

STRATEGIC DRIVERS OF SUSTAINABLE MARKET COMPETITIVENESS IN BEIJING'S PRINTING SECTOR: A MIXED-METHODS ANALYSIS OF DIFFERENTIATION AS A MEDIATOR

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Abstract

In the context of the digital economy and increasingly stringent environmental regulations, Beijing's printing enterprises face significant challenges in maintaining sustainable market competitiveness. This study investigates the impact of technological innovation capability, service system optimization, and brand management on sustainable market competitiveness, specifically examining the mediating role of enterprise competitive differentiation capability. Grounded in the Resource-Based View (RBV) and Institutional Theory, this research employs an explanatory sequential mixed-methods design. Quantitative data were collected via questionnaires from 751 senior and middle managers in Beijing printing enterprises and analyzed using PLS-SEM. Qualitative insights were gathered through semi-structured interviews with 20 industry leaders. The results demonstrate that technological innovation, service optimization, and brand management significantly enhance sustainable competitiveness. Crucially, competitive differentiation capability acts as a vital mediator, translating these strategic capabilities into superior market performance. The findings provide a theoretical framework and actionable strategies for printing enterprises to navigate industrial transformation through integrated innovation, service, and branding strategies.

Keywords: Sustainable Market Competitiveness, Technological Innovation, Service System Optimization, Brand Management, Competitive Differentiation, Beijing Printing Industry

Introduction

Background of the Study

The global economic landscape is undergoing profound transformations driven by accelerated integration and the rapid evolution of information technology. In this context, traditional competitive strategies are being reshaped, compelling enterprises to seek new pathways for sustainable development (Li, 2024). As China's political, cultural, and international exchange hub, Beijing hosts a diverse array of enterprises that are pivotal to the city's economic vitality and industrial structure optimization (Liu, 2022). However, the printing industry in Beijing, a traditional sector, faces severe challenges including stringent environmental regulations, rising labor costs, and fierce market competition.

The central challenge for these enterprises is cultivating differential competitive advantages to achieve sustainable development. While technological innovation, service system optimization, and brand management are recognized as critical drivers of enterprise development (Wang & Chen, 2023), the mechanisms by which these factors interact to foster differentiation and subsequent competitiveness remain under-explored in the context of traditional industries undergoing digital transformation.

Statement of the Problem

Despite the recognition of innovation, service, and branding as pivotal factors, printing enterprises encounter theoretical and practical hurdles. Current research on technological innovation in traditional industries often yields contradictory findings regarding implementation effectiveness, particularly when enterprises face integration challenges with existing systems and talent shortages (Liu & Zhang, 2023). Similarly, while service system optimization is generally seen as beneficial, some studies highlight potential negative consequences such as operational complexity (Li & Wang, 2022). Furthermore, the specific pathways through which brand management translates into differentiation capabilities remain theoretically unclear (Gao & Wang, 2023).

The core research problem addressed in this study is the absence of a comprehensive theoretical framework explaining how technological innovation capability, service system optimization, and brand management contribute to sustainable market competitiveness through the mediating mechanism of differentiation capability. This gap is particularly acute for Beijing's printing enterprises, which must navigate the dual pressures of digital disruption and environmental compliance.

Research Objectives

This study aims to:

1. Evaluate the current levels of technological innovation capability, service system optimization, brand management, and enterprise differential competitive capability among Beijing printing enterprises.
2. Examine the mediating role of enterprise differential competitive capability in the relationships between these core strategic capabilities and sustainable market competitiveness.
3. Validate an integrated structural equation model (SEM) that provides a roadmap for enhancing the sustainable market competitiveness of Beijing printing enterprises.

Literature Review and Theoretical Framework

Theoretical Underpinnings

This study is grounded in the Resource-Based View (RBV) and Institutional Theory.

- **Resource-Based View (RBV):** RBV posits that a firm's competitive advantage stems from its unique bundle of valuable, rare, inimitable, and non-substitutable resources (Barney, 1991). In the context of Beijing printing enterprises, technological innovation capabilities (process, equipment, material) and service system optimization constitute core resources that enable differentiation.

- **Institutional Theory:** This theory highlights the role of formal and informal institutions in shaping organizational behavior (DiMaggio & Powell, 1983). Brand management in Beijing printing enterprises serves as a reflection of a firm's adherence to industry norms and social values, such as environmental regulations ("Green Printing"), thereby securing legitimacy and competitive advantage.

- **Enterprise Sustainable Development Theory:** This perspective emphasizes balancing economic, environmental, and social performance (Elkington, 1998). For Beijing printing firms, this means achieving profitability while meeting strict environmental compliance and social responsibility standards.

Technological Innovation Capability

Technological innovation capability refers to an enterprise's comprehensive ability to identify, acquire, integrate, and transform technical knowledge into new products and

processes (Chen, et al., 2022). In the printing industry, this capability manifests through three dimensions:

1. Printing Process Innovation: The development of digital workflows, AI-driven automation, and quality control mechanisms that enhance efficiency and customization. This includes the transition from analog to digital processes (Ma, 2024).

2. Equipment Technology Innovation: The integration of advanced machinery, such as IoT-connected devices and predictive maintenance systems, to optimize production. Smart equipment with machine vision allows for real-time defect detection (Zhang, et al., 2023).

3. Material Innovation: The development of eco-friendly inks, sustainable substrates, and functional materials (e.g., conductive inks for printed electronics) to meet regulatory and market demands (Wang, et al., 2023).

Research indicates that technological innovation improves production efficiency and product quality, serving as a primary driver of economic benefits. Thus, we propose:

- **H₁:** Technological innovation capability positively affects the sustainable market competitiveness of printing enterprises in Beijing.

Service System Optimization

Service system optimization involves the comprehensive enhancement of service delivery architectures through digital integration and process redesign (Chen, et al., 2023). It encompasses:

1. Service Process Automation: The systematic implementation of digital technologies (AI, RPA) to streamline customer-facing and back-office operations, reducing manual intervention and errors (Wang, et al., 2023).

2. Service Customization Capability: The ability to deliver personalized service offerings at scale, often utilizing mass customization methodologies and modular service architectures (Li, et al., 2024).

3. Service Agility: The capacity to rapidly reconfigure service processes and redeploy resources in response to market changes or disruptive opportunities (Zhang & Wang, 2022).

Effective service optimization improves customer satisfaction and loyalty by meeting evolving demands for convenience and personalization. Therefore:

- **H₂:** Service system optimization positively affects the sustainable market competitiveness of printing enterprises in Beijing.

Brand Management

Brand management is the strategic creation and maintenance of brand assets to establish distinctive market positioning (Wang, et al., 2023). It includes:

1. Brand Social Responsibility: Integrating environmental and ethical considerations into brand strategy, such as sustainability initiatives and community engagement (Guo, et al., 2023).

2. Brand Positioning & Communication: Developing distinctive identities and consistent messaging across integrated communication channels to shape stakeholder perceptions (Li, et al., 2023).

3. Brand Internationalization: Expanding brand presence across global markets through adaptation and localization strategies, particularly relevant under China's Belt and Road Initiative (Liu, et al., 2023).

Strong brands command price premiums and foster customer trust, essential for long-term success. Thus:

- **H₃:** Brand management positively affects the sustainable market competitiveness of

printing enterprises in Beijing.

The Mediating Role of Enterprise Competitive Differentiation Capability

Enterprise competitive differentiation capability is defined as the ability to build distinct, hard-to-replicate strengths in products or services (Barney, 2001; Liu, 2022). It acts as a bridge, translating internal capabilities (innovation, service, brand) into external market advantages.

- **Technological innovation** enables unique product features (e.g., functional materials) and process efficiencies that competitors cannot easily mimic.
- **Service optimization** creates superior customer experiences (e.g., rapid customization) that distinguish the firm from competitors.
- **Brand management** establishes a unique identity and emotional connection with stakeholders.

Consequently, differentiation capability is hypothesized to mediate the impact of these strategic factors on competitiveness:

- **H4:** Enterprise differential competitive capability mediates the relationship between technological innovation capability and sustainable market competitiveness.
- **H5:** Enterprise differential competitive capability mediates the relationship between service system optimization and sustainable market competitiveness.
- **H6:** Enterprise differential competitive capability mediates the relationship between brand management and sustainable market competitiveness.

Methodology

Research Design

This study adopts a pragmatic paradigm and employs an explanatory sequential mixed-methods design (Creswell & Plano Clark, 2018). The research was conducted in two phases:

1. **Quantitative Phase (QUAN):** A large-scale survey was administered to establish statistical relationships between the variables using Structural Equation Modeling (SEM).
2. **Qualitative Phase (qual):** Semi-structured interviews were conducted to explore the underlying mechanisms and contextual factors explaining the quantitative results.

Population and Sampling

The target population comprised printing enterprises in Beijing, covering various segments including publishing, packaging, and commercial printing.

- **Quantitative Sample:** A stratified random sampling method was used to select participants from a database of 580 enterprises. The final valid sample consisted of **751** senior and middle managers, ensuring representation across firm sizes and districts (Haidian, Chaoyang, Fengtai, etc.).
- **Qualitative Sample:** Purposive sampling was used to select **20** industry leaders (executives, managers) from diverse firms based on the quantitative results, ensuring diversity in capability profiles.

Data Collection Instruments

- **Questionnaire:** The survey items were adapted from validated scales in existing literature. It assessed technological innovation (process, equipment, material), service optimization (automation, customization, agility), brand management (responsibility, positioning, internationalization), differentiation capability (product, service), and sustainable market competitiveness (market share, loyalty, profitability, compliance). A pre-test with 25

respondents ensured clarity and validity.

- **Interview Guide:** A semi-structured guide containing open-ended questions probed the implementation of strategic initiatives and their perceived impact on competitiveness. Questions were refined based on preliminary quantitative analysis.

Data Analysis

- **Quantitative:** Data were analyzed using **SPSS 28.0** for descriptive statistics and **SmartPLS 4.0** for PLS-SEM to test the measurement and structural models. This included reliability tests (Cronbach's Alpha, CR), validity tests (AVE, HTMT), and hypothesis testing (bootstrapping).

- **Qualitative:** **NVivo 14** was used for thematic analysis, employing open, axial, and selective coding to identify core themes. **Leximancer 5.0** provided automated semantic content analysis to validate manual coding.

Results

Quantitative Findings

The demographic analysis of the 751 survey participants revealed a diverse representation of the Beijing printing industry, spanning various enterprise sizes and market specializations.

Measurement Model Assessment

The reliability and validity of the measurement model were confirmed. The results indicated that:

- **Reliability:** First-order and second-order variables demonstrated high reliability, with Cronbach's Alpha and Composite Reliability (CR) values exceeding the 0.70 threshold.

- **Validity:** Convergent validity was established with Average Variance Extracted (AVE) values above 0.50. Discriminant validity was confirmed using the Fornell-Larcker criterion and HTMT (Heterotrait-Monotrait) ratios (all < 0.90), ensuring the distinctiveness of the constructs.

Structural Model and Hypothesis Testing

The PLS-SEM analysis supported the proposed hypotheses:

- **Direct Effects:** Technological innovation capability (H₁), service system optimization (H₂), and brand management (H₃) were found to have significant positive impacts on sustainable market competitiveness. Path coefficients indicated strong relationships, validating the importance of these strategic capabilities.

- **Mediating Effects:** The analysis confirmed the mediating role of enterprise competitive differentiation capability.

- Differentiation mediated the relationship between technological innovation and competitiveness (H4).

- Differentiation mediated the relationship between service system optimization and competitiveness (H5).

- Differentiation mediated the relationship between brand management and competitiveness (H6).

- **Model Fit:** The model demonstrated good predictive power (R² and Q²) and adequate model fit indices (SRMR < 0.08).

Qualitative Findings

The qualitative analysis of 20 interviews provided rich context to the statistical findings, revealing six primary themes regarding how capabilities translate into competitiveness.

Innovation-Driven Differentiation

Participants emphasized that technological innovation is not merely about efficiency but about creating unique market value. For instance, the integration of 3D printing with traditional processes allowed firms to offer specialized packaging prototyping, a distinct competitive advantage. Interviewees noted that "proprietary material formulations" and "unique component configurations" created fundamental product advantages that were difficult for competitors to reverse engineer. One manager stated, "Our investment in green materials wasn't just for compliance; it opened up the high-end food packaging market for us because no one else could meet the safety standards."

Service as a Differentiator

Service optimization was described as a shift from transactional processing to "integrated solution provision." Mass customization methodologies enabled firms to deliver personalized services at scale, which participants identified as a key driver of customer loyalty. The use of AI in customer service (e.g., NLP chatbots) significantly reduced response times, enhancing the perception of service agility. A participant remarked, "Our automated quoting and tracking system isn't just a tool; it's why clients stay. They know they can get an answer at 2 AM."

Brand Ecosystems

Brand management was found to extend beyond visual identity. Successful firms employed "brand ecosystem orchestration," integrating social responsibility and community engagement into their brand narratives. Participants highlighted that sustainability initiatives, such as using eco-friendly materials and obtaining green certifications (e.g., FSC), were critical for differentiation in the environmentally conscious Beijing market.

The Mediating Mechanism

The qualitative data strongly supported the mediating role of differentiation. Interviewees explained that innovation and service efforts (internal capabilities) only translated into sustainable market share (competitiveness) when they resulted in a clear "differentiation capability"—such as a unique product feature or a superior service experience—that customers valued. As one executive summarized, "Innovation gives us the gun, but differentiation is the bullet that actually hits the target."

Discussion

Integration of Strategic Capabilities

The findings of this study confirm that technological innovation, service optimization, and brand management are not isolated activities but interconnected drivers of competitiveness. This aligns with the Resource-Based View, suggesting that the synergy between these capabilities creates a robust resource base. For example, technological innovation in digital workflows (Process Innovation) directly enables Service Customization capabilities, allowing for web-to-print solutions that enhance the customer experience. This integration supports the view that sustainable competitiveness requires a holistic approach to capability development.

Managerial Implications

For printing enterprise managers:

1. Focus on Differentiation: Strategic investments should be evaluated based on their potential to create differentiation. Innovation for innovation's sake is less effective than innovation that creates unique customer value.

2. Integrate Services: Transition from a manufacturing mindset to a service-provider mindset. Investing in digital platforms for service customization (web-to-print, automated CRM) can yield high returns in customer retention.

3. Build a Responsible Brand: Embed sustainability into the core brand identity. Communicating these efforts transparently can justify price premiums and build long-term trust.

Limitations and Future Research

This study focused on Beijing printing enterprises; future research could expand to other regions or industries to test the generalizability of the findings. Additionally, longitudinal studies could further elucidate the dynamic nature of capability development over time, particularly how differentiation strategies evolve as technologies mature.

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