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Research on the Impact of Digital Transformation on the Performance of Apparel Enterprises

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Abstract: Under the rapid development of the digital economy, the apparel industry faces new challenges such as personalized consumer demands and flexible supply chains, making digital transformation a critical path for enterprises to enhance competitiveness. However, in practices like intelligent production, data-driven design, and omnichannel marketing, apparel enterprises commonly encounter issues such as fragmented technology applications and insufficient organizational coordination, leading to significant disparities in transformation performance. By analyzing the motivations for digital transformation and the mechanisms of digital transformation in apparel enterprises, this study explores factors influencing the performance of digital transformation in these enterprises. It further proposes targeted recommendations to enhance the digital transformation performance of manufacturing enterprises.

Keywords: Digital Transformation, Apparel Industry, Enterprise Performance

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1.The Connotation and Drivers of Digital Transformation

1.1 Connotation of Digital Transformation

Digital transformation refers to a systemic change process driven by digital technologies, where enterprises integrate data resources, restructure business processes, and innovate business models to achieve operational efficiency improvements, user experience optimization, and value creation capabilities. Leveraging technologies such as cloud computing, big data, artifi cial intelligence (AI), and the Internet of Things (IoT), it enables data collection, analysis, and application to advance business intelligence. This transformation breaks traditional organizational boundaries, optimizes supply chains, production, and marketing through digital tools, and establishes end-to-end effi cient collaboration. By constructing data-driven decision-making mechanisms and fostering a digital mindset across all employees, enterprises shift toward flexible and agile organizational structures. Moving from a "product-centric" to a "user-centric" approach, companies leverage data insights to uncover new demands and expand innovative business models such as personalized services and subscription-based off erings.

1.2 Drivers of Digital Transformation

Amid global consumer market evolution and deep penetration of digital technologies, the apparel industry is transitioning from "scale-driven" to "value-reconstructed" paradigms. Rising consumer sovereignty, inefficiencies in industrial chain coordination, and shifts in global competition compel traditional apparel enterprises to abandon linear production logic and enhance total factor productivity through digital transformation. This shift is both an inevitable choice for industrial

upgrading and a core path to survival in the digital economy era, driven by external pressures and internal development needs.

External Pressures

New consumer demographics demand hyper-segmentation, personalized customization, contextualized styling, and instant gratification. Traditional "forecast-produce-distribute" models struggle with fragmented orders, leading to rising inventory turnover days and necessitating data-driven agile supply chains. Emerging channels like social commerce and livestreaming e-commerce require end-to-end digital integration of design, production, and marketing to support flexible, small-batch production. Technologies such as AI, 3D virtual simulation, and IoT are reshaping the industry from "experience-based" to "algorithm-driven" decision-making. Digital twin technology slashes product development cycles by over 50%, while intelligent scheduling systems boost capacity utilization by 30–40%. Competition now hinges on data asset management and digital technology adoption. International fast-fashion brands achieve "weekly new releases" through digital capabilities, pressuring traditional enterprises to accelerate technological upgrades. Additionally, stringent global "carbon footprint" regulations drive digital tools for green manufacturing and sustainable supply chains. China's Three-Year Action Plan for Digital Transformation in the Textile Industry mandates the construction of industrial internet platforms and smart manufacturing demonstration factories. Against the backdrop of global supply chain restructuring, low-cost Southeast Asian manufacturing and high-end Western customization create dual pressures, forcing domestic enterprises to escape the low-value "smile curve" through digital transformation.

1.3 Needs for Internal Development

Traditional apparel enterprises face exacerbated "bullwhip effects," with a 35–40% supply-demand mismatch due to disconnected design and consumer data. Digital transformation enables consumer behavior data to reverse-engineer product development, increasing hit-rate prediction accuracy by over 20 percentage points. It optimizes raw material procurement, production scheduling, and logistics, pushing industry average gross margins from 18% toward 25%. Rising labor costs (22% of industry average) and volatile energy/material prices compel enterprises to adopt digital twin factories and AI quality control systems to reduce unit costs. Smart cutting technology improves fabric utilization by 8–12%, while digital process libraries cut sample-making time by 60%, addressing resource misallocation. Competition now focuses on ecosystem efficiency rather than individual firms. Industrial clusters integrate SMEs via industrial internet platforms, enabling smart order allocation, cloud-based capacity scheduling, and full-process quality traceability. Digital technologies facilitate "crowdsourced design-distributed production-omnichannel marketing" ecosystems, where leading enterprises dominate value distribution through data assets and algorithmic advantages.

In this context, digital transformation transcends technological upgrades, becoming a survival strategy. Industry estimates show that full digital transformation can triple market response speed, optimize inventory turnover by over 40%, and boost new product contribution rates beyond 60%. This digital revolution is accelerating the apparel industry's shift from "labor-intensive" to "data-intensive," reshaping global fashion power dynamics.

Mechanisms of Digital Transformation Impacting Apparel Enterprise Performance

Apparel enterprises enhance performance through three pathways: demand-driven innovation, full-value-chain cost optimization, and end-to-end efficiency upgrades.

1.4 Data-Driven Product and Service Innovation

Dynamic analysis of consumer behavior data (e.g., social media trends, e-commerce preferences) enables rapid identification of fashion elements and market demands, guiding fabric R&D, design, and color matching to shorten product cycles. 3D virtual design replaces physical sampling, reducing trial costs and accelerating time-to-market. Virtual fitting via AI and augmented reality (AR) enhances online shopping experiences, lowers return rates, and increases customer retention. Blockchain-enabled traceability systems ensure transparency from raw materials to finished products, strengthening brand trust and premium pricing. Digital collaboration platforms integrate design, procurement, and production data, enabling real-time cross-departmental coordination. Flexible production systems dynamically adjust plans to achieve small-batch, multi-order responsiveness.

1.5 Cost Reduction and Efficiency Gains via Technology

AI demand forecasting models optimize inventory and procurement using historical sales data and external variables (e.g., seasonality, regional habits), minimizing overstock and stockouts. Digital supplier management systems automate pricing and order allocation, cutting procurement costs and lead times. Smart manufacturing equipment (e.g., automated cutting, AI sewing systems) reduces labor costs and material waste. IoT-enabled predictive maintenance minimizes downtime and extends equipment lifespan. Social commerce and direct-to-consumer (DTC) models eliminate intermediaries, while data-driven marketing (e.g., short videos, livestreaming) lowers customer acquisition costs. Programmatic advertising boosts ROI through user profiling.

2.Process Reengineering Through Digital Technologies

Consumer-direct manufacturing integrates orders with production systems for on-demand customization and "zero-inventory" management, shortening delivery cycles. Digital twins simulate production lines to optimize workflows and resource allocation. Smart warehousing employs automated sorting and route planning to reduce logistics labor costs. Real-time logistics tracking and big data analytics enhance last-mile delivery efficiency. Business intelligence (BI) systems consolidate sales, inventory, and supply chain data into real-time dashboards for agile decision-making. AI-powered trend forecasting and risk warnings improve strategic agility.

2.1 Key Constraints on Digital Transformation Performance

External Constraints:

(1) Lagging data governance standards and cross-border data sovereignty conflicts.

(2)Fragmented digital ecosystems across supply chains ("bucket effect").

Internal Constraints:

(3) Technology incompatibility and over-reliance on external vendors.

(4) Organizational inertia, skill gaps, and misaligned resource allocation.

2.2 Strategic Pathways for Enhancing Transformation Performance

(1) Systematic Empowerment: Strengthen policy support, industry standards, and cross-sector collaboration.

(2) Strategic Reconfiguration: Foster organizational agility, digital literacy, and ecosystem integration.

(3) Value Leapfrogging: Leverage digital twins and scenario-based services to transition from mass production to personalized value creation.

Conclusion

Digital transformation is reshaping global apparel competition. By 2022, China's apparel industry digitalization rate exceeded 35%, with smart customization and flexible supply chains boosting leading firms' profits by over 20%. This study reveals the "innovation-cost-efficiency" triad driving performance gains and highlights constraints in ecosystem coordination, organizational change, and technology adaptation. Future advancements in generative AI and the metaverse will accelerate "virtual-physical integration." Enterprises must balance short-term investments with long-term gains, embracing digital ecosystems and business model innovation to secure sustainable growth in China's apparel industry.

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Conflict of Interests

The author(s)declare(s) that there is no conflict of interest regarding the publication of this paper.

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