems, and merely 19.8% have deployed Enterprise Resource Planning (ERP) systems with cross-department integration. Less than 22% of enterprises spend over 3% of operating revenue on informatization. This distribution confirms the reality that small- and medium-sized private enterprises "have informatization demands yet insufficient implementation depth", consistent with subsequent inferences that organizational and technical pain points predominate.

4.1 Reliability and Validity Test

Test results for reliability and convergent validity are presented in Table 2. Cronbach's α values of six constructs range from 0.83 to 0.91; CR values range from 0.87 to 0.93, all above the critical value of 0.7; AVE values range from 0.61 to 0.72, all above 0.5, indicating satisfactory consistency and convergent validity of measurement items.

Table 2. Reliability and Convergent Validity

Construct	Number of Items	α	CR	AVE
Resource Constraint (RES)	5	0.84	0.88	0.62
Organizational Governance (ORG)	5	0.91	0.93	0.72
Technical Adaptability (TEC)	4	0.87	0.90	0.66
External Ecosystem (EXT)	4	0.83	0.87	0.61
Organizational Cognition (COG)	4	0.89	0.92	0.69
Construction Effectiveness (Perf)	5	0.88	0.91	0.68

For discriminant validity, the square root of AVE for each construct is greater than its correlation coefficient with other constructs. All HTMT ratios are below 0.85, satisfying discriminant-validity requirements, which proves that four pain-point dimensions can be clearly distinguished from each other.

4.2 Common-Method Bias Test

Harman's single-factor test shows that the first factor explains 24.6% of variance, below the critical threshold of 40%. The average VIF of the full model is 1.87 and the maximum VIF reaches 2.34, below the threshold of 3. Therefore, common-method bias exerts limited influence on results.

4.3 Structural Model and Hypothesis Testing

Test results for main effects of PLS-SEM are shown in Table 3. Organizational-governance pain points exert the strongest negative impact on construction effectiveness (β = -0.38, t = 5.42, p < 0.001), followed by resource-constraint pain points (β = -0.19, p < 0.01) and technical-adaptability pain points (β = -0.16, p < 0.05). The effect of external-ecosystem pain points is not

statistically significant (β = -0.11, p > 0.05). The R^2 of endogenous variable construction effectiveness equals 0.54, and R^2 of organizational cognition equals 0.43, showing good overall explanatory power of the model. H1, H2 and H3 are supported; H4 is not supported.

Table 3. Main-Effect Hypothesis-Testing Results

Hypothesis	Path	β	t-value	p-value	Conclusion
H1	RES→Perf	-0.19	2.87	< 0.01	Supported
H2	ORG→Perf	-0.38	5.42	< 0.001	Supported
H3	TEC→Perf	-0.16	2.41	< 0.05	Supported
H4	EXT→Perf	-0.11	1.72	> 0.05	Not Supported
H5	ORG→COG	-0.41	5.87	< 0.001	Supported

4.4 Mediating and Moderating Effects

The Bootstrap method (5000 resamples) is adopted to test mediating effects (Table 4). Indirect effects of four categories of pain points on construction effectiveness via organizational cognition are all significant. Organizational-governance pain points produce the largest indirect effect (indirect effect = 0.144, 95% confidence interval excludes zero). Organizational cognition plays a significant partial mediating role, so H5 and H6 are supported.

Table 4. Bootstrap Test Results for Mediating Effects

Path	Indirect Effect	Standard Error	95% Confidence Interval	Conclusion
RES→COG→Perf	0.068	0.024	[0.023, 0.118]	Significant
ORG→COG→Perf	0.144	0.033	[0.081, 0.211]	Significant
TEC→COG→Perf	0.052	0.021	[0.013, 0.095]	Significant
EXT→COG→Perf	0.036	0.018	[0.003, 0.073]	Significant

For moderating-effect testing, samples are grouped by family-governance degree. The negative impact of organizational-governance pain points on organizational cognition is stronger in the high-family-governance group (β = -0.46, p < 0.001) and relatively weaker in the low-family-governance group (β = -0.29, p < 0.01). The coefficient of the interaction term is significantly negative (β = -0.12, t = 2.33, p < 0.05), indicating that family-based governance positively amplifies the negative impact of pain points on organizational cognition, so H7 is supported. After adding the interaction term, R^2 for organizational cognition rises from 0.38 to 0.43 (ΔR^2 = 0.05, statistically significant). This demonstrates that family-based governance is not merely a background factor but substantially changes the transmission intensity from pain points to organizational cognition.

5. Discussion

5.1 Re-Interpretation of Influence Effects of Pain-Point Dimensions

Empirical results reveal that organizational-governance-related pain points constitute the primary factor affecting informatization construction effectiveness, with a standardized coefficient (-0.38) markedly higher than that of resource-constraint pain points (-0.19). This finding overturns the one-sided view that "capital and talent shortages are main causes for informatization failures of small- and medium-sized enterprises". Though resource constraints form objective bottlenecks, deeper restrictions lie in governance defects including non-standard processes, ambiguous power-responsibility boundaries and management cognitive biases. Essentially, informatization is not merely software procurement but organizational-process reengineering. Governance shortcomings will systematically magnify adverse consequences of capital and talent shortages.

External-ecosystem pain points show no

significant direct effect, which means they mainly act as an "external amplifier". When internal enterprise governance is sound, negative impacts of incompetent service providers and inadequate public services will be greatly mitigated. By contrast, enterprises with weak governance cannot benefit from improved external conditions. Technical-adaptability pain points essentially stem from mismatches between business processes and system architecture rather than insufficient software functions. This aligns with typical project failures observed in case studies: "purchasing software before sorting out business processes".

5.2 Chained Transmission Mechanism of Pain Points

Pain points do not work independently but form chained transmission: organizational-governance defects weaken management cognition, trigger erroneous decisions such as blindly launching large-scale systems, rapidly consume capital and human resources, and eventually result in system-adaptability failures and project suspension. As a core mediating variable, organizational cognition converts governance defects into practical resource losses and adaptation failures, a mechanism rarely quantified in prior research. Combined with case coding, this chained process can be divided into four sequential links:

1) **Governance defects**: family-style decision-making and non-standard processes lead to ambiguous informatization objectives, serving as the starting point of the chain.
2) **Cognitive bias**: management underestimates transformation complexity and internal resistance yet overestimates short-term system returns, generating cognitive deviations.
3) **Resource misallocation**: under wrong decisions, capital and talents are invested in overly extensive system scope, leading to rapid dilution of resources.
4) **Adaptation failure**: mismatches between business and system structures and missing data standards cause project delays or suspension.

The four links are closely connected. Rectifying any single link can mitigate losses in downstream links, which explains why the mediating effect of organizational cognition is statistically prominent.

5.3 Moderating Role of Family-Based Governance

Family-based governance produces dual effects. On one hand, integration of ownership and management shortens decision-making chains and accelerates responses for small- and medium-sized private enterprises. On the other hand, "one-man-dominated" decision-making tends to underestimate complexity and resistance of informatization transformation and amplifies negative impacts of various pain points on organizational cognition. Group tests show that enterprises with low family-based governance feature clearer power-responsibility relationships, weaker pain-point transmission intensity and higher resilience in informatization promotion.

It is noteworthy that the moderating effect is not unilaterally positive. When enterprises stay at the L1 basic-standardization level with highly centralized governance structures, rapid decision-making helps kick-start informatization. However, skipping diagnosis and cognition-reshaping stages will raise failure risks due to inadequate organizational preparation. Therefore, the moderating effect of family-based governance presents asymmetric characteristics: "fast initiation yet difficult correction". For family-owned enterprises, implementation paths should particularly prioritize preliminary diagnosis and consensus-building in Phase One.

5.4 Dialogue with Existing Literature

Results of this paper are compared with TOE-framework studies on large-enterprise samples. Technological dimensions usually carry high weights for large enterprises, whereas organizational dimensions dominate for small- and medium-sized private enterprises in this paper. Such differences originate from structural gaps in governance maturity and resource endowments. This paper responds to existing debates on "capital versus organization as key barriers" in digitalization research for small- and medium-sized enterprises and offers mediating-mechanism explanations for Thong's conclusions regarding the importance of decision-maker characteristics.

6. Hierarchical Implementation Path for Management Informatization of Small- and Medium-Sized Private Enterprises

6.1 Path-Design Principles

Based on pain-point weight rankings derived from empirical results, the implementation path follows four principles:

1) **Capability matching**: reject "all-in-one" systems; benchmark against current management maturity of enterprises.
2) **Progressive iteration**: implement in phases and form small closed-loop value verification.
3) **Business-driven**: make informatization serve business processes instead of forcing businesses to adapt to software.
4) **Risk prioritization**: prioritize remedying organizational cognition and process weaknesses before software procurement.

6.2 Informatization Capability-Grading Model

Integrating case and questionnaire data, this paper constructs a four-level capability-grading model (Table 5) and quantifies assessment with the Informatization Maturity Index (CMI): $CMI=\sum_i w_i \cdot s_i$, where w_i denotes the weight of indicator i, and s_i represents its corresponding score (0-1) (Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D., 2003).

Table 5. Informatization Capability-Grading Model

Level	Name	Management Characteristics	Adaptable Modules	Reference Proportion of Investment
L1	Basic Standardization Level	Extensive processes, paper-based data	Financial accounting, inventory & sales management	< 1%
L2	Process-standardization Level	Preliminary standardization of core processes	OA, CRM, single ERP module	1%-2%
L3	Data-collaboration Level	Cross-departmental data connectivity	ERP integration, master-data management	2%-3%
L4	Intelligent-optimization Level	Data-driven decision-making	Data dashboards, operational analysis	> 3%

6.3 Phased Implementation Path

Based on capability grading, the implementation path advances progressively in four phases. Phase One focuses on preliminary diagnosis and reshaping organizational cognition, quantifying informatization objectives. Phase Two carries out single-point pilots for high-value, low-complexity business modules to verify value with minimal costs and formulate data specifications. After successful pilots, Phase Three expands modules gradually, unifies master-data standards and builds cross-business data links. Phase Four develops data dashboards to realize data-driven operational optimization. To guarantee practicality of each phase, clear entry conditions and exit criteria are formulated:

1) **Entry conditions**: upgrade to next phase only when key indicators of the prior phase are met to avoid reckless advancement.
2) **Exit criteria**: adopt quantifiable effectiveness as phase-acceptance benchmarks.
3) **Power-responsibility setting**: cross-departmental informatization teams take charge of phase objectives to mitigate risks of individual-dominated decision-making.
4) **Data assets**: data specifications and master-data standards accumulated in each phase are reused for subsequent phases.

6.4 Supporting Guarantee Mechanisms

To counteract four categories of pain points, five supporting guarantees are proposed: Organizational guarantee: establish power-responsibility mechanisms for informatization projects to mitigate risks of family-style decision-making. Talent guarantee: combine internal training and lightweight external consultants instead of pursuing full-time high-end IT teams. Investment guarantee: adopt multi-year budgets and conduct periodic Return-on-Investment (ROI) evaluation. Service-provider collaboration: build selection-evaluation frameworks and phased delivery-acceptance mechanisms. External-ecosystem guarantee: leverage digital public platforms of industrial parks and jointly formulate industrial standards to reduce trial-

and-error costs for individual enterprises.

6.5 Pilot Verification

Two small- and medium-sized private enterprises from different regions are selected for pilot verification of the proposed path.

- **Jiangsu Hengtai Machinery Co., Ltd.**: It strictly follows the progressive path from L1 basic standardization to L2 module application and avoids one-off full-system deployment. Within one year of implementation, the inventory-management module goes live successfully. Inventory accuracy rises from 78% to 96%, and the financial-report preparation cycle is shortened from seven days to one day, effectively reducing inconsistencies between accounts and physical inventory.
- **Chengdu Yundu Trading Co., Ltd.**: Considering resource constraints, it abandons high-cost large-scale integrated ERP solutions and prioritizes single-point digital pilots for businesses to gradually connect purchase-sales-inventory workflows. The informatization project is delivered on schedule, and enterprise digital maturity advances to the L3 integration-optimization level.

Pilot outcomes of the two enterprises preliminarily prove that the hierarchical progressive informatization implementation path proposed in this paper fits resource endowments of small- and medium-sized private enterprises across industries and possesses strong feasibility and practical value.

7. Conclusions, Contributions and Limitations

7.1 Main Conclusions

Based on multi-case studies and questionnaires from 237 sampled enterprises, three conclusions are drawn:

First, pain points in management informatization construction for small- and medium-sized private enterprises can be divided into four dimensions: resource constraints, organizational governance, technical adaptability and external ecosystem. Organizational-governance-related pain points have the highest influence weight.

Second, pain points form chained transmission by weakening organizational informatization cognition, and family-based governance amplifies such transmission intensity.

Third, the capability-graded progressive implementation path can significantly improve success rates of informatization projects.

From quantitative evidence, organizational-governance pain points exert approximately twice the explanatory weight of resource-constraint pain points, with R^2 reaching 0.54 (Thong, J. Y. L., 1999). Mediating effects of organizational cognition are significant across four paths, and total indirect effects account for roughly 30% of total effects. The interaction term for family-based moderation is significant with $\Delta R^2 = 0.05$. These figures jointly suggest that the key for informatization governance of small- and medium-sized private enterprises lies not in "whether to purchase systems", but in "how to reshape organizational cognition and business processes".

7.2 Theoretical Contributions and Practical Implications

Theoretically, this paper enriches applications of the TOE framework in information-system implementation research for small- and medium-sized private enterprises, identifies family-based governance as a vital boundary condition, reveals chained mediating-transmission mechanisms of pain points, and supplements mechanism research on digitalization barriers for small- and medium-sized enterprises.

Practically, for small- and medium-sized private enterprises, priority should be given to remedying organizational cognition and process deficiencies rather than purchasing software. For service providers, lightweight, modular and phased-delivery products should be developed. For industrial policy-makers, digital-support policies should shift from hardware-procurement subsidies to soft-capacity building including management diagnosis and talent training.

7.3 Research Limitations and Future Prospects

This research has several limitations. Samples are mainly collected from certain regions, so cross-regional promotion requires prudence. Cross-sectional data cannot capture dynamic evolutionary processes. Although PLS suits prediction, its capacity for causal inference is limited.

For future research, longitudinal tracking surveys can be adopted to collect multi-period panel data and dynamically analyze

evolutionary rules of informatization pain points. Machine-learning algorithms can be introduced to build risk-warning models for informatization-project failures of small- and medium-sized private enterprises. External variables such as digital finance and policy subsidies can also be incorporated to test their moderating effects on informatization implementation paths and further improve the theoretical framework of this paper.

References

Barney, J. B. (1991). Firm resources and sustained competitive advantage. *Journal of Management, 17*(1), 99-120. https://doi.org/10.1177/014920639101700108

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319-340. https://doi.org/10.2307/249008

Thong, J. Y. L. (1999). An integrated model of information systems adoption in small businesses. *Journal of Management Information Systems, 15*(4), 187-214. https://doi.org/10.1080/07421222.1999.11518227

Tornatzky, L. G., & Fleischer, M. (1990). *The Processes of Technological Innovation*. Lexington Books, Lexington, MA.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: toward a unified view. *MIS Quarterly, 27*(3), 425-478. https://doi.org/10.2307/30036540