

The Causal Factors of Strategic Management and Operational Performance: An Empirical Study on the Industrial Machinery and Equipment Sales and Rental Business

Phatchaya Mangmesub^{1*}, Vichit U-on²

¹Doctor of Business Administration, Graduate College of Management, Sripatum University, Bangkok, Thailand.

²Graduate College of Management, Sripatum University, Bangkok, Thailand.

Keywords:

Causal factors,
Logistics management,
Machinery sales and
rental business (or
equipment sales and
rental business),
Operational performance
(or operational efficiency),
Strategic management.

Abstract. The objective of this research is to investigate the causal factors of strategic management and operational performance development that impact the Industrial Machinery and Equipment Sales and Rental Business. The study focuses on analyzing the role of human resources, internal quality systems, and logistics management and their linkage to creating a competitive advantage and enhancing the organizational capability of firms. This research utilizes Systems Theory and Strategic Management as its analytical framework. Data was collected from entrepreneurs and employees in the industrial machinery sales and rental business through both a quantitative questionnaire survey and qualitative in-depth interviews. The research findings indicate that effective human resource management, a standardized internal quality system, and appropriate logistics management have a positive influence on the organization's operational performance and strategic management, ultimately leading to an elevated competitive potential in the heavy industry to evolve the strategic plan by integrating the management of human resources, internal systems, and machinery/equipment for the purpose of building sustainable growth and long-term competitive advantage.

1. INTRODUCTION

1.1. Background and Importance of the Problem

In an era of globalization and rapid technological transformation, the industrial machinery and equipment sales and rental business has become one of the most competitive and strategically significant sectors in the industrial economy. Organizations in this field are facing numerous challenges such as fluctuating costs of machinery and spare parts, rising energy prices, environmental regulations, and customer demands for high-quality, fast, and reliable services. To survive and achieve long-term sustainability, businesses must not only improve their operational efficiency but also strengthen their strategic management capabilities through the effective integration of human resources, internal quality systems, and logistics management.

Human resources are widely recognized as the most critical driver of organizational success. Skilled and motivated employees contribute directly to the achievement of strategic goals by improving productivity, enhancing innovation, and promoting adaptability to change. Theories such as the Resource-Based View (RBV) and Human Capital Theory emphasize that human capital when effectively managed creates value that is rare and difficult for competitors to imitate. In the context of the industrial machinery business, competent personnel ensure the safe operation, maintenance, and rental management of complex equipment, which in turn supports customer satisfaction and organizational reputation.

Equally important is the internal quality system, which provides a structured mechanism for ensuring that processes and outputs meet both internal standards and customer expectations. The adoption of internationally recognized systems such as ISO 9001, ISO 14001, Lean Management, and Total Quality Management (TQM) not only enhances consistency and reliability but also drives continuous improvement through the PDCA (Plan–Do–Check–Act) cycle. An effective internal quality system reduces operational errors, lowers production costs, and supports sustainable competitive advantage by embedding quality into every level of the organization.

However, while human resource management, internal quality systems, and logistics management have been individually studied in various industries, there is still a lack of integrated empirical research that explores their combined causal impact on strategic management and operational performance in the industrial machinery and equipment sales and rental sector. Understanding these interrelationships is essential for developing evidence-based strategies that enhance both operational efficiency and strategic sustainability.

Therefore, this study aims to investigate the causal factors influencing strategic management and operational performance, focusing on the roles of human resources, internal quality systems, and logistics management. The findings are expected to provide valuable insights for business leaders and policymakers in designing management frameworks that promote efficiency, competitiveness, and long-term growth in Thailand's industrial machinery and equipment sales and rental business.

1.2. Research Question

- 1) How do human resource management practices influence strategic management in the industrial machinery and equipment sales and rental business?
- 2) What is the relationship between internal quality systems and the development of organizational operational performance?

3) How does strategic management mediate the relationship between key causal factors (human resources, internal quality system, and logistics management) and organizational operational performance?

1.3. Research Objective

1) To examine the influence of human resource management practices on strategic management within the industrial machinery and equipment sales and rental business.

2) To investigate the relationship between internal quality systems and the development of organizational operational performance.

3) To determine the mediating role of strategic management between key causal factors (human resources, internal quality system, and logistics management) and organizational operational performance.

1.4. Research Framework

Based on the aforementioned knowledge, the researcher developed a causal model utilizing the Input–Process–Output (IPO) system concept (Bertalanffy, 1968) to reflect the relationships among various variables, namely: Input Factors (X1–X3): Collaborative Leadership Development, Resilience & Adaptability to Change, and Cross-Functional Team Collaboration; Process Factor (Y1): ESG-Based Training; and Outcome (Y2): Performance. This can be used as a theoretical framework for designing the training policy of social enterprises to systematically enhance sustainability, as illustrated in Figure 1..

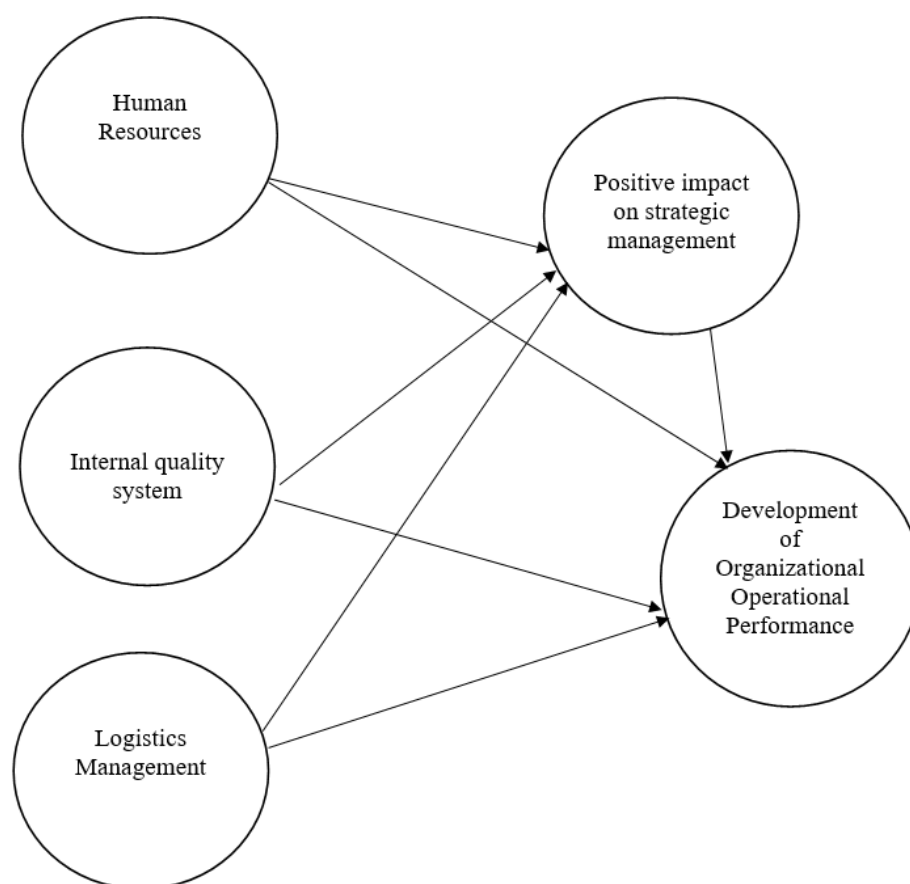


Figure 1. Shows the conceptual framework of the research.

1.5. Research Hypothesis

Hypothesis 1: Human Resources positively affect Strategic Management.

Hypothesis 2: Human Resources positively affect the development of Organizational Operational Performance.

Hypothesis 3: Internal Quality System positively affects Strategic Management.

Hypothesis 4: Internal Quality System positively affects the development of Organizational Operational Performance.

Hypothesis 5: Logistics Management positively affects Strategic Management.

Hypothesis 6: Logistics Management positively affects the development of Organizational Operational Performance.

Hypothesis 7: Strategic Management positively affects the development of Organizational Operational Performance.

2. LITERATURE REVIEW

2.1. Concepts, Theories and Related Research Results

2.1.1. Inputs and Expenditures

Inputs refer to the resources both tangible and intangible that an organization utilizes to produce outputs. According to the Input–Process–Output (IPO) Model (Bertalanffy, 1968), inputs such as financial capital, human resources, and material resources

directly influence the performance and sustainability of organizations. In the industrial machinery and equipment sector, key inputs include machinery investment, maintenance costs, workforce skills, and energy consumption. Efficient allocation and monitoring of expenditures help maintain cost competitiveness and operational efficiency. Prior studies (Kaplan & Norton, 1996; Slack et al., 2010) emphasize that controlling expenditures in relation to productivity is essential for sustaining profitability and long-term growth.

2.1.2. Market Demand

Market demand represents the total quantity of products and services that customers are willing and able to purchase at a given time. Porter (1985) highlights that understanding demand patterns enables firms to adopt appropriate differentiation or cost leadership strategies. In the machinery sales and rental business, demand is influenced by industrial investment trends, construction growth, and infrastructure development. According to Kotler and Keller (2017), demand forecasting and customer behavior analysis play critical roles in aligning supply capacity with market opportunities. Prior research (Neely, 2005) indicates that companies responding effectively to fluctuating demand can enhance customer satisfaction and achieve sustainable operational performance.

2.1.3. Brand Communication

Brand communication involves transmitting the brand's values, identity, and promises to target customers through consistent messaging and multiple channels. Keller (2003) defines brand communication as a strategic process that builds brand equity and customer loyalty. Effective communication ensures that customers perceive the brand as reliable, high-quality, and aligned with their expectations. In industrial contexts, especially machinery and equipment businesses, brand communication often centers on service reliability, safety, and after-sales support. Research by Aaker (1996) and Kotler (2017) found that clear brand communication enhances perceived value and differentiates firms in competitive markets. Furthermore, integrated brand communication combining online and offline strategies contributes to long-term brand trust and customer engagement.

2.1.4. Quantum Marketing Strategy

Quantum marketing, introduced by Kotler et al. (2021), refers to a data-driven, technology-enabled approach that leverages artificial intelligence (AI), big data, and predictive analytics to understand consumer behavior dynamically. Unlike traditional marketing that focuses on linear consumer journeys, quantum marketing adapts to rapidly changing digital interactions and emotional triggers. In the context of industrial machinery, quantum marketing allows businesses to personalize communication, optimize digital campaigns, and anticipate customer needs. Studies such as Shankar (2020) emphasize that the integration of quantum marketing strategies can enhance decision-making, improve marketing agility, and support long-term competitiveness.

2.1.5. Marketing Performance

Marketing performance measures how effectively marketing activities contribute to business objectives, including customer acquisition, retention, and profitability. According to Clark (1999) and Morgan et al. (2002), marketing performance is typically assessed through indicators such as sales growth, market share, return on marketing investment (ROMI), and customer satisfaction. The Balanced Scorecard (Kaplan & Norton, 1996) also includes marketing performance as part of the customer and internal process perspectives, linking marketing outcomes to strategic objectives. In the machinery and equipment business, effective marketing performance reflects a company's ability to align promotional strategies with market demand, brand strength, and customer loyalty. Research by Srivastava et al. (1998) indicates that firms with strong marketing performance can achieve superior operational efficiency and sustainable competitive advantage.

2.2. Research Variable

2.2.1. Concepts and Theories about Inputs and Expenditures

2.2.1.1. Meaning of Inputs and Expenditures

Inputs and expenditures refer to the resources and financial commitments necessary to carry out organizational activities. According to Bertalanffy's (1968) General System Theory, inputs include material, human, technological, and financial elements entering the system to produce desired outputs. Expenditures, meanwhile, represent the financial allocation and investment in these resources. In the context of industrial machinery and equipment businesses, inputs include machinery acquisition, maintenance costs, skilled labor, and energy usage, while expenditures encompass operating budgets, marketing expenses, and quality management costs. Efficient management of inputs and expenditures enhances productivity, cost efficiency, and competitiveness.

2.2.1.2. Composition of Inputs and Expenditures

The composition of inputs and expenditures can be categorized as follows:

- 1) Human Inputs: Manpower, training, and employee development activities that contribute to operational efficiency.
- 2) Material Inputs: Raw materials, spare parts, and machinery equipment required for production and maintenance.
- 3) Technological Inputs: Implementation of information systems, automation, and digital tools that improve accuracy and speed.
- 4) Financial Inputs: Capital investment, operational costs, and financial management systems.
- 5) Expenditures: Costs associated with procurement, maintenance, utilities, logistics, and administrative operations. According to Kaplan and Norton (1996), effective cost allocation leads to performance optimization and long-term sustainability.

2.2.2. Concepts and Theories about Market Demand

2.2.2.1. Meaning of Market Demand

Market demand represents the total quantity of products or services that consumers are willing and able to purchase at various price levels within a given period (Kotler & Keller, 2017). It reflects customer needs, preferences, purchasing power, and market trends. In the industrial machinery sector, demand is influenced by industrial investment cycles, infrastructure development, and the overall economic environment. Understanding demand enables firms to adjust production capacity, pricing, and marketing strategies effectively.

2.2.2.2. Composition of Market Demand

Market demand can be analyzed through the following components:

- 1) Customer Segmentation – Classification of customers by industry type, project size, or geographic area.
- 2) Price Sensitivity – Degree to which changes in price affect demand volume.
- 3) Market Trends – Emerging patterns in technological adoption, sustainability focus, and government investment projects.
- 4) Customer Expectations – Desired product quality, after-sales service, and brand reputation.
- 5) Competitor Influence – Market dynamics shaped by pricing, promotions, and innovation strategies of competitors. Understanding these elements helps companies design strategies that balance supply and demand effectively (Porter, 1985).

2.2.3. Concepts and Theories about Brand Communication

2.2.3.1. Meaning of Brand Communication

Brand communication is the process of conveying a company's identity, value, and promise to its target audience. Keller (2003) defines it as a key mechanism for creating brand equity and customer loyalty. It encompasses all marketing communications that influence customers' perceptions, including advertising, public relations, personal selling, and digital engagement. For industrial machinery firms, brand communication emphasizes reliability, safety, and service excellence, reinforcing trust and long-term relationships with clients.

2.2.3.2. Composition of Brand Communication

The composition of brand communication includes the following elements:

- 1) Brand Identity: The visual and verbal symbols representing the brand, such as logos, colors, and slogans (Aaker, 1996).
- 2) Message Strategy: Core messages that reflect the brand's promise, positioning, and unique selling proposition (USP).
- 3) Communication Channels: Traditional and digital media platforms such as trade shows, corporate websites, social media, and technical documentation.
- 4) Customer Engagement: Interactive communication that builds trust and emotional connection with customers.
- 5) Feedback Mechanism: Processes for capturing customer responses and integrating feedback into continuous improvement strategies. Kotler and Keller (2017) emphasize that consistent and authentic brand communication strengthens competitive positioning and brand loyalty.

2.2.4. Concepts and Theories about Quantum Marketing Strategy

2.2.4.1. Meaning of Quantum Marketing Strategy

Quantum marketing is an advanced, technology-driven marketing approach that integrates artificial intelligence (AI), machine learning, big data, and behavioral analytics to understand and predict consumer behavior in real time. Kotler, Kartajaya, and Setiawan (2021) introduced the concept of Quantum Marketing as part of Marketing 5.0, which emphasizes the use of technology for humanity. It combines emotional intelligence, contextual awareness, and digital connectivity to engage customers more effectively across multiple channels. Unlike traditional marketing models that rely on linear consumer journeys, quantum marketing operates in a multidimensional and data-rich environment, allowing marketers to dynamically adapt strategies to rapidly changing customer expectations and technological innovations.

In the industrial machinery and equipment sector, quantum marketing helps organizations enhance customer engagement by using data analytics to predict purchasing trends, tailor product recommendations, and personalize brand communication. This approach improves marketing precision, reduces inefficiencies, and increases overall return on marketing investment (ROMI).

2.2.4.2. Composition of Quantum Marketing Strategy

The composition of a quantum marketing strategy includes the following elements:

- 1) Data-Driven Insights – The foundation of quantum marketing, focusing on the collection, analysis, and interpretation of customer data to guide marketing decisions.
- 2) Artificial Intelligence and Automation – Utilization of AI tools and automated platforms for campaign optimization, customer segmentation, and personalized marketing.
- 3) Omnichannel Integration – Seamless integration of online and offline marketing channels to ensure consistent brand messaging and customer experience.
- 4) Emotional and Contextual Engagement – Understanding customers' emotional states and contextual behavior to create relevant, human-centered messages.
- 5) Predictive Analytics – Use of machine learning models to forecast market trends, demand fluctuations, and customer preferences.
- 6) Ethical and Human-Centered Approach – Ensuring that technological applications align with ethical standards and contribute positively to society.

2.2.5. Concepts and Theories about

2.2.5.1. Meaning of Marketing Performance

Marketing performance refers to the measurement of the effectiveness and efficiency of marketing activities in achieving organizational objectives. Clark (1999) defines it as the degree to which marketing contributes to business outcomes such as profitability, market share, and customer satisfaction. Similarly, Morgan, Clark, and Gooner (2002) emphasize that marketing performance evaluation enables firms to identify which strategies generate the highest value relative to their investment. In industrial machinery businesses, marketing performance reflects how effectively promotional efforts, branding, and customer relationship activities translate into sales growth and sustainable market presence.

The concept also aligns with the Balanced Scorecard framework (Kaplan & Norton, 1996), which views marketing performance from four perspectives: financial results, customer relationships, internal processes, and learning and innovation. High marketing performance not only improves revenue generation but also enhances brand reputation and long-term competitiveness.

2.2.5.2. Composition of Marketing Performance

The main components of marketing performance include:

- 1) Sales Growth: An increase in sales volume or revenue generated from marketing efforts.
- 2) Market Share: The organization's proportion of total industry sales, reflecting competitive position.
- 3) Customer Acquisition and Retention: Ability to attract new customers and maintain loyalty among existing ones.
- 4) Brand Equity: The perceived value of a brand in the minds of customers, resulting from effective communication and consistent experience.
- 5) Return on Marketing Investment (ROMI): The financial return generated from marketing expenditures.
- 6) Customer Satisfaction and Loyalty: Measured through customer surveys, repeat purchases, and referral rates.
- 7) Digital Engagement Metrics: Performance indicators such as website traffic, social media interactions, and conversion rates, which reflect marketing effectiveness in the digital era

According to Srivastava, Shervani, and Fahey (1998), organizations that integrate performance measurement with strategic marketing decisions can improve resource allocation, operational efficiency, and overall business performance.

2.3. Relationship between Variables and Hypothesis

2.3.1. Hypothesis 1

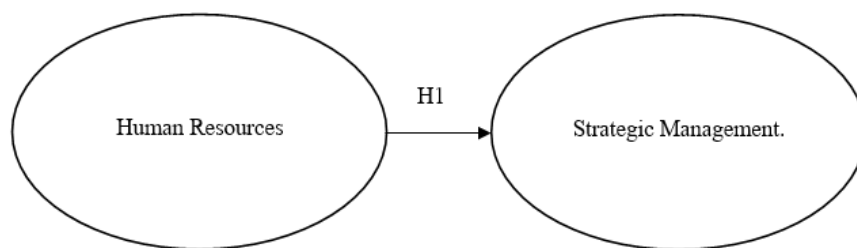


Table 1. Human Resources positively affect Strategic Management.

Reference (Researcher's name/Year)	Recruitment and selection	Training and development	Internal relocation	Returns	Job security	Performance appraisal	Job design	Participation
Gooderham et al. (2008)		✓	✓	✓			✓	
Ferguson & Reio Jr. (2010)	✓	✓	✓			✓		✓
Lee et al. (2010)	✓	✓		✓	✓	✓		✓
Osman et al. (2011)	✓	✓		✓		✓	✓	
Guthrie et al. (2011)	✓	✓		✓		✓		
Chan & Mak (2012)	✓	✓	✓	✓	✓	✓		
Jiang et al. (2012)	✓	✓	✓	✓	✓	✓	✓	✓
Ferreira et al. (2012)		✓		✓				
Clinton & Guest (2013)		✓	✓			✓	✓	
Khan et al. (2013)	✓	✓	✓	✓		✓	✓	✓

2.3.2. Hypothesis 2.

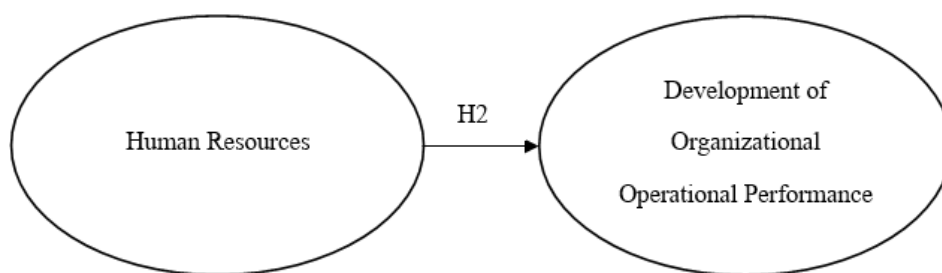


Table 2. Human Resources positively affect the development of Organizational Operational Performance.

Reference (Researcher's name/Year)	Recruitment and selection	Training and development	Compensation and incentives	Performance appraisal	Employee engagement	Personnel retention/safety
Huselid (1995)	✓	✓	✓	✓	✓	
Becker & Gerhart (1996)	✓	✓	✓		✓	
Ichniowski et al. (1997)	✓	✓	✓	✓		
Batt (2002)	✓	✓	✓	✓	✓	
Sun et al. (2007)	✓	✓	✓	✓	✓	
Katou (2008)	✓	✓	✓	✓	✓	✓
Chow et al. (2008)	✓	✓		✓	✓	
Usanee (2561)	✓	✓	✓		✓	✓
Teera (2562)		✓	✓	✓		✓
Wilaiwan (2563)		✓		✓	✓	✓

2.3.3. Hypothesis 3

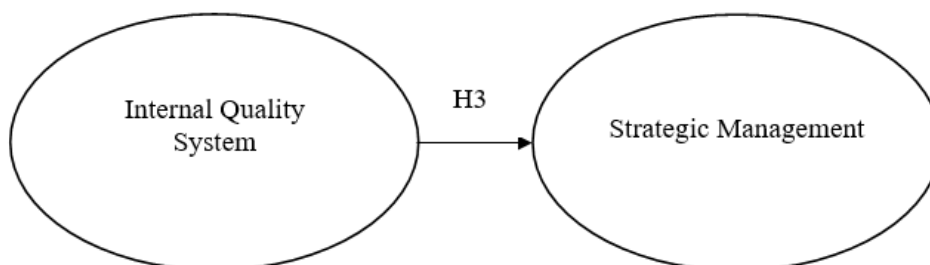


Table 3. Internal Quality System positively affects Strategic Management.

Reference (Researcher's name/Year)	Quality planning	Quality control	Continuous quality improvement	Knowledge management	Employee participation	Strategic management
Deming (1986)		✓	✓		✓	✓
Juran (1993)	✓	✓	✓	✓	✓	✓
Crosby (1996)	✓	✓			✓	✓
Powell (1995)	✓	✓	✓	✓	✓	✓
Samson & Terziovski (1999)	✓	✓			✓	✓
Kaynak (2003)	✓	✓	✓	✓	✓	✓
Prajogo & Sohal (2006)	✓	✓	✓	✓	✓	✓
Fotopoulos & Psomas (2009)	✓	✓	✓		✓	✓
Sila (2007)	✓	✓	✓	✓	✓	✓
Kumar et al. (2009)	✓	✓	✓	✓	✓	✓
Lee et al. (2010)	✓	✓	✓	✓	✓	✓

2.3.4. Hypothesis 4

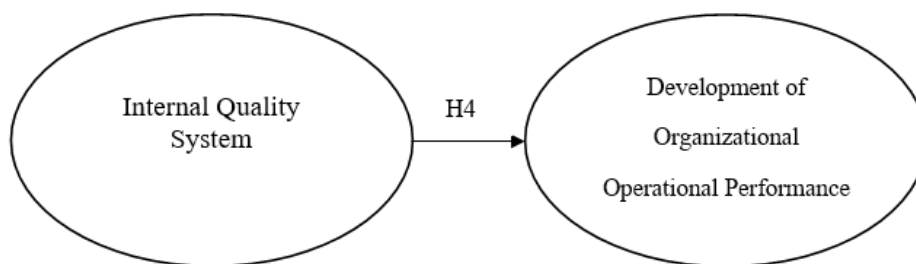


Table 4. Internal Quality System positively affects the development of Organizational Operational Performance.

Reference (Researcher's name/Year)	Quality planning	Quality control	Continuous improvement	Employee participation	Measurement and Evaluation	Operational efficiency
Deming (1986)	✓	✓	✓	✓	✓	✓
Powell (1995)	✓	✓	✓	✓	✓	✓
Samson & Terziovski (1999)	✓	✓	✓	✓	✓	✓
Kaynak (2003)	✓	✓	✓	✓	✓	✓
Prajogo & Sohal (2006)	✓	✓	✓	✓	✓	✓
Sila (2007)	✓	✓	✓	✓	✓	✓
Fotopoulos & Psomas (2009)	✓	✓	✓	✓	✓	✓
Sadikoglu & Zehir (2010)	✓	✓	✓	✓	✓	✓
Abdullah et al. (2012)	✓	✓	✓	✓	✓	✓
Calvo-Mora et al. (2014)	✓	✓	✓	✓	✓	✓

2.3.5. Hypothesis 5

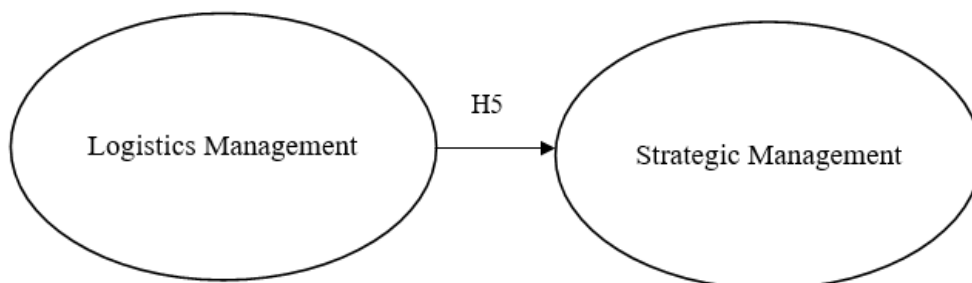


Table 5. Logistics Management positively affects Strategic Management.

Reference (Researcher's name/Year)	Logistics planning	Supply chain management	Warehouse management	Transportation and ...	Use of logistics	Strategic management
Porter (1985)	✓	✓	✓	✓	✓	✓
Christopher (1998)	✓	✓	✓	✓	✓	✓
Mentzer et al. (2001)	✓	✓	✓	✓	✓	✓
Bowersox & Closs (2002)	✓	✓	✓	✓	✓	✓
Lambert et al. (2005)	✓	✓	✓	✓	✓	✓
Simchi-Levi et al. (2008)	✓	✓	✓	✓	✓	✓
Harrison & Van Hoek (2011)	✓	✓	✓	✓	✓	✓
Chopra & Meindl (2013)	✓	✓	✓	✓	✓	✓
Azevedo et al. (2011)	✓	✓	✓	✓	✓	✓
Wong & Karia (2010)	✓	✓	✓	✓	✓	✓

2.3.6. Hypothesis 6

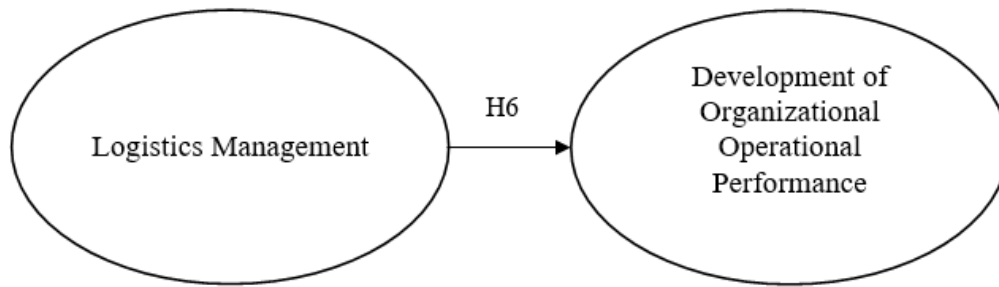


Table 6. Logistics Management positively affects the development of Organizational Operational Performance.

Reference (Researcher's name / Year)	Logistics Planning	Supply Chain Management	Warehouse Management	Transportation & Distribution	Logistics Technology	Operational Performance
Porter (1985)	✓	✓		✓		✓
Christopher (1998)	✓	✓	✓	✓	✓	✓
Mentzer et al. (2001)	✓	✓	✓	✓	✓	
Bowersox & Closs (2002)	✓	✓	✓	✓	✓	
Lambert et al. (2005)	✓	✓	✓	✓	✓	✓
Simchi-Levi et al. (2008)	✓	✓	✓		✓	✓
Seuring & Müller (2008)	✓	✓			✓	✓
Wong & Karia (2010)	✓	✓	✓	✓	✓	✓
Azevedo et al. (2011)	✓	✓	✓	✓	✓	✓
Gawankar et al. (2015)	✓	✓	✓	✓	✓	✓

2.3.7. Hypothesis 7

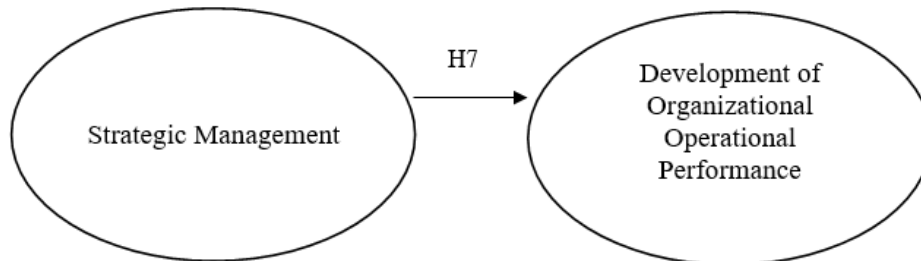


Table 7. Strategic Management positively affects the development of Organizational Operational Performance.

Reference (Researcher's Name / Year)	Strategic Planning	Strategy Implementation	Resource Allocation	Performance Measurement	Continuous Improvement	Operational Performance
Porter (1985)	✓	✓	✓	✓		✓
Mintzberg (1994)	✓	✓	✓	✓	✓	✓
Kaplan & Norton (1996)	✓	✓	✓	✓	✓	✓
Barney (1997)	✓	✓	✓	✓		✓
Johnson, Scholes & Whittington (2008)	✓	✓	✓	✓	✓	✓
Hitt, Ireland & Hoskisson (2011)	✓	✓	✓	✓	✓	✓
Wheelen & Hunger (2012)	✓	✓	✓	✓	✓	✓
David & David (2017)	✓	✓	✓	✓	✓	✓
Al-Dhaafri & Al-Swidi (2016)	✓	✓	✓	✓	✓	✓
Li et al. (2018)	✓	✓	✓	✓	✓	✓

3. RESEARCH METHODOLOGY

3.1. Research Design

This research employs a mixed-method design, emphasizing a quantitative causal model supported by qualitative insights.

The study aims to examine the causal relationships among Human Resources (HR), Internal Quality Systems (IQS), Logistics Management (LM), Strategic Management (SM), and Operational Performance (OP) in Thailand's industrial machinery and equipment sales and rental sector.

A structural equation modeling (SEM) framework is utilized to test seven hypotheses (Hypothesis 1 - Hypothesis 7). The conceptual framework is based on Systems Theory (Bertalanffy, 1968) and integrates RBV (Barney, 1991), TQM (Deming, 1986; Juran, 1998), Balanced Scorecard (Kaplan & Norton, 1996), and Dynamic Capabilities Theory (Teece et al., 1997) to explain the causal linkage between strategic and operational outcomes.

3.2. Population and Sample

1) Population: Executives, managers, and operational staff working in Thailand's industrial machinery and equipment sales and rental sector.

2) Sampling Technique: Stratified random sampling and purposive sampling were applied to ensure representation across company size and region.

3) Sample Size: Based on Hair et al. (2019), at least 300–500 respondents were determined sufficient for SEM with more than 20 observed variables.

4) Pilot Study: A pilot test with 30–50 participants was conducted to ensure reliability and validity before the main survey. Cronbach's Alpha ≥ 0.70 was used as the reliability criterion.

3.3. Research Instruments

The primary instrument is a structured questionnaire divided into five parts:

1) Demographic Information – respondent's position, experience, company type, and size.

2) Human Resource Practices – items on recruitment, training, performance appraisal, motivation, and participation.

3) Internal Quality System – items on ISO implementation, PDCA, auditing, and continuous improvement.

4) Logistics Management – items on cost, time, resource utilization, and sustainability.

5) Strategic Management and Operational Performance – items reflecting planning, execution, evaluation, and KPI alignment.

Each item uses a 5-point Likert scale (1 = strongly disagree $\rightarrow$ 5 = strongly agree). And instrument validity and reliability are established as follows:

- Content Validity: Expert panel review (IOC ≥ 0.50).
- Construct Validity: CFA (Confirmatory Factor Analysis).
- Reliability: Cronbach's Alpha ≥ 0.70 for each construct.

3.4. Data Collection

1) Preparation Stage: Design questionnaire and obtain expert validation.

2) Pilot Study: Conducted with 30–50 participants.

3) Main Data Collection: Distributed questionnaires both online and in-person to targeted respondents in relevant organizations.

4) Data Screening: Addressed missing data, tested normality (Skewness/Kurtosis within ± 2), and eliminated outliers.

3.5. Statistics Used for Data Analysis

3.5.1. Descriptive statistical analysis

Descriptive statistics are applied to summarize general characteristics of respondents and research variables.

The analysis includes:

- Frequency and Percentage – to describe demographic data (e.g., position, years of experience, firm size).
- Mean ($\bar{x}$) and Standard Deviation (SD) – to indicate the level of agreement for each item.
- Skewness and Kurtosis Tests – to assess data normality (acceptable range ± 2).
- Reliability Testing – Cronbach's Alpha coefficient (≥ 0.70) ensures internal consistency.
- Composite Reliability (CR) and Average Variance Extracted (AVE) – confirm internal reliability and convergent validity for SEM constructs.

3.5.2. Inferential Statistics

Inferential statistical analysis aims to test hypotheses (H1–H7) and validate the causal relationships among latent variables through a Structural Equation Modeling (SEM) framework.

3.6. Key Analytical Procedures Include

- Correlation Analysis — to examine the direction and strength of relationships among variables.
- Multiple Regression Analysis — preliminary testing for linear associations.
- Confirmatory Factor Analysis (CFA) — to validate the measurement model, ensuring discriminant and convergent validity.
- Structural Equation Modeling (SEM) — to evaluate causal relationships and test the full theoretical model, including direct, indirect, and total effects.

4. ANTICIPATED RESULTS

Based on theoretical foundations (RBV, TQM, SCM, and BSC) and prior empirical evidence, the study expects the following outcomes:

1) *Human Resources (H1–H2)*: Human Resource Management practices—recruitment, training, performance appraisal, and

motivation—will have a significant positive impact on both Strategic Management and Operational Performance. HR capabilities enhance employee alignment and operational excellence.

2) *Internal Quality Systems (H3–H4)*: Implementation of ISO-based systems, PDCA, Kaizen, and risk-based thinking will significantly improve Strategic Management and Operational Performance by standardizing processes, reducing waste, and enhancing quality.

3) *Logistics Management (H5–H6)*: Efficient logistics—through Lean, Agile, and Green Logistics—will strengthen both Strategic Management and Operational Performance by reducing costs, lead time, and environmental impact.

4) *Strategic Management (H7)*: Acts as a mediating variable, translating organizational capabilities into measurable performance outcomes in time, cost, quality, resource utilization, and sustainability.

The SEM model is anticipated to show a good fit ($CFI \geq 0.90$; $RMSEA \leq 0.08$) and strong explanatory power ($R^2 \geq 0.70$), confirming that HR, IQS, and LM collectively determine Strategic Management and Operational Performance in industrial machinery firms.

5. CONCLUSION AND RECOMMENDATION

5.1. Conclusion

The empirical results are expected to confirm that Human Resources, Internal Quality Systems, and Logistics Management are significant causal factors influencing Strategic Management and Operational Performance.

- Human Resources drive organizational adaptability, innovation, and strategic alignment.
- Internal Quality Systems serve as a foundation for operational consistency and continuous improvement.
- Logistics Management contributes to cost efficiency, customer satisfaction, and environmental sustainability.
- Strategic Management functions as the mediating mechanism that integrates these internal capabilities and transforms them into superior operational outcomes.

This finding reinforces Systems Theory (Bertalanffy, 1968) and the Resource-Based View (Barney, 1991), proving that effective integration of HR, quality, and logistics systems enhances organizational competitiveness and sustainable growth within the industrial machinery sector.

5.2. Recommendation

5.2.1. Theoretical Implications

- The study contributes to the academic literature by integrating multiple theoretical lenses—RBV, TQM, SCM, Balanced Scorecard, and Dynamic Capabilities Theory—into a unified causal model validated through SEM.
- It provides empirical support for the mediating role of Strategic Management in transforming internal resources into measurable operational outcomes.
- The results expand the understanding of causal pathways in industrial service and manufacturing contexts, offering a foundation for further Scopus-indexed comparative studies.

5.2.2. Managerial Implications

1) Human Resources:

- Invest in continuous training and leadership development.
- Link HR performance indicators with strategic KPIs via HR Scorecard and Balanced Scorecard frameworks.

2) Internal Quality Systems:

- Adopt ISO 9001/14001 standards and implement Kaizen, PDCA, and Six Sigma tools.
- Encourage employee participation in QCC (Quality Control Circles) and Suggestion Systems.

3) Logistics Management:

- Apply Lean and Green Logistics to reduce cost and environmental impact.
- Utilize digital technologies (IoT, AI, Blockchain, Big Data) for predictive and transparent logistics.

4) Strategic Integration:

- Link all functional areas (HR, Quality, Logistics) to strategic objectives through integrated performance measurement systems.

5.2.3. Recommendations for Future Research

- 1) Incorporate Digital Transformation or Organizational Culture as moderating variables to extend the model.
- 2) Conduct longitudinal studies to capture the dynamic evolution of causal relationships over time.
- 3) Expand the research to ASEAN industrial sectors to validate cross-cultural generalizability.
- 4) Apply Multi-Group SEM to analyze differences by firm size, ownership type, or regional distribution.

REFERENCES

- Ballou, R. H. (2007). The evolution and future of logistics and supply chain management. *European Business Review*, 19(4), 332–348. <https://doi.org/10.1108/09555340710760152>
- Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99–120. <https://doi.org/10.1177/014920639101700108>
- Christopher, M. (2016). *Logistics & supply chain management* (5th ed.). Pearson Education.
- Deming, W. E. (1986). *Out of the crisis*. MIT Press.
- Elkington, J. (1997). *Cannibals with forks: The triple bottom line of 21st century business*. Capstone Publishing.

- Gunasekaran, A., Patel, C., & Tirtiroglu, E. (2001). Performance measures and metrics in a supply chain environment. *International Journal of Operations & Production Management*, 21(1/2), 71–87. <https://doi.org/10.1108/01443570110358468>
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). *Multivariate data analysis* (8th ed.). Cengage Learning.
- Juran, J. M. (Ed.). (1998). *Juran's quality handbook* (5th ed.). McGraw-Hill.
- Kaplan, R. S., & Norton, D. P. (1996). *The balanced scorecard: Translating strategy into action*. Harvard Business School Press.
- Kotler, P., & Keller, K. L. (2017). *Marketing management* (15th ed.). Pearson Education.
- Lambert, D. M., Stock, J. R., & Ellram, L. M. (2008). *Fundamentals of logistics management* (4th ed.). McGraw-Hill.
- Langley, C. J. (2014). *The state of logistics outsourcing: 3PL study*. Penn State University.
- Mentzer, J. T., & Konrad, B. P. (1991). An efficiency/effectiveness approach to logistics performance analysis. *Journal of Business Logistics*, 12(1), 33–62.
- Mentzer, J. T., DeWitt, W., Keebler, J. S., Min, S., Nix, N. W., Smith, C. D., & Zacharia, Z. G. (2001). Defining supply chain management. *Journal of Business Logistics*, 22(2), 1–25. <https://doi.org/10.1002/j.2158-1592.2001.tb00001.x>
- Monczka, R. M., Handfield, R. B., Giunipero, L. C., & Patterson, J. L. (2015). *Purchasing and supply chain management* (6th ed.). Cengage Learning.
- Neely, A. (2005). The evolution of performance measurement research. *International Journal of Operations & Production Management*, 25(12), 1264–1277. <https://doi.org/10.1108/01443570510633648>
- Oakland, J. S. (2014). *Total quality management and operational excellence: Text with cases* (4th ed.). Routledge.
- Porter, M. E. (1985). *Competitive advantage: Creating and sustaining superior performance*. Free Press.
- Silver, E. A., Pyke, D. F., & Peterson, R. (1998). *Inventory management and production planning and scheduling* (3rd ed.). Wiley.
- Slack, N., Chambers, S., & Johnston, R. (2010). *Operations management* (6th ed.). Pearson Education.
- Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7), 509–533. [https://doi.org/10.1002/\(SICI\)1097-0266\(199708\)18:7<509::AID-SMJ882>3.0.CO;2-Z](https://doi.org/10.1002/(SICI)1097-0266(199708)18:7<509::AID-SMJ882>3.0.CO;2-Z)
- Williamson, O. E. (1985). *The economic institutions of capitalism: Firms, markets, relational contracting*. Free Press.
- Wheelen, T. L., & Hunger, J. D. (2017). *Strategic management and business policy: Globalization, innovation, and sustainability* (15th ed.). Pearson Education.
- Womack, J. P., & Jones, D. T. (2003). *Lean thinking: Banish waste and create wealth in your corporation* (2nd ed.). Free Press.