Paradigm Academic Press
Frontiers in Management Science
ISSN 2788-8592
SEP. 2026 VOL.5, NO.5

Research on Optimization of Collaborative Management Between Human Resources and Finance in Small- and Medium-Sized Enterprises

Lei Fang[1]

[1] Hainan Yahong Industrial Co., Ltd., Haikou 570000, China

Correspondence: Lei Fang, Hainan Yahong Industrial Co., Ltd., Haikou 570000, China.

doi:10.63593/FMS.2788-8592.2026.09.003

Abstract

Small- and medium-sized enterprises (SMEs) constitute the micro-entities of the national economy. By the end of 2024, the number of domestic SMEs in China exceeded 60 million, contributing more than half of tax revenues, 60% of GDP and 80% of urban employment. Nevertheless (Barney, J. B., 1991), SMEs are generally plagued by functional segmentation between human resources (HR) and finance. Disconnection between human resource planning and capital control exacerbates financing constraints, human-resource cost stickiness and operational risks. Drawing on the resource-based view, synergetics and cost-stickiness theory, this paper establishes a human-finance collaborative framework and constructs a four-dimensional indicator system covering strategy, process, information and assessment. Based on panel data of enterprises listed on the Small- and Medium-sized Enterprise Board and the New Third Board from 2018 to 2023 (Huselid, M. A., 1995), this study adopts two-way fixed-effect models, chain-mediation and moderation-effect models as well as system dynamics simulation. The empirical results show that a one-standard-deviation increase in the collaboration degree raises the return on total assets by 0.83 percentage points and significantly reduces cost stickiness (Anderson, M. C., Banker, R. D., & Janakiraman, S. N., 2003). Human-capital allocation and cash-flow stability exert chain-mediating effects; digital transformation positively moderates collaborative benefits, whereas family governance produces negative moderating effects. Accordingly, this paper proposes a layered and progressive lightweight collaborative scheme. This study expands the application of collaborative-management theory in the SME context and provides quantitative evidence for breaking down departmental barriers and optimizing resource allocation.

Keywords: small- and medium-sized enterprises, human resource management, financial management, collaborative management, cost stickiness, system dynamics, cash-flow stability, digital transformation

1. Introduction

1.1 Research Background

SMEs are a vital force of the national economy. By the end of 2024, the quantity of domestic SMEs surpassed 60 million, featuring the well-know (Haken, H., 1983); economic contribution pattern. Despite the continuous expansion of inclusive micro-and-small credit, SMEs still suffer high financing costs and inefficient internal resource allocation. Internal segmentation between human-resource and financial departments prevails within enterprises. Human-resource decisions lack financial-return evaluation, while financial budgeting fails to consider the long-term value of human capital, pushing up human-resource cost stickiness and aggravating cash-flow risks. Therefore, building a human-finance collaborative-management system adapted to SMEs resource constraints is of great practical significance for improving operational resilience.

1.2 Domestic and International Research Status

Foreign scholars have conducted extensive research on high-performance human-resource management, cost stickiness and human-finance integration. Huselid confirmed that high-performance work practices can significantly improve corporate profits; Anderson et al. proposed the cost-stickiness theory; Boudreau & Ramstad advocated incorporating financial-return assessment into human-capital decision-making. OECD reports indicate that functional fragmentation and insufficient cross-department collaboration suppress SMEs production efficiency.

Existing domestic literature mostly focuses on industry-finance integration and human-resource budget control for large-scale groups, and separately verifies the driving factors of human-capital value and cost stickiness. In general, existing studies tend to isolate human-resource and financial behaviors. Quantitative measurement of the collaboration level between the two domains remains scarce, and lightweight collaborative schemes are underdeveloped. Moreover, most existing research draws samples from large enterprises and cannot accommodate SMEs constraints of limited resources and simple organizational structures.

1.3 Research Questions

Given the above-mentioned theoretical gaps and practical management pain points of SMEs, this paper puts forward three core research questions:

1) How to construct a collaborative-evaluation indicator system for human resources and finance adapted to SMEs resource constraints so as to realize quantitative measurement of collaboration level?
2) Through what intermediate transmission mechanisms does human-finance collaborative management exert influences on SMEs operational performance and cost stickiness?
3) How do situational factors including digitalization level, family governance and industry attributes moderate the implementation effects of human-finance collaboration?

1.4 Research Innovations

The marginal contributions of this paper are reflected in three aspects:

1) **Scenario and indicator innovation**: This research extends collaborative-management research to SMEs and builds a four-dimensional indicator system measuring collaboration degree from strategy, process, information and assessment perspectives in consideration of resource constraints. It remedies the deficiency of existing literature which mainly targets large-scale groups and lacks quantitative tools for SME collaboration.
2) **Mechanism-identification innovation**: This paper unpacks the black box of the transmission channel through which collaboration affects performance. It introduces cost stickiness as a key intermediate outcome variable and reveals the chain transmission path of human-finance collaboration optimized human-capital allocation stable cash flow improved operational performance, clarifying the internal mechanism of collaborative management.
3) **Research-method and practical-scheme innovation**: This paper combines panel econometrics with system-dynamics simulation, reconciling static causal identification and long-term dynamic deduction to overcome the limitations of single econometric methods. On this basis, a lightweight phased collaborative scheme is designed. It requires no additional staff or large-scale system deployment and fits SMEs resource constraints.

2. Literature Review and Theoretical Foundations

2.1 Definition of Core Concepts

This paper defines SMEs according to standards issued by the Ministry of Industry and Information Technology and excludes large-enterprise samples. Human resource management shapes organizational capabilities through human-resource planning, recruitment, compensation and performance management. Financial management focuses on budgeting, cost control, cash-flow and risk management to realize optimal capital allocation. Human-finance collaborative management refers to the two-way linkage between human-resource activities and financial resources in strategy, process, information and assessment dimensions, eliminating resource mismatch and internal friction arising from independent departmental decision-making.

2.2 Review of Relevant Literature

2.2.1 Research Venues

From the human-resource perspective, high-performance work practices can reduce employee turnover and improve operational performance. Based on samples of nearly one thousand enterprises, Huselid verified that a one-standard-deviation improvement in high-performance practices raises per-capita profit by 4,000 US dollars and corporate market value by 18,000 US dollars. Nevertheless, such effects rely on the smooth conversion of human-resource inputs into outputs; capital constraints and departmental barriers will lower the conversion

efficiency of human-capital investment.

In the financial-management domain, cost-stickiness theory reveals asymmetric characteristics of expense changes relative to revenue fluctuations. Anderson et al. found that a 1% revenue increase triggers a 0.55% rise in SG&A expenses, whereas a 1% revenue decline only brings a 0.35% reduction in such expenses (Banker, R. D., & Byzalov, D., 2014). Human resources constitute resources with high adjustment costs; personnel retention amid market downturns aggravates human-resource cost rigidity.

2.2.2 Literature on Human-Finance Collaboration and Research Gaps

Human-resource and financial research have long developed independently. Existing collaborative studies mostly target large-scale groups and emphasize group control and resource sharing, with insufficient attention to the linkage between human-resource input and capital allocation within SMEs. Most relevant studies adopt qualitative analysis, lacking quantitative measurement of collaboration degree and mechanism testing. Three research gaps are therefore summarized:

1) **Scenario absence**: Existing collaborative mechanisms lack systematic empirical tests under SME scenarios featuring limited resources and simplified governance structures.
2) **Mechanism black box**: The intermediate variables and transmission paths through which human-finance collaboration affects corporate performance and cost stickiness have not been fully identified.
3) **Scheme vacancy**: Low-cost, implementable and phased lightweight collaborative-management solutions are scarce and cannot serve SME practices directly.

2.3 Theoretical Foundations

This paper constructs an integrated analytical framework of resource coupling-system synergy-cost response to interpret how human-finance collaboration affects SME operations:

1) **Resource coupling (Resource-Based View)**: Human capital represents heterogeneous strategic resources requiring supporting financial investment. The matching degree between the two types of resources determines whether resource potential can be converted into corporate competitive advantages.
2) **System synergy (Synergetics)**: The human-resource and financial subsystems shift from independent disorder to linked order. Synergetic order parameters reduce cross-department frictions and generate organizational gains of 1+1>2.
3) **Cost response (Cost-Stickiness Theory)**: Insufficient linkage between human resources and finance pushes up human-resource adjustment-cost rigidity. Enterprises face greater difficulty in cutting expenses amid revenue downturns, which elevates operational risks.

To sum up, the three theories correspond respectively to the resource foundation, system operation and economic consequences in this framework. They jointly support the deduction of research hypotheses and lay theoretical logic for subsequent indicator-system design and empirical analysis.

2.4 Research Hypotheses

Based on the above theories, three sets of hypotheses are proposed:

H1: Improved human-finance collaboration significantly enhances SMEs operational performance and reduces cost stickiness, namely there exists a main collaborative effect.

H2: Optimized human-capital allocation and cash-flow stability exert parallel and chain-mediating effects between collaboration and performance. Collaboration improves performance by optimizing human-capital allocation and stabilizing cash flow.

H3: Digitalization level positively moderates collaborative benefits; family governance exerts negative moderating effects; industry attributes produce differentiated moderating effects.

3. Research Design

3.1 Sample, Data and Sample Characteristics

3.1.1 Sample Screening

The sample period spans 2018-2023. Initial samples consist of enterprises listed on the SME Board and the New Third Board. ST enterprises, samples with critical missing data and enterprises with fewer than three consecutive observations are eliminated. All continuous variables are winsorized at the 1% and 99% quantiles to mitigate outlier interference. Finally, a balanced panel dataset is obtained, covering 486 enterprises and 2,916 firm-year observations.

3.1.2 Data Sources

Financial data are retrieved from the CSMAR database and corporate annual reports. Human-resource data including personnel structure, compensation and training are extracted from notes to annual reports and public disclosure documents. Since no public datasets provide human-finance collaboration indicators, special questionnaire surveys are conducted covering human-resource-budget linkage, financial review and inter-departmental data sharing. Questionnaire information is cross-validated against annual-report texts.

3.1.3 Sample Distribution Characteristics

- Industry distribution: manufacturing 47.6%, wholesale and retail trade 27.2%, information-technology services 25.2%.
- Enterprise-size distribution: small-sized enterprises 62.1%, micro-enterprises 18.4%**,** medium-sized enterprises 19.5%.

Samples cover diverse industries and enterprise sizes and satisfy data requirements for heterogeneity analysis.

3.2 Variable Definition and Measurement

The core explanatory variable is the human-finance collaboration degree. This paper establishes an evaluation system covering strategy, process, information and assessment dimensions and computes the composite collaboration index via the entropy-weight TOPSIS method.

Composite Calculation Formula for Collaboration Degree

$$SD_{it}=\sum_{j=1}^{n} w_j \cdot s_{ijt}, w_j=\frac{d_j}{\sum_{j=1}^{n} d_j}$$

Where: SD_{it}= composite human-finance collaboration score of firm i in year t; s_{ijt} = standardized value of the j-th sub-indicator for firm i in year t; w_j= weight of the j-th indicator; d_j = information-entropy redundancy of the j-th indicator; n = total number of evaluation indicators.

Note: This formula adopts the entropy-weight method to compute the composite collaboration degree from four-dimensional indicators, consistent with the collaboration-degree construction chapter in this paper.

Table 1. Evaluation Indicator System for Human-Finance Collaboration Degree

Dimension	Secondary Indicator	Indicator Description	Weight (%)
Strategic Collaboration	Human-resource planning incorporated into annual budgeting	Whether talent strategy and financial budgeting are formulated synchronously	21.3
Process Collaboration	Financial review of human-resource investment projects	Whether returns are assessed for recruitment and training inputs	26.8
Information Collaboration	Real-time sharing of human-cost ledgers	Whether human-resource and financial data are interconnected	28.9
Assessment Collaboration	Cross-department joint KPIs	Whether performance appraisal considers both human-resource and financial returns	23.0

Variable definition

The dependent variables are operational performance and cost stickiness. Operational performance is measured by return on total assets and return on equity; cost stickiness is represented by the residuals from the ABJ model regression, with larger absolute residuals indicating higher cost stickiness, and the average cost stickiness of the sample firms is 0.184. The mediating variables include human capital allocation levels and cash flow stability. The former is the logarithm of per capita training investment, with a sample mean of 1.072; the latter is the logarithm of the inverse of operating cash flow volatility.

Moderating variables are digitalization level and the family-governance dummy variable. Digitalization level is measured comprehensively by digital-input intensity (sample mean = 0.236). The family-governance dummy takes the value of 1 when family holding ratio exceeds 50%; family enterprises account for 41.2% of the sample. Control variables include firm age, firm size, asset-liability ratio, equity concentration and revenue-growth rate. Individual and year two-way fixed effects are incorporated into models. See Table 2 for definitions of other variables.

Table 2. Variable Definition and Measurement

Variable	Symbol	Measurement Approach
Return on Total Assets	ROA	Net profit / average total assets
Cost Stickiness	STICKY	Residual estimation from the ABJ model
Collaboration Degree	SD	Composite index calculated via entropy-weight TOPSIS
Human-Capital Allocation	HC	Natural logarithm of per-capita training input
Cash-Flow Stability	CF	Natural logarithm of reciprocal of operating-cash-flow volatility

3.3 Econometric Model Specification

To test the main collaborative effect, a two-way fixed-effect model is specified:

Baseline Regression Model

$$Perf_{it}=\alpha_0+\alpha_1 SD_{it}+\gamma X_{it}+\mu_i+\lambda_t+\varepsilon_{it}$$

Where: Perfit—the operating performance (return on total assets, ROA) of enterprise i in period t; SDit—the human-financial synergy degree of enterprise i in period t; Xit—a set of control variables; α0—the constant term; α1—the regression coefficient of the core explanatory variable; γ—the coefficient vector of control variables; μi—the fixed effect of enterprise i; λt—the fixed effect of time; εit—the random disturbance term.

Cost-Stickiness Test Model

$$\ln\left(\frac{Cost_{it}}{Cost_{i,t-1}}\right)=\beta_0+\beta_1 \ln\left(\frac{Sale_{it}}{Sale_{i,t-1}}\right)+\beta_2 D_{it}\cdot\ln\left(\frac{Sale_{it}}{Sale_{i,t-1}}\right)+\varepsilon_{it}$$

Where: Dit - revenue decline dummy variable, if Saleit<Salei, t-1, Dit=1, otherwise it is 0; β 0- constant term; β 1- the elasticity coefficient of cost with changes in revenue when revenue increases; β 2- coefficient of cost elasticity difference caused by revenue decline; ε it - Random perturbation term.

Among them, Dit is the dummy variable of income decline. If β 2 is significantly negative, there is cost stickiness. The mediation mechanism adopts stepwise regression and Bootstrap chain mediation test, and endogeneity treatment adopts lagged one period explanatory variable and instrumental variable method.

4. Empirical Results and Analysis

4.1 Descriptive Statistics

Table 3 reports descriptive statistics for major variables. The sample-period mean collaboration degree is approximately 0.48 with a standard deviation of 0.21, indicating generally low and highly differentiated collaboration levels among SMEs. The mean ROA reaches 5.62%; the mean operating-cash-flow volatility is 0.34; the mean financing-constraint index equals 0.62, reflecting weak overall operational resilience.

Table 3. Descriptive Statistics of Major Variables

Variable	Mean	Std. Dev.	Min	Max
ROA	5.62	4.18	-8.35	21.47
Collaboration Degree (SD)	0.48	0.21	0.11	0.89
Human Capital (HC)	7.86	1.24	5.02	10.35
Cash Flow (CF)	1.08	0.52	0.15	2.46
Asset-Liability Ratio	0.46	0.21	0.08	0.89

Correlation tests show that collaboration degree is significantly positively correlated with ROA and significantly negatively correlated with cost stickiness, providing preliminary evidence for research hypotheses. Variance-inflation factors are all below 3, ruling out severe multicollinearity. The mean value of information-collaboration dimension equals 0.42, representing the primary shortcoming. The mean collaboration degree for information-technology-service enterprises stands at 0.57, higher than 0.45 for manufacturing firms and 0.40 for wholesale-retail enterprises. This reflects the influence of digital endowments and lays foundations for subsequent heterogeneity and moderation-effect analysis.

4.2 Baseline Regression and Robustness Tests

Table 4 presents baseline-regression results. Column (1) shows that after controlling firm and year fixed effects, the regression coefficient of collaboration degree on ROA is 0.039, significant at the 1% level. After adding control variables in Column (2), the coefficient remains significant, verifying the robustness of the main collaborative effect. Column (3) reports a significantly negative coefficient of collaboration degree on cost stickiness, suggesting higher collaboration suppresses human-resource cost stickiness.

Table 4. Baseline Regression Results

Variable	**(1) ROA**	**(2) ROA**	**(3) STICKY**
Collaboration Degree (SD)	0.039	0.036	-0.028
Firm Size	Uncontrolled	0.012	0.005
Asset-Liability Ratio	Uncontrolled	-0.034	0.011
Firm / Year Fixed Effects	Controlled	Controlled	Controlled
R-squared	0.42	0.47	0.38

Note: Clustered robust standard errors are reported in parentheses. Asterisks attached to coefficients denote significance levels; more asterisks indicate higher significance. Coefficients demonstrate that a one-standard-deviation increase in collaboration degree raises ROA by approximately 0.76-0.82 percentage points, consistent with the 0.83-percentage-point estimate in the abstract. Three robustness-test approaches are adopted: substituting the explained variable, replacing the collaboration-degree measurement method, and shortening the sample window to 2018-2021. The direction and significance of results remain essentially unchanged.

4.3 Mediation-Effect Test

To unpack the underlying mechanism, this paper tests the chain-mediation paths of human-capital allocation and cash-flow stability. Table 5 reports Bootstrap chain-mediation test results with 5,000 sampling repetitions.

Table 5. Chain-Mediation-Effect Test Results

Path	**Effect Value**	**Bootstrap Std. Error**	**95% Confidence Interval**
Collaboration Performance Total Effect	0.039	0.011	[0.018, 0.061]
Indirect Effect (Human-Capital Allocation)	0.014	0.006	[0.003, 0.026]
Indirect Effect (Cash Flow)	0.011	0.005	[0.002, 0.021]
Chain-Mediation Effect (Human Capital Cash Flow)	0.006	0.003	[0.001, 0.012]
Direct Effect	0.008	0.009	[-0.010, 0.025]

Results indicate that confidence intervals of the three indirect paths exclude zero, confirming valid chain-mediation effects. Namely, collaboration improves performance by optimizing human-capital allocation and stabilizing cash flow, supporting Hypothesis H2. The insignificant direct effect implies collaborative gains are mainly realized through mediating mechanisms.

4.4 Moderation and Heterogeneity Analysis

1) **Positive moderating effect of digitalization level**: The interaction-term coefficient between collaboration degree and digitalization level equals 0.018 and is significant at the 5% level. Digitalization lowers cross-department collaboration costs, enables real-time synchronization of human-resource ledgers and financial budgets, mitigates information asymmetry and amplifies collaborative benefits, verifying Hypothesis H3.
2) **Negative moderating effect of family governance**: The interaction-term coefficient between collaboration degree and the family-governance dummy variable is -0.021, significant at the 5% level. Family-governed enterprises tend to prioritize short-run profits, squeeze long-term human-capital investment and raise implementation costs for institutionalized collaboration, weakening collaborative value.
3) **Industry-heterogeneity grouped regression**: Grouped regressions yield collaboration coefficients of 0.044 for information-technology-service enterprises, 0.031 for manufacturing firms and 0.026 for wholesale-retail enterprises. The collaborative effect is stronger within the information-technology sector. Differences in industry-digital endowments constitute boundary conditions for collaborative benefits, consistent with

foregoing statistical conclusions.

4.5 Endogeneity Treatment

To alleviate omitted-variable bias and reverse causality, the one-period-lagged collaboration degree is adopted as the explanatory variable. The coefficient equals 0.031 and remains significant, eliminating contemporaneous reverse-causality concerns. Further, the average collaboration degree of firms within the same industry and region is selected as the instrumental variable. Its relevance originates from similar market environments and learning spillovers among geographically proximate enterprises; exogeneity holds because individual-firm performance hardly reversely shapes regional-average collaboration levels.

- **First-stage regression**: F-statistic reaches 24.6, exceeding the empirical threshold of 10, so weak-instrument risks are limited.
- **Second-stage regression**: coefficient direction and significance remain unchanged.

Placebo tests randomly shuffle collaboration-degree values before regression; coefficients become insignificant, excluding spurious correlation. Synthesizing the above tests, the causal credibility of collaboration effect on operational performance is well-established rather than merely reflecting correlation.

4.6 System-Dynamics Simulation

Built upon static causal identification, this paper constructs a system-dynamics model for SMEs incorporating human-resource subsystem, financial subsystem and collaborative-coupling structures.

1) **Model-framework construction**: Drawing on static empirical conclusions, a system-dynamics model with human-resource, financial and collaborative-coupling modules is built. Human-capital stock, operating cash flow and collaboration degree are chosen as state variables. Two feedback loops are included:
   - Positive growth loop driven by improved collaboration;
   - Negative loop triggered by insufficient collaboration, which induces cost runaway and talent loss.
2) **Model-validity test**: Parameters are calibrated based on sample means and expert inputs. The relative historical-fitting error stands at 4.7%, satisfying the criterion of less than 5%. Sensitivity tests prove the model is stable and insensitive to fluctuations in core parameters.
3) **Multi-scenario simulation setup**: Four scenarios are configured: baseline status-quo, information-collaboration enhancement, process-collaboration enhancement and deep strategic collaboration. The simulation cycle covers 36 months to observe dynamic changes in operating cash flow and human-capital stock; simulation outputs are presented in Table 6.

Table 6. Simulation Results for Different System-Dynamics Scenarios

Scenario	12-Month Cash Flow	24-Month Cash Flow	36-Month Human Capital	Cumulative Revenue Growth
Baseline (Status Quo)	100	104	100	Baseline
Information Collaboration	106	114	106	+4.8%
Process Collaboration	111	126	114	+9.6%
Deep Strategic Collaboration	118	141	126	+16.3%

Simulation results reveal marginal returns of collaborative optimization increase first and then decrease. When upgrading from information collaboration to process collaboration, 24-month operating cash flow rises from 114 to 126 with narrowed marginal increments, indicating boundary conditions for collaborative returns. Long-run benefits rely on sustained strategic investment. From a dynamic perspective, single-dimension collaboration yields limited outcomes; advancement of the full four-dimensional system is required.

5. Optimization Schemes for Human-Finance Collaborative Management in SMEs

5.1 General Principles

Derived from empirical and simulation conclusions, optimization schemes follow three principles: lightweight implementation, value-orientation and progressive advancement. Lightweight implementation means operating through cross-departmental task groups drawing on existing functions without adding redundant positions, fitting SMEs streamlined organizations and limited budgets. Value-orientation demands financial-return evaluation for all human-resource activities prior to implementation. Progressive advancement proceeds hierarchically from information collaboration, process collaboration, assessment collaboration to strategic collaboration to avoid

organizational turbulence caused by radical transformation.

5.2 Construction of the Four-Dimensional Collaborative System

A four-dimensional collaborative optimization framework is established. For information collaboration, build lightweight data dashboards to interconnect human-resource and financial data, set six core monitoring indicators and realize monthly ledger updates. For process collaboration, reconstruct four key business workflows and embed financial reviews into human-resource decision-making; conduct return estimation for recruitment and training projects to reduce ineffective human-resource inputs.

For assessment collaboration, design cross-department joint KPIs. Human-resource supervisors performance appraisal is tied to human-resource-cost-return ratios, while financial supervisors are assessed against human-capital-preservation indicators to eliminate departmental parochialism. For strategic collaboration, formulate human-resource plans and financial budgets synchronously, incorporate long-term talent investment into capital budgets and implement long-run evaluation for human-capital investment.

5.3 Phased Implementation Path

- **Phase I (0-12 months)**: Prioritize information collaboration. Establish human-resource-cost ledgers and monthly joint review meetings. This phase features low transformation barriers and quick returns and can be initiated without additional staffing.
- **Phase II (1-3 years)**: Roll out process collaboration and joint performance appraisal. Form evaluation mechanisms for financial returns of human-resource projects and deepen collaboration from the data layer to the decision-making layer.
- **Phase III (3 years and beyond)**: Achieve strategic collaboration. Incorporate human-resource investment into long-term corporate capital planning and dynamically adjust resource matching.

Simulation results support this path: information collaboration generates cash-flow improvements in the short run, whereas process and strategic collaboration sustain benefits in the medium-to-long term. Note that phases are not strictly separated. SMEs may select entry points flexibly conditional on firm scale and digital foundations. Micro-sized enterprises may skip partial process-collaboration steps and directly focus on information and assessment collaboration to lower implementation costs.

5.4 Safeguard Mechanisms

- **Organizational safeguard**: Set up a part-time cross-department collaborative working group led by a deputy general manager with clarified rights and obligations; no independent new departments are created.
- **Digital safeguard**: Adopt lightweight SaaS tools for automatic reconciliation of human-resource and financial data, lowering transformation costs without deploying large-scale ERP systems.
- **Cultural safeguard**: Break down departmental barriers through unified objectives and regular cross-department meetings to foster collaborative mindsets.
- **Risk safeguard**: Set warning thresholds for human-resource costs. Trigger formal reviews when human-resource costs exceed 40% of revenue or when compensation growth outpaces profit growth for two consecutive quarters. Conduct annual assessments based on the collaboration-degree indicator, feeding assessment outcomes into next-year budgets and human-resource planning to form closed-loop management.

6. Conclusions and Prospects

6.1 Main Conclusions

This paper conducts theoretical and empirical research on human-finance collaborative management for SMEs and draws three major conclusions:

First, the main collaborative effect holds. Human-finance collaboration significantly improves SME performance and inhibits cost stickiness. A one-standard-deviation rise in collaboration degree increases ROA by 0.83 percentage points, and this finding survives multiple robustness tests.

Second, clear mechanism paths are identified. Optimized human-capital allocation and cash-flow stability exert parallel and chain-mediating effects. Collaborative benefits are transmitted through these channels. Value comes not from departmental consolidation but from opening intermediate pathways translating resources into performance.

Third, situational boundaries are clarified. Digitalization amplifies collaborative effects, while family governance and industry endowments impose constraints. Simulation results indicate phase-dependent marginal returns for collaborative optimization: information collaboration delivers short-term gains, while long-run benefits depend on continuous advancement of process and strategic collaboration.

6.2 Managerial Implications

1) **For SME operators**: Collaborative development does not require one-off full-scale implementation. Priority should be given to interconnecting foundational human-resource and financial data via low-threshold data dashboards, followed by gradual improvement of process and assessment mechanisms. Simulations demonstrate that the information-collaboration phase already improves corporate cash flow.
2) **For policy-makers**: Match talent services and financing support; leverage public digital services to reduce enterprises collaborative-transformation costs. Confronting insufficient collaborative performance among family-owned enterprises, guide the introduction of external professional expertise and utilize institutionalized governance to mitigate crowding-out effects of short-term profit targets on long-term human-capital investment.
3) **For traditional manufacturing enterprises**: Traditional manufacturers with weak digital foundations should prioritize improvement of underlying data infrastructure to unlock collaborative benefits.

6.3 Research Limitations and Future Prospects

Three limitations exist within this paper. Part of the collaboration-degree indicators rely on questionnaires and disclosed texts, bringing measurement errors. System-dynamics parameters are derived from sample averages, so caution is required for extrapolation. Samples are confined to domestic enterprises without cross-country comparisons. Future research may extend to the shock-resilience effects of collaborative management amid different crises, the empowerment of collaborative mechanisms by AI-driven digital tools, and linkages between collaborative management and ESG performance, further expanding the application boundaries of collaborative-management theory within the SME context.

References

Anderson, M. C., Banker, R. D., & Janakiraman, S. N. (2003). Are selling, general, and administrative costs sticky? *Journal of Accounting Research, 41*(1), 47-63. https://doi.org/10.1111/1475-679X.00095

Banker, R. D., & Byzalov, D. (2014). Asymmetric cost behavior. *Journal of Management Accounting Research, 26*(2), 43-79. https://doi.org/10.2308/jmar-50713

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

Haken, H. (1983). *Synergetics: An Introduction: Nonequilibrium Phase Transitions and Self-Organization in Physics, Chemistry, and Biology*. Berlin, Heidelberg: Springer-Verlag.

Huselid, M. A. (1995). The impact of human resource management practices on turnover, productivity, and corporate financial performance. *Academy of Management Journal, 3*8(3), 635-672. https://doi.org/10.5465/256718

Copyrights

Copyright for this article is retained by the author(s), with first publication rights granted to the journal.

This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (http://creativecommons.org/licenses/by/4.0/).