



## **INTEGRATED STRATEGIC MANAGEMENT OF ENTERPRISE RESOURCE AND OPERATIONAL EFFICIENCY**

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### **Abstract**

Contemporary enterprises face market uncertainty, resource constraints, intensified competition, rapid digital transformation, and growing operational and financial risks. Under these conditions, isolated management of individual functional areas is increasingly insufficient, as decisions concerning logistics, marketing, finance, human resources, and taxation are interrelated and jointly influence resource use and business processes. The study therefore aims to substantiate an integrated approach to the strategic management of enterprise resource and operational efficiency and to determine the role of coordinated functional decisions in achieving higher efficiency. The theoretical framework combines the resource-based view, dynamic capabilities, strategic fit, and functional integration perspectives. Digitalization and risk management are treated as cross-cutting factors supporting coordination, information exchange, analytical capabilities, and managerial responsiveness rather than as autonomous components of the integrated management system. The empirical analysis uses panel data from publicly listed retail enterprises selected according to the availability and consistency of financial, operational, human resource, and digital disclosures. The methodology includes the formation and normalization of functional indicators, their aggregation into an Integrated Strategic Management Index, and the construction of a Resource and Operational Efficiency Index reflecting enterprises' ability to transform available resources into operating outcomes. Descriptive statistics, correlation analysis, and panel regression modelling are used to examine the relationship between managerial integration and enterprise efficiency, with alternative panel specifications applied to assess the robustness of the results. The findings reveal a positive and statistically significant relationship between the integration of functional managerial decisions and resource and operational efficiency, indicating that coordinated management provides a stronger basis for enterprise performance than isolated functional optimization. After managerial integration is taken into account, neither digitalization nor risk exposure demonstrates an independent statistically significant relationship with efficiency. This supports the interpretation of digitalization as an enabling mechanism for information connectivity, analytical support, and cross-functional coordination, while risk should be considered within the broader system of coordinated managerial decisions. The study highlights the practical importance of aligning logistics, digital marketing, budgeting, human resource management, and tax management within a unified strategic framework. The proposed approach can help enterprises identify functional imbalances, improve resource allocation and process coordination, strengthen managerial adaptability, and increase resource and operational efficiency under changing business conditions.

**KEY WORDS:** logistics activities, digital marketing, budgeting, human resource management, tax management, strategic management.

**JEL classification:** M10, M21, L81, C23.

### **Introduction**

Enterprise performance increasingly depends on the coordination of functional decisions rather than on the isolated optimization of individual areas. Logistics structures material and information flows (Mentzer et al., 2001; Flynn et al., 2010; Gajda et al., 2025), marketing shapes demand and resource requirements, financial management translates these requirements into budgets and funding constraints (Lileikienė et al., 2024; Lileikienė & Martinkienė, 2023), and human resource management determines the capacity to execute them (Huselid, 1995; Giedraitis et al., 2024; Burinskienė & Daškevič, 2023). Digitalization and risk management cut across these functions by strengthening information support and controlling uncertainty. Yet the literature remains fragmented regarding the joint effect of such coordination on resource and operational efficiency.

The study tests hypothesis H1 that the integration of logistics, marketing, financial, and human resource decisions has a positive and statistically significant effect on resource and operational efficiency. Its purpose is to substantiate an integrated strategic management approach and determine the effect of coordinated decision-making on enterprise performance. The research object is strategic management of enterprise efficiency; the subject is the theoretical, methodological, and applied principles of

cross-functional decision integration. The study develops an indicator framework and tests it using a balanced panel of retail enterprises, indicator normalization, correlation analysis, and panel econometric models. The contribution is a unified empirical representation of functional integration that distinguishes managerial coordination from the cross-cutting effects of digitalization and risk exposure.

### **Theoretical framework**

Contemporary enterprise conditions are characterized by intensifying competition, resource constraints, demand instability, uncertainty, and the need to ensure both current performance and long-term competitiveness. Under these conditions, marketing, logistics, financial, human resource, and tax decisions cannot be considered autonomous, as changes in one functional area directly affect others. For example, marketing expansion increases requirements for inventory, procurement, transportation, financing, and staffing, while changes in logistics may require adjustments to assortment, pricing, and financial policy. Resource and operational efficiency therefore requires an integrated strategic approach that coordinates goals, resources, functional decisions, and performance

outcomes (Barney, 1991; Teece et al., 1997; Kaplan & Norton, 1992; Christopher, 2016).

The theoretical foundation of this approach is the resource-based view of the firm. Barney (1991) argues that sustainable competitive advantages depend on the effective use of valuable, rare, inimitable, and non-substitutable resources, while Prahalad and Hamel (1990) emphasize core competences as a basis for coordinated resource deployment and long-term competitiveness. Thus, resource efficiency should be understood not simply as minimizing resource consumption, but as the ability to form, allocate, combine, and use resources in accordance with strategic priorities. This is particularly important under resource scarcity, when efficiency depends on the quality of resource configuration rather than its absolute volume (Barney, 1991; Prahalad & Hamel, 1990; Bujáki & Vinogradov, 2024).

However, resources alone do not ensure high performance. In a dynamic environment, enterprises must be able to sense changes, seize opportunities, and reconfigure their resource base. Teece et al. (1997) associate competitive advantage with such dynamic capabilities. Strategic management should therefore ensure both efficient use of existing resources and their continuous alignment with current and prospective enterprise needs (Solomatina, 2025).

Logistics occupies a central position in this integrated system. Mentzer et al. (2001) define supply chain management as the coordination of business functions and processes within and across enterprises, while Christopher (2016) emphasizes the systemic coordination of material, information, and financial flows. Flynn et al. (2010) establish a positive relationship between supply chain integration and enterprise performance, and Li et al. (2006) demonstrate the contribution of supply chain practices to competitive advantage and organizational performance. Recent studies also highlight intermodal transport and logistics cost optimization (Bairam & Valackiene, 2025; Lingaitienė & Burinskienė, 2024). Procurement, inventory, transportation, and distribution should therefore be treated as interconnected elements of strategic decision-making.

Logistics is directly linked to marketing because demand, assortment, pricing, distribution channels, and service levels determine requirements for logistics processes. Kotler et al. (2022) emphasize the interdependence of market decisions, customer value, channels, pricing, and demand management, while Varadarajan (2010) considers marketing strategy an integral component of strategic decision-making. Marketing decisions affect supply, inventory, distribution capacity, and service quality, whereas logistics capabilities determine the feasibility of market strategies. Their coordination should therefore form a unified value-creation system linking demand, supply capabilities, operational capacity, and resources.

The interaction of marketing, digital, and financial decisions is also confirmed by Dranus et al. (2026), who demonstrate that digitalization and volatility of marketing expenditures influence the financial performance of insurance companies. This supports the view that marketing expenditures should be evaluated in connection

with digital capabilities and financial outcomes rather than in isolation.

The financial component includes budgeting, cost control, financing, and tax decisions. Lileikienė et al. (2024) emphasize the role of advanced management and FinTech models in supporting innovative activity, while Lileikienė and Martinkienė (2023) identify challenges to financial stability during economic downturns. Financial management should therefore combine resource allocation, stability, and the capacity to support operational and strategic change (Vinogradov & Nagy, 2025). Budgeting consequently links the resource requirements of marketing, logistics, and human resources with available financial capacity.

Tax management should be integrated into this financial framework because tax decisions influence available resources, financial outcomes, and risk. Desai and Dharmapala (2009) demonstrate that corporate tax decisions have implications for firm value beyond the tax function itself. Tax management should therefore be aligned with budgeting, financial planning, financial stability, and overall strategy, particularly under uncertainty (Desai & Dharmapala, 2009; Lileikienė & Martinkienė, 2023).

Human capital is another essential component of integrated management. Huselid (1995) establishes the relationship between HR practices, productivity, employee turnover, and financial performance, while Becker et al. (1997) consider HR a potential source of shareholder value. Giedraitis et al. (2024) further highlight employee empowerment as a factor of organizational performance. HR decisions should therefore correspond to logistics and marketing requirements, financial capabilities, and strategic objectives.

Digitalization represents a cross-cutting mechanism rather than an autonomous functional subsystem, providing information support, monitoring, automation, and analytical capabilities. Lileikienė et al. (2024) associate advanced management and FinTech models with innovative activity. Digitalization therefore strengthens information availability, process visibility, analytical capacity, and managerial responsiveness across functional areas (Nedbálek, 2024).

Risk management should constitute another cross-cutting element. Demand uncertainty, resource constraints, supply disruptions, marketing expenditure volatility, and financial and HR risks can simultaneously affect several functional subsystems. Lileikienė and Martinkienė (2023) highlight financial stability challenges, while Dranus et al. (2026) demonstrate the relationship between marketing expenditure volatility and financial performance. Risk management should therefore accompany the formation, implementation, monitoring, and adjustment of major managerial decisions rather than operate as an isolated function.

The synthesis of the above theoretical propositions provides grounds for constructing a conceptual framework in which strategic management serves as the central mechanism for coordinating goals, resources, functional decisions, risks, and outcomes. The corresponding logic of relationships is presented in Fig. 1.

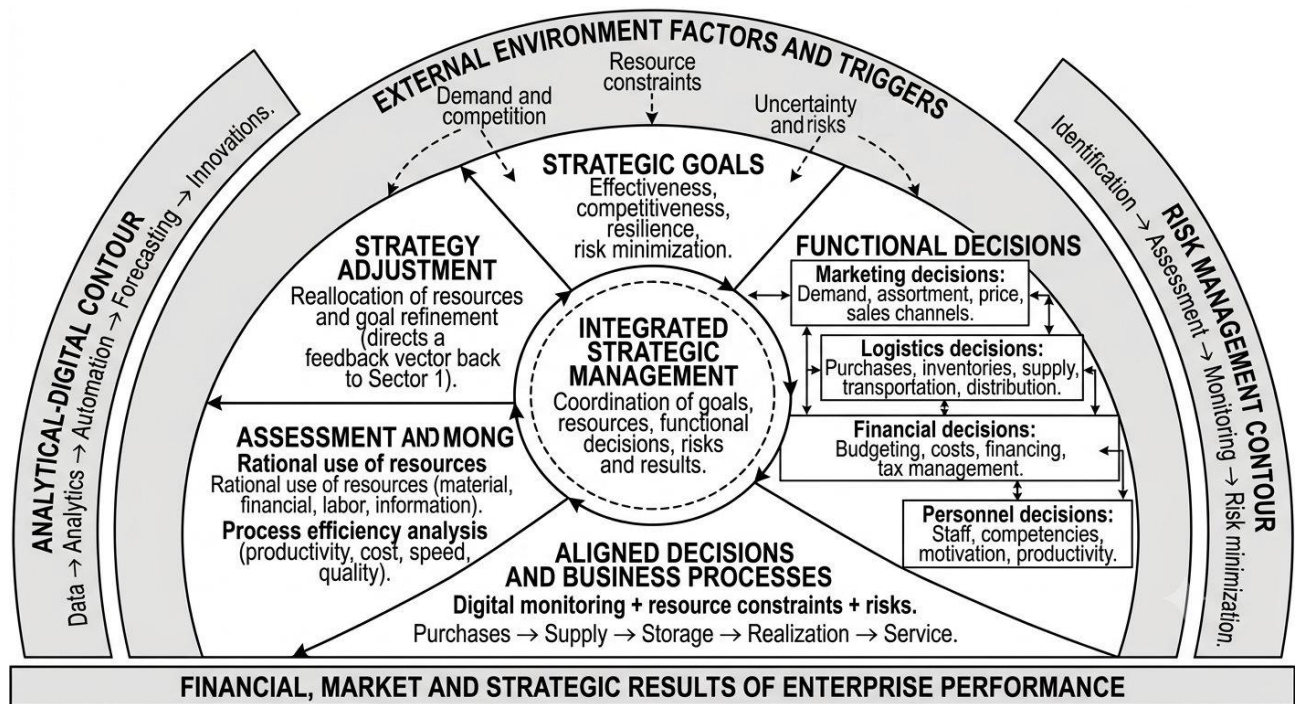


**Fig. 1.** Conceptual framework of integrated strategic management of enterprise resource and operational efficiency  
Source: developed by the authors based on Barney (1991), Teece et al. (1997), Mentzer et al. (2001), Habánik et al. (2024), Giedraitis et al. (2025) and Dranus et al. (2026).

As shown in Fig. 1, the central element of the proposed concept is integrated strategic management, which aligns strategic goals, resources, functional decisions, and risks. The functional block combines marketing, logistics, financial, and HR decisions through direct and feedback relationships, ensuring the transformation of resources into business-process outcomes such as productivity, cost, speed, quality, and service level, and ultimately into financial, market, and strategic results.

A distinctive feature of the framework is the integration of an analytical-digital circuit and a risk circuit. Digitalization provides data collection and processing, automation, monitoring, forecasting, and analytical support across functional processes, while risk management enables the identification, assessment, monitoring, and mitigation of risks throughout decision-making (Bartekova et al., 2026). This is consistent with research emphasizing the role of digital and advanced management tools in supporting enterprise decisions and performance (Dranus et al., 2026; Lileikienė et al., 2024).

The framework incorporates feedback from performance outcomes to strategic goals and resource allocation, allowing the enterprise to assess goal attainment, adjust strategy, and reconfigure resources in response to environmental changes (Barney, 1991; Teece et al., 1997; Gruodė et al., 2025). In this context, resource efficiency refers to the rational formation, allocation, and use of material, financial, human, and information resources, whereas operational efficiency reflects their transformation within business processes through productivity, cost, speed, quality, and service level (Christopher, 2016; Flynn et al., 2010; Li et al., 2006).

Integrated strategic management is therefore defined as a system in which strategic goals guide the coordination of

marketing, logistics, financial, and HR decisions; digitalization strengthens information and analytical capacity; risk management supports resilience; and performance feedback informs strategy adjustment and resource reallocation (Barney, 1991; Teece et al., 1997; Mentzer et al., 2001; Huselid, 1995; Ovchynnykova & Navickas, 2025).

The unresolved issue is the simultaneous quantitative assessment of these functional decisions within one framework while keeping digitalization and risk management analytically distinct. This gap motivates the operationalization of cross-functional integration and its empirical comparison with resource and operational efficiency (Neely et al., 1995; Hair et al., 2019; Calderon-Monge, & Ribeiro-Soriano, 2024).

## Research Methods

The purpose of the study is to empirically examine whether the integration of logistics, marketing, financial, and human resource decisions contributes to higher resource and operational efficiency of retail enterprises. The study is based on the hypothesis that coordinated management of these functional areas generates a cumulative effect that cannot be adequately captured by examining individual functions separately. This approach is consistent with the resource-based view, which emphasizes the importance of effectively organizing and utilizing resources to create competitive value (Barney, 1991; Shen et al., 2025).

The conceptual framework presented in Figure 1 defines integrated strategic management as a coordination mechanism linking marketing, logistics, finance, and human resources. Digitalization and risk management are treated as cross-cutting conditions affecting the

effectiveness of integration rather than components of the integrated management index. This distinction separates internal functional integration from the technological and risk environment in which managerial decisions are implemented.

The empirical analysis covers 2021–2025 and focuses on nine publicly traded U.S. retail enterprises selected on the basis of complete financial, operational, human resource, and digital-sales disclosures. The balanced panel comprises 45 firm-year observations. Annual reports, SEC filings, and official corporate disclosures available through the investor-relations websites of American Eagle Outfitters, Best Buy, Gap Inc., Kohl's, Lands' End, Macy's, Oxford Industries, Sally Beauty Holdings, and Tilly's constitute the primary data sources (American Eagle Outfitters, n.d.; Best Buy, n.d.; Gap Inc., n.d.; Kohl's, n.d.; Lands' End, n.d.; Macy's, n.d.; Oxford Industries, n.d.; Sally Beauty Holdings, n.d.; Tilly's, n.d.). A panel-data design accounts for differences between enterprises and changes within enterprises over time (Wooldridge, 2001; Li et al., 2006).

Four functional blocks are used to operationalize integrated managerial decisions: marketing (M), logistics (L), finance (F), and human resources (HR). Each block is represented by an indicator reflecting the relationship between the resources employed and the corresponding economic result:

$$M_{it} = \frac{SG\&A_{it}}{Revenue_{it}}, (1)$$

where SG&A<sub>it</sub> (Selling, General and Administrative Expenses) - these are the company's selling, general and administrative expenses.

The marketing indicator captures the relative intensity of selling, general and administrative expenditure and serves as an observable proxy for the resource commitment associated with market-facing and supporting activities. The logistics indicator is defined as inventory turnover:

$$L_{it} = \frac{Cost\ of\ sales_{it}}{Average\ Inventory_{it}}, (2)$$

Inventory turnover is used as a proxy for the effectiveness of material flow management.

The financial block encompasses budgeting, financing, cost control, and tax management, which jointly determine the allocation of financial resources and the enterprise's capacity to support operational activities. Due to the absence of standardized publicly disclosed indicators that directly measure the quality of budgeting and tax management across the enterprises included in the sample, the empirical financial component is operationalized through the ratio of operating cash flow to total debt:

$$F_{it} = \frac{Operating\ Cash\ Flow_{it}}{Total\ Debt_{it}}, (3)$$

This indicator does not measure budgeting or tax management separately but serves as an observable proxy for the resulting financial capacity of the enterprise to generate operating cash flows relative to its debt obligations. Budgeting and tax management are therefore incorporated into the conceptual interpretation of the financial block rather than treated as independently measurable components of the index.

The human resource indicator is calculated as:

$$HR_{it} = \frac{Revenue_{it}}{Employees_{it}}, (4)$$

Because the indicators differ in measurement units and scales, min–max normalization is applied. For a stimulant indicator:

$$Z_{ijt} = \frac{X_{ijt} - X_j^{min}}{X_j^{max} - X_j^{min}}, (5)$$

where  $X_{ijt}$  represents the observed value of indicator  $j$  for enterprise  $i$  in period  $t$ , while  $X_j^{min}$  and  $X_j^{max}$  denote the minimum and maximum values of the respective indicator in the study sample.

For a destimulant indicator, the following transformation is applied:

$$Z_{ijt} = \frac{X_j^{max} - X_{ijt}}{X_j^{max} - X_j^{min}}, (6)$$

The normalized indicators are then aggregated into the Integrated Strategic Management Index (ISI):

$$ISI_{it} = \frac{M_{it} + L_{it} + F_{it} + HR_{it}}{4}, (7)$$

Equal weights are assigned to the four functional blocks to avoid subjective assumptions concerning their relative importance. ISI therefore measures the degree of integration of strategic managerial decisions rather than the efficiency of an individual functional area.

The dependent variable is the Resource and Operational Efficiency Index (REI), constructed independently from ISI. Three indicators are used:

$$RE_1 = \frac{Revenue}{Total\ Assets}, (8)$$

$$RE_2 = \frac{Operating\ Income}{Revenue}, (9)$$

$$RE_3 = \frac{Operating\ Cash\ Flow}{Total\ Assets}, (10)$$

After normalization, the three indicators are aggregated as follows:

$$REI_{it} = \frac{RE_{1,it} + RE_{2,it} + RE_{3,it}}{3}, (11)$$

Thus, ISI and REI represent conceptually distinct constructs. ISI characterizes the integration of functional managerial decisions, whereas REI reflects efficiency in asset utilization, operating income generation, and conversion of resources into operating cash flows.

Digitalization is included as a cross-cutting factor. Where comparable data are available, it is measured as the share of sales generated through digital channels:

$$DIG_{it} = \frac{Digital\ Sales_{it}}{Revenue_{it}}, (12)$$

This indicator captures the observable contribution of digital sales to overall enterprise activity.

Risk exposure is measured by the ratio of total debt to total assets:

$$RISK_{it} = \frac{Total\ Debt_{it}}{Total\ Assets_{it}}, (13)$$

Neither DIG nor RISK is included in the construction of ISI. This is intentional: digitalization and risk management are considered contextual and cross-

functional factors that affect the conditions under which integrated managerial decisions generate efficiency outcomes.

To test the research hypothesis, the following baseline panel-data model is estimated:

$$REI_{it} = \beta_0 + \beta_1 ISI_{it} + \mu_i + \lambda_t + \varepsilon_{it}, (14)$$

where  $REI_{it}$  - is the Resource and Operational Efficiency Index of enterprise  $i$  in period  $t$ ;

$ISI_{it}$  - is the Integrated Strategic Management Index;

$\beta_0$  - is the intercept;

$\beta_1$  - measures the effect of integrated strategic management on resource and operational efficiency;

$\mu_i$  - represents firm-specific effects;

$\lambda_t$  - represents time effects;

$\varepsilon_{it}$  - is the idiosyncratic error term.

The hypotheses are formulated as follows:

$$H0:\beta_1 \leq 0, H1:\beta_1 > 0, (15)$$

The null hypothesis assumes that integration of logistics, marketing, financial, and human resource decisions does not have a positive statistically significant effect on resource and operational efficiency. The alternative hypothesis assumes a positive effect.

To assess the robustness of the estimated relationship, an extended specification is additionally considered:

$$REI_{it} = \beta_0 + \beta_1 ISI_{it} + \beta_2 DIG_{it} + \beta_3 RISK_{it} + \mu_i + \lambda_t + \varepsilon_{it}, (16)$$

The empirical analysis compares pooled ordinary least squares (OLS), fixed-effects, and random-effects specifications. The choice between alternative panel estimators is based on the data structure and formal specification testing, including the Hausman test. Firm and time effects are considered to account for unobserved heterogeneity and common temporal shocks.

The statistical analysis includes descriptive statistics and correlation analysis. The estimated coefficients are additionally assessed for heteroskedasticity and serial correlation, with heteroskedasticity- and autocorrelation-robust standard errors applied where necessary.

Given the short time dimension of the panel, dynamic panel estimation is not treated as the default specification. GMM estimators are considered only if the empirical results indicate substantial persistence in REI or potential endogeneity of ISI. This approach avoids imposing an unsupported dynamic structure and is consistent with established principles of panel-data econometrics (Wooldridge, 2001).

## Results and Discussion

The empirical analysis was conducted using a balanced panel dataset comprising 45 observations for nine publicly listed U.S. retail enterprises over the 2021–2025 fiscal years. The sample included Macy's, Inc., Kohl's Corporation, Best Buy Co., Inc., The Gap, Inc., American Eagle Outfitters, Inc., Sally Beauty Holdings, Inc., Oxford Industries, Inc., Tilly's, Inc., and Lands' End, Inc. The final sample was constructed according to two criteria: the availability of a complete set of financial and human resource indicators required to calculate the functional components of integrated strategic management, and the systematic disclosure of the share of sales generated through digital or online channels. This approach ensured the construction of a consistent dataset for calculating M, L, F, HR, ISI, REI, DIG, and RISK.

The DIG variable was measured as the share of sales generated through digital or e-commerce channels in the respective sales base reported by each enterprise. The definition of the digital channel consistently applied by each enterprise in its corporate reporting was used throughout the study period. This approach preserved the temporal comparability of the indicator within each enterprise and enabled digitalization to be incorporated into the empirical model as a cross-cutting control factor.

The descriptive statistics are presented in Table 1. The results indicate substantial heterogeneity among the enterprises in terms of their functional characteristics, the degree of integration of managerial decisions, digital penetration, and resource and operational efficiency.

**Table 1.** Descriptive statistics of the variables in the study sample

| Variable                      | Mean   | Standard deviation | Minimum | Maximum |
|-------------------------------|--------|--------------------|---------|---------|
| M                             | 0.351  | 0.095              | 0.165   | 0.553   |
| L                             | 4.054  | 1.529              | 1.770   | 6.930   |
| F                             | 0.258  | 0.207              | -0.217  | 0.826   |
| HR, USD thousand per employee | 230.01 | 118.67             | 101.34  | 514.42  |
| ISI                           | 0.422  | 0.116              | 0.260   | 0.737   |
| REI                           | 0.571  | 0.171              | 0.400   | 1.067   |
| DIG                           | 0.345  | 0.160              | 0.072   | 0.763   |
| RISK                          | 0.427  | 0.115              | 0.225   | 0.682   |

Source: calculated by the authors based on publicly available corporate and financial reports of the enterprises included in the sample

The mean value of the marketing component M, measured as the ratio of SG&A expenses to revenue, was 0.351. Its variation from 0.165 to 0.553 reflects differences in the operating and administrative cost structures of the retail enterprises. The average inventory turnover indicator

L was 4.054, while the difference between its minimum and maximum values indicates considerable heterogeneity in logistics models and the speed at which inventories are converted into sales.

The financial component F exhibited the greatest relative variability. Its mean value was 0.258, while the minimum value was negative. This reflects the presence of individual periods with negative operating cash flows and supports retaining such observations in the sample, as they capture actual changes in the financial position of the enterprises. The substantial variation in HR likewise demonstrates significant differences in the productivity of human resource utilization.

The Integrated Strategic Management Index ISI had a mean value of 0.422, ranging from 0.260 to 0.737. Thus, even among enterprises operating within the same broad sector, considerable differences can be observed in the configuration of marketing, logistics, financial, and human resource decisions. The mean value of the outcome variable REI was 0.571, further confirming differences in the ability of enterprises to transform available resources into operational outcomes.

The variation in DIG is particularly relevant to the analysis. The average share of digital sales was 34.5%, ranging from 7.2% to 76.3%. The sample therefore includes both enterprises for which digital channels constitute a supplementary component of the sales model and enterprises characterized by high digital penetration. This variation provides a sufficient empirical basis for examining whether digitalization has an independent effect on REI, or whether its effect is primarily manifested through the integration of functional managerial decisions.

The next stage involved a correlation analysis of the main variables. The results are presented in Table 2.

**Table 2.** Correlation matrix of the main variables

| Variable | ISI          | REI          | DIG    | RISK   |
|----------|--------------|--------------|--------|--------|
| ISI      | 1.000        | <b>0.755</b> | 0.197  | −0.763 |
| REI      | <b>0.755</b> | 1.000        | 0.145  | −0.583 |
| DIG      | 0.197        | 0.145        | 1.000  | −0.637 |
| RISK     | −0.763       | −0.583       | −0.637 | 1.000  |

The strongest relationship was observed between ISI and REI, with a correlation coefficient of 0.755. This indicates that enterprises with a higher degree of integration of marketing, logistics, financial, and human resource decisions tend to exhibit higher resource and operational efficiency. However, correlation analysis reflects only the overall association and does not distinguish structural differences across enterprises from changes occurring within individual enterprises over time.

The correlation between DIG and REI was positive but weak, at 0.145. Thus, a higher share of digital sales alone does not exhibit a strong direct relationship with resource and operational efficiency. At the same time, the weak positive relationship between DIG and ISI ( $r = 0.197$ ) indicates that digital penetration and the degree of functional management integration are related but distinct characteristics of an enterprise.

The RISK variable was negatively correlated with both ISI (−0.763) and REI (−0.583). This suggests that enterprises with higher debt burdens within the sample generally exhibit lower values of both the integrated strategic management index and resource and operational efficiency. Nevertheless, conclusions regarding the

independent effect of RISK require multivariate estimation.

To directly test the research hypothesis, an extended panel model was estimated in which ISI served as the main explanatory variable, while DIG and RISK were included as control variables. Three specifications were estimated sequentially: Pooled OLS, the Fixed Effects model, and the Random Effects model. The results are presented in Table 3.

**Table 3.** Results of panel regression model estimation

| Variable / statistic   | Pooled OLS    | Fixed Effects | Random Effects   |
|------------------------|---------------|---------------|------------------|
| ISI                    | <b>1.0885</b> | <b>0.7958</b> | <b>0.8482</b>    |
| Standard error         | 0.3250        | 0.2099        | 0.1663           |
| p-value                | <b>0.0008</b> | <b>0.0002</b> | <b>&lt;0.001</b> |
| DIG                    | −0.0241       | −0.2747       | −0.1139          |
| Standard error         | 0.1494        | 0.2196        | 0.2139           |
| p-value                | 0.8720        | 0.2110        | 0.5945           |
| RISK                   | −0.0521       | 0.0170        | 0.0218           |
| Standard error         | 0.3550        | 0.2033        | 0.2135           |
| p-value                | 0.8833        | 0.9335        | 0.9187           |
| R <sup>2</sup>         | 0.5753        | 0.5115*       | 0.5168           |
| Number of observations | 45            | 45            | 45               |

\* Within-R<sup>2</sup> is reported for the Fixed Effects model.

The results of all three specifications demonstrate a robust positive and statistically significant relationship between ISI and REI. In the Pooled OLS model, the coefficient on ISI was 1.0885 ( $p = 0.0008$ ). After controlling for time-invariant enterprise-specific characteristics in the Fixed Effects model, the coefficient decreased to 0.7958 but remained positive and highly statistically significant ( $p = 0.0002$ ). The Random Effects model produced a similar result, with  $\beta_1 = 0.8482$  and  $p < 0.001$ .

The consistency of the direction and statistical significance of the ISI coefficient across all three specifications is particularly important. It indicates that the positive relationship between the integration of managerial decisions and resource and operational efficiency cannot be attributed exclusively to structural differences across enterprises. The Fixed Effects result shows that changes in the degree of managerial integration within enterprises over time are also positively associated with changes in resource and operational efficiency.

The Hausman test was applied to select between the Fixed Effects and Random Effects specifications:

$$\chi^2(3) = 1.007; p = 0.799.$$

Since  $p > 0.05$ , there is no statistical basis for rejecting the null hypothesis that the differences between the FE and RE estimates are not systematic. Accordingly, the Random Effects model is used as the preferred specification for the main econometric interpretation. In this model, the coefficient on ISI is:

$$\beta_1 = 0.8482; p < 0.001.$$

Given the hypotheses

$$H_0: \beta_1 \leq 0; H_1: \beta_1 > 0.$$

The null hypothesis is rejected, while hypothesis H1 receives empirical support. The results therefore indicate a positive and statistically significant effect of the integration of marketing, logistics, financial, and human resource decisions on the resource and operational efficiency of the retail enterprises included in the sample.

At the same time, the coefficient on DIG was not statistically significant in any of the three models. In the Random Effects specification, it was  $-0.1139$  with  $p = 0.5945$ . Therefore, after controlling for the integration of managerial decisions and financial risk, the share of digital sales does not demonstrate a statistically significant independent effect on REI. This finding is important for interpreting the role of digitalization within the proposed conceptual framework. It supports the treatment of digitalization not as an isolated functional block whose effectiveness is automatically determined by the share of online sales, but rather as a cross-cutting factor that provides an informational and technological basis for coordinating functional managerial decisions.

A similar result was obtained for RISK. Despite its relatively strong negative pairwise correlation with REI, after simultaneously controlling for ISI and DIG, the coefficient on financial risk in the Random Effects model was only  $0.0218$  ( $p = 0.9187$ ). Thus, within the study sample, the debt burden does not exhibit a statistically significant independent effect on resource and operational efficiency once the integrated nature of managerial decisions is taken into account.

Managerially, the findings imply that marketing decisions should reflect logistics capacity; inventory policies should correspond to demand and financial constraints; HR decisions should support process productivity; and financial policy should sustain operations without excessive risk exposure. Digitalization provides the informational connectivity required to coordinate these choices.

The insignificant direct effect of DIG indicates that digital sales penetration is not a self-sufficient measure of efficiency. Digital channels can entail additional fulfilment, infrastructure, last-mile logistics, returns, and customer-acquisition costs; their contribution therefore depends on integration with the enterprise's other business processes.

The results should nevertheless be interpreted in light of several limitations. The panel comprises nine large publicly listed retail enterprises over five fiscal years; therefore, the findings primarily characterize large companies with a sufficient level of information disclosure and should not be automatically generalized to small and medium-sized enterprises. In addition, DIG primarily captures the output dimension of digital presence through the share of digital sales and does not encompass all aspects of the digitalization of internal business processes. Further research may therefore extend the time and cross-sectional dimensions of the sample, incorporate lagged effects, and examine more specifically the combinations of functional decisions through which digital technologies translate into improvements in resource and operational efficiency.

## Conclusions

The empirical results confirm the central regularity underlying the proposed framework: cross-functional integration is positively associated with resource and operational efficiency. Across 45 observations for nine publicly listed U.S. retail enterprises in 2021–2025, ISI and REI show a strong positive correlation ( $r = 0.755$ ), while the ISI coefficient remains positive and statistically significant in pooled OLS ( $1.0885$ ;  $p = 0.0008$ ), fixed effects ( $0.7958$ ;  $p = 0.0002$ ), and random effects ( $0.8482$ ;  $p < 0.001$ ). The Hausman test ( $\chi^2(3) = 1.007$ ;  $p = 0.799$ ) supports the random-effects specification for the main interpretation. These estimates provide empirical support for H1 and indicate that the relationship persists after accounting for firm and time heterogeneity.

Digitalization and risk exposure do not replace the role of functional integration. Although digital sales penetration varies from 7.2% to 76.3% across the sample, DIG is not statistically significant in the preferred model ( $\beta = -0.1139$ ;  $p = 0.5945$ ). RISK is likewise insignificant after controlling for ISI and DIG ( $\beta = 0.0218$ ;  $p = 0.9187$ ), despite its negative pairwise correlation with REI ( $r = -0.583$ ). The resulting regularity is that digitalization and risk management operate more plausibly as cross-cutting conditions of coordinated management than as autonomous determinants of efficiency.

The scientific contribution is the separation of three analytical dimensions within one model: functional integration represented by ISI, resource and operational outcomes represented by REI, and contextual conditions represented by DIG and RISK. This structure avoids embedding digitalization or risk directly in the integration index and allows their independent effects to be tested. For business practice, the findings support coordinated decisions on demand generation, inventories, financing, and workforce productivity rather than isolated functional optimization. Digital initiatives should therefore be evaluated jointly with fulfilment capacity, inventory requirements, financing constraints, and labour productivity, while risk controls should accompany resource allocation and strategic adjustment.

The evidence is limited to nine large publicly listed retailers and five fiscal years, so the identified relationships should not be generalized automatically to smaller enterprises or other sectors. Further studies should expand the cross-sectional and time dimensions of the panel, test lagged effects, and complement digital sales penetration with indicators of internal process digitalization. Such extensions would clarify the channels through which digital technologies and coordinated functional decisions jointly translate into resource and operational efficiency.

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