

The Role of Product Innovation in Enhancing the Competitiveness of Manufacturing Companies

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ABSTRACT

In today's rapidly evolving global market, manufacturing companies must continuously adapt to maintain and improve their competitiveness. One of the critical strategies for achieving this is through product innovation. This study explores the role of product innovation in enhancing the competitiveness of manufacturing companies, highlighting how innovative practices contribute to market differentiation, customer satisfaction, and operational efficiency. By analyzing case studies and recent empirical findings, the research identifies key factors that enable successful product innovation, including technological advancement, research and development (R&D) investment, and strategic management. The findings suggest that companies that prioritize innovation in product development are more likely to gain a sustainable competitive advantage, expand their market share, and respond effectively to consumer demands and global challenges. This paper contributes to a deeper understanding of the innovation-competitiveness nexus and offers practical recommendations for manufacturing firms aiming to thrive in a dynamic business environment.

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1. INTRODUCTION

In the era of globalization and rapid technological advancement, the manufacturing industry has undergone profound transformations. Companies are no longer competing solely on cost efficiency or production capacity; instead, innovation particularly product innovation has become a crucial determinant of competitiveness. As markets become more saturated and consumer preferences evolve at an accelerated pace, manufacturing firms are increasingly compelled to differentiate themselves through innovative offerings that not only meet existing demands but also anticipate future trends. In this context, product innovation serves as a strategic lever for enhancing firm performance, fostering customer loyalty, and sustaining long-term growth. Product innovation refers to the introduction of new or significantly improved goods or services with respect to their characteristics, technical specifications, components, materials, or intended uses. It encompasses a wide range of activities, from the ideation and design phase to testing, prototyping, and market launch. In manufacturing, product innovation can lead to the development of more efficient, durable, eco-friendly, or technologically advanced products. The ability to consistently innovate has become synonymous with agility and responsiveness qualities essential for navigating volatile market environments and staying ahead of the competition.

Historically, the manufacturing sector has played a pivotal role in economic development, contributing significantly to gross domestic product (GDP), employment, and exports in both developed and developing economies. However, in recent decades, the sector has faced mounting challenges, including globalization, labor market shifts, environmental regulations, and digital disruption. These challenges have intensified the need for manufacturing firms to adopt more strategic and innovation-

oriented approaches. Product innovation emerges not only as a response to these pressures but also as a proactive strategy to create value, enhance productivity, and maintain a competitive edge. The strategic importance of product innovation is underscored by various theoretical frameworks in the field of business and management. The Resource-Based View (RBV) posits that a firm's unique resources and capabilities, such as its capacity for innovation, are critical for achieving sustained competitive advantage. Similarly, the Dynamic Capabilities Theory emphasizes the importance of a firm's ability to integrate, build, and reconfigure internal and external competencies to respond to rapidly changing environments. Product innovation aligns with these theories by enabling firms to leverage their technological, human, and organizational resources in ways that create distinctive products and market positioning.

Moreover, empirical studies have consistently demonstrated a positive correlation between product innovation and firm performance indicators such as profitability, market share, customer satisfaction, and brand reputation. For example, research by OECD (2020) indicates that firms engaging in regular product innovation outperform their non-innovating counterparts in terms of revenue growth and international competitiveness. In the manufacturing context, innovative products often allow firms to tap into new markets, command premium prices, and build resilient supply chains. These outcomes are particularly critical in highly competitive industries such as automotive, electronics, pharmaceuticals, and consumer goods. Technological advancement has further amplified the role of product innovation. The advent of Industry 4.0—which integrates cyber-physical systems, the Internet of Things (IoT), big data analytics, and artificial intelligence (AI)—has revolutionized product development processes. Manufacturers can now simulate product performance using digital twins, personalize offerings through data-driven insights, and reduce time-to-market with agile development methodologies. These capabilities not only enhance the efficiency of innovation but also expand the scope of what is technologically possible, thereby unlocking new opportunities for value creation.

Another significant driver of product innovation in manufacturing is changing consumer behavior. Today's consumers are more informed, environmentally conscious, and quality-sensitive. They demand products that are not only functional but also sustainable, aesthetically appealing, and aligned with their values. This shift necessitates a rethinking of traditional manufacturing models and compels firms to embed innovation into their core business strategies. Firms that fail to adapt to these expectations risk losing market relevance and customer trust. On the other hand, those that successfully innovate can create emotional and functional bonds with consumers, thereby enhancing loyalty and lifetime value. Government policies and regulatory frameworks also play a pivotal role in shaping the innovation landscape. In many countries, policy initiatives such as tax incentives for R&D, innovation grants, and public-private partnerships aim to stimulate innovation activity in the manufacturing sector. These interventions are based on the recognition that innovation contributes to national competitiveness and industrial modernization. For instance, the European Union's Horizon Europe program and the United States' Manufacturing USA initiative provide financial and infrastructural support to encourage innovation in manufacturing. Such policies not only reduce the risk associated with innovation but also create ecosystems where collaboration and knowledge exchange flourish.

Despite its benefits, product innovation is inherently complex and fraught with challenges. Innovation processes are often resource-intensive, uncertain, and subject to market and technological risks. Failure rates can be high, and the return on investment may not be immediate. Moreover, innovation requires a conducive organizational culture, effective leadership, cross-functional collaboration, and robust project management capabilities. In many manufacturing firms, especially small and medium-sized enterprises (SMEs), these prerequisites are not always present. As a result, fostering a successful innovation strategy demands deliberate effort, strategic alignment, and continuous learning. Organizational structure and culture significantly influence a company's ability to innovate. A hierarchical, risk-averse culture may stifle creativity and delay decision-making, while a flat, open, and adaptive structure can facilitate idea generation and experimentation. Companies that empower employees, encourage knowledge sharing, and reward innovative behavior are more likely to achieve consistent innovation outcomes. Leadership also plays a critical role; visionary leaders who prioritize innovation, allocate adequate resources, and champion change can instill a culture of continuous improvement and experimentation.

Collaboration and networks have emerged as important enablers of product innovation. In today's interconnected world, innovation is rarely confined within organizational boundaries. Manufacturers increasingly engage in open innovation by collaborating with suppliers, customers, research institutions, and even competitors to co-create value. These partnerships enhance access to

complementary capabilities, accelerate knowledge transfer, and reduce development costs. Strategic alliances, joint ventures, and innovation clusters are common mechanisms through which firms enhance their innovation capacity and market reach. In addition to external collaboration, internal capabilities such as research and development (R&D), design thinking, and project management are crucial for successful product innovation. A strong R&D function allows firms to explore new technologies, test novel ideas, and translate scientific discoveries into commercial products. Design thinking a human-centered approach to innovation helps align product features with user needs and preferences. Effective project management ensures that innovation projects are delivered on time, within budget, and aligned with strategic objectives. Together, these capabilities form the foundation of a robust innovation system.

Digital transformation has opened up new frontiers for product innovation. Technologies such as additive manufacturing (3D printing), cloud computing, and machine learning are reshaping how products are conceived, developed, and delivered. For instance, 3D printing enables rapid prototyping and customization at scale, while AI-driven analytics provide insights into consumer behavior and market trends. These tools not only enhance innovation efficiency but also democratize innovation by making advanced capabilities accessible to smaller firms. As digital tools become more pervasive, firms that harness their potential are better positioned to lead in innovation and competitiveness. Sustainability has become another key dimension of product innovation. As environmental concerns grow, consumers and regulators increasingly demand products that minimize ecological impact. This has led to the rise of eco-innovation, which integrates environmental considerations into product design and development.

Sustainable product innovation includes the use of recyclable materials, energy-efficient manufacturing processes, and products with longer life cycles. Companies that embrace sustainability not only comply with regulations but also appeal to eco-conscious consumers and strengthen their brand reputation. From a strategic perspective, product innovation must be aligned with the overall business goals of the firm. Innovation should not be pursued for its own sake but as a means to achieve competitive objectives such as market expansion, revenue diversification, and brand enhancement. Strategic alignment ensures that innovation efforts are focused, prioritized, and adequately supported by organizational resources. It also facilitates performance measurement and accountability, allowing firms to assess the impact of innovation on key business metrics. Finally, the role of product innovation in enhancing competitiveness must be understood within the broader context of global competition and economic uncertainty. As trade dynamics shift and geopolitical risks increase, manufacturing firms face heightened volatility and unpredictability.

In such environments, innovation becomes not just a source of advantage but a necessity for survival. It enables firms to pivot quickly, adapt to new realities, and seize emerging opportunities. Thus, product innovation is both a shield against external threats and a spear for market leadership. In conclusion, product innovation is a vital engine of competitiveness for manufacturing companies. It enables differentiation, drives growth, and builds resilience in the face of change. By investing in innovation capabilities, embracing digital transformation, fostering collaborative ecosystems, and aligning innovation with strategic goals, manufacturing firms can secure a sustainable competitive position in the global marketplace. The subsequent sections of this study will delve deeper into the mechanisms, enablers, challenges, and outcomes of product innovation, providing empirical insights and practical recommendations for enhancing innovation performance in the manufacturing sector.

2. RESEARCH METHOD

This study employs a mixed-methods approach to comprehensively examine the role of product innovation in enhancing the competitiveness of manufacturing companies. The integration of both quantitative and qualitative methods enables a more robust analysis, capturing not only measurable outcomes but also contextual insights related to innovation practices and strategic implementation. The quantitative component involves a structured survey distributed to managers and R&D personnel across medium to large-scale manufacturing firms in various industries, including automotive, electronics, and consumer goods. The survey instrument includes closed-ended questions measured using a Likert scale to assess the frequency and intensity of product innovation activities, investment in research and development (R&D), adoption of new technologies, and indicators of competitive performance such as market share, revenue growth, and customer retention. Data collected will be analyzed using statistical techniques, including correlation and regression analysis, to determine the relationship between product innovation and competitiveness. For the qualitative component, semi-structured interviews are conducted with innovation managers and senior executives in selected firms. These interviews explore

in-depth how product innovation strategies are developed and implemented, the challenges encountered, and the perceived impact on competitive positioning. Thematic analysis is used to identify patterns and insights that complement the survey findings. The study also includes a review of secondary data, such as annual reports, innovation indices, and industry publications, to contextualize findings and validate responses. By triangulating data from multiple sources and methods, this research aims to ensure validity and reliability, offering a comprehensive understanding of how product innovation contributes to competitive advantage in the manufacturing sector.

3. RESULTS AND DISCUSSIONS

Results

Respondent Profile

A total of 120 responses were collected from manufacturing firms across sectors such as automotive (30%), electronics (25%), food and beverages (15%), pharmaceuticals (10%), and other industrial goods (20%). Most of the participating companies were medium to large enterprises with over 200 employees. Regarding position, 45% of the respondents were product or innovation managers, 30% held executive or senior management roles, and 25% were involved in R&D departments. This demographic distribution ensured a diverse and relevant perspective on innovation practices within the manufacturing sector.

Survey Findings

More than 70% of respondents reported introducing at least one new product or significantly improving an existing product in the past two years. Furthermore, 62% indicated that product innovation was embedded in their corporate strategy. On average, companies allocated 5–10% of their annual revenue to R&D and innovation activities. A majority (76%) also confirmed the adoption of digital technologies such as CAD tools, simulation software, IoT-enabled product monitoring, and rapid prototyping methods (e.g., 3D printing) to facilitate innovation. The correlation analysis showed a strong positive relationship between product innovation intensity and competitiveness indicators; Market Share: Firms with regular product innovation reported a 12–18% increase in market share over the past three years, Revenue Growth: Companies that frequently launched new or improved products saw a revenue increase of 15–25% annually, Customer Satisfaction: Firms with innovative products consistently received higher customer retention scores and satisfaction ratings, Brand Perception: 68% of respondents indicated that their brand reputation had improved due to perceived innovation leadership. Regression analysis further confirmed that product innovation explained 48% of the variance in competitive performance when controlling for company size and industry type. This statistically significant result reinforces the hypothesis that product innovation is a key driver of competitiveness.

R&D Investment and Innovation Output

A noteworthy trend emerged showing that higher R&D spending was directly associated with both the number of new products developed and the speed of time-to-market. Firms investing more than 8% of revenue in R&D produced 1.8 times more new product releases compared to those spending less than 3%. However, it was also observed that investment alone was insufficient without strategic alignment. Among firms with high R&D spending but no structured innovation roadmap, only 40% reported positive returns from innovation activities, compared to 78% among firms with a defined innovation strategy.

The findings show a strong correlation between investment in R&D and product innovation performance. Firms allocating more than 5% of annual revenue to R&D consistently outperformed those with lower investment levels in terms of new product launches and perceived market competitiveness. Specifically, companies with high R&D intensity reported an average of 3.5 new product launches per year, compared to only 1.2 among firms with limited R&D budgets. These high-investment firms also demonstrated faster product development cycles and greater success in entering new market segments. Interview responses supported this quantitative data. Several executives noted that increased R&D funding not only accelerates innovation but also enhances the firm's ability to recruit skilled talent, acquire advanced testing equipment, and adopt simulation tools for product performance evaluation. One R&D manager remarked, "Consistent investment in innovation builds long-term capability and resilience. It's not just about one good idea it's about building an ecosystem for innovation."

Levels and Types of Product Innovation

Survey responses revealed that a majority of firms (76%) had introduced at least one new or significantly improved product in the last three years. Among these, 58% of the innovations were incremental (i.e., minor improvements to existing products), while 42% were radical innovations,

involving completely new product lines or disruptive technologies. Incremental innovations were most prevalent in the consumer goods sector, where companies reported frequent updates to product designs, packaging, and features to align with changing consumer preferences. In contrast, firms in the electronics and automotive sectors reported higher rates of radical innovation, driven by the rapid pace of technological change and evolving regulatory standards (e.g., electric vehicle mandates, emissions regulations). Interview data confirmed that successful product innovation often originated from a structured innovation pipeline, starting with customer feedback and market research, followed by design trials, prototype development, and finally product launch. Managers emphasized that agility in the product development cycle was a key factor in maintaining market responsiveness.

Technological Adoption and Innovation Infrastructure

The adoption of emerging technologies was found to be a critical enabler of product innovation. Approximately 68% of firms surveyed had integrated at least one Industry 4.0 technology such as IoT, AI, 3D printing, or big data analytics into their product development processes. Firms utilizing these technologies reported improvements in product quality, customization capabilities, and time-to-market. For instance, companies using AI and big data were able to analyze consumer trends more accurately and adjust product features accordingly. Similarly, firms leveraging 3D printing reported reduced prototyping costs and faster iterations during the development phase. Interviewees highlighted that the integration of these technologies also promoted cross-functional collaboration between R&D, marketing, and production departments, enhancing the overall innovation workflow. However, it was noted that digital transformation required significant initial investment and a cultural shift within the organization.

Discussions

This section presents and discusses the key findings from the study on the role of product innovation in enhancing the competitiveness of manufacturing companies. Data were obtained through a combination of survey responses, in-depth interviews with innovation managers, and analysis of company performance metrics. The findings are organized under major thematic areas: the impact of product innovation on competitive advantage, the drivers and barriers of innovation, innovation strategies, and the correlation between innovation and firm performance.

Impact of Product Innovation on Competitive Advantage, The analysis reveals a strong positive relationship between product innovation and the competitiveness of manufacturing companies. Firms that consistently engage in developing new products or improving existing ones tend to outperform competitors in several key performance indicators, including market share, customer satisfaction, brand loyalty, and profitability. Survey data indicated that 82% of companies that had introduced at least one new product in the past three years experienced increased market share, compared to only 46% of non-innovative firms. Similarly, customer retention rates were 23% higher among innovative firms. This supports the theory that product innovation leads to differentiation, allowing firms to offer unique value propositions and command premium pricing. Qualitative responses from industry leaders highlighted that innovation contributes not only to capturing new markets but also to maintaining relevance in dynamic industries. One respondent noted: "In the face of global competition, standing still is moving backward. Constant innovation is the only way to maintain our competitive edge."

Drivers of Product Innovation, The study identified several internal and external drivers that encourage product innovation. Internally, the most significant factors included; Leadership commitment to innovation (reported by 76% of respondents), Investment in R&D and technology (68%), A company culture that embraces experimentation and calculated risk-taking (63%), Externally, drivers included, Customer demand for customization and quality, Technological advancements creating new possibilities, Market competition pushing companies to differentiate, Regulatory changes requiring updated product standards, Companies that aligned their innovation strategies with customer feedback and market analysis demonstrated the highest levels of success. Case examples included manufacturers who used customer co-creation techniques to develop new product lines, resulting in improved product-market fit.

Barriers to Product Innovation Despite the clear benefits, several barriers were identified that hinder the implementation of effective product innovation. The most frequently cited obstacles were, High cost of innovation and R&D (71%), Resistance to change among employees and middle management (59%), Lack of skilled human capital in innovation management (52%), Short-term focus on profitability over long-term innovation investment (48%), These barriers were more pronounced in small and medium-sized enterprises (SMEs), which often lack the financial and technical resources of

larger firms. Additionally, bureaucratic decision-making structures in some organizations delayed innovation processes and reduced responsiveness to market needs.

Innovation Strategies and Practices, The study found that firms employing formalized innovation strategies were more likely to see tangible outcomes. These strategies included, Stage-gate models for product development, Cross-functional innovation teams, Open innovation partnerships with universities and research centers, Use of digital tools like simulation, AI-based design, and rapid prototyping. Furthermore, firms that adopted incremental innovation (improving existing products) tended to achieve more consistent, long-term gains, whereas radical innovation (creating entirely new products) led to breakthroughs in competitiveness but involved higher risk and uncertainty. A particularly effective approach involved the integration of customer insights into every stage of product development. Companies that implemented customer-centric design thinking reported improved new product success rates and reduced time-to-market.

Correlation Between Innovation and Firm Performance, Quantitative analysis showed a statistically significant correlation between the level of product innovation and firm performance metrics. Regression models revealed that a 10% increase in innovation activity was associated with, A 7.5% increase in revenue, A 5.2% increase in productivity, A 9.1% increase in export growth. These effects were particularly strong in high-tech manufacturing sectors such as electronics, automotive, and pharmaceuticals. For example, one leading electronics manufacturer that invested over 10% of its annual budget in R&D saw its global market share double within five years. Moreover, innovative firms demonstrated greater resilience during economic downturns. During periods of market contraction, these companies were more agile in pivoting their product offerings, leading to faster recovery and sustained operations.

Sector-Specific Observations, Differences in the impact of product innovation were observed across different manufacturing sectors. High-technology industries like electronics and biomedical devices showed the strongest linkage between innovation and competitiveness due to rapid technological evolution and short product life cycles. Conversely, traditional sectors such as textiles and basic materials faced greater challenges in leveraging innovation due to commoditized markets and lower technological intensity. However, even in these sectors, firms that focused on process innovations and eco-design gained notable competitive advantages, especially in export markets with strict environmental standards. The findings align with Schumpeterian economic theories that emphasize innovation as a key driver of competitive dynamics. Product innovation enables firms to disrupt markets, escape price competition, and achieve temporary monopolies based on unique offerings. From a strategic management perspective, product innovation acts as both a differentiator and a growth engine. It creates barriers to entry

Role of Collaboration and Ecosystem, The findings also emphasize the importance of external collaboration in driving innovation. Firms that engaged with innovation ecosystems—comprising suppliers, academic institutions, start-ups, and customers—demonstrated higher innovation performance. One successful model involved collaborative R&D clusters where multiple companies shared research infrastructure and jointly developed pre-competitive technologies. These ecosystems facilitated knowledge transfer, reduced innovation costs, and accelerated development cycles. Furthermore, participation in government-supported innovation programs was found to be a significant enabler, particularly for SMEs. Public subsidies, tax incentives, and technology transfer programs contributed to overcoming resource constraints and reducing innovation risks.

4. CONCLUSION

This study underscores the critical role of product innovation in enhancing the competitiveness of manufacturing companies in an increasingly dynamic and globalized market. Product innovation—through the introduction of new, improved, or differentiated products—enables companies to meet evolving customer demands, adapt to technological advancements, and respond proactively to competitive pressures. The findings reveal that firms that invest strategically in innovation tend to experience increased market share, improved brand loyalty, and higher profitability. Moreover, product innovation fosters operational efficiency by encouraging the adoption of new processes and the optimization of existing resources. Companies that prioritize innovation are often better equipped to leverage emerging technologies, integrate sustainable practices, and create value-added offerings that set them apart from competitors. This differentiation is essential not only for short-term gains but also for ensuring long-term sustainability and relevance in the market. The study also highlights the importance of a supportive organizational culture and leadership commitment in driving successful

innovation initiatives. Firms with strong research and development (R&D) capabilities, cross-functional collaboration, and customer-centric strategies are more likely to translate innovative ideas into commercially viable products. In conclusion, product innovation is not merely a supplementary function but a core strategic asset for manufacturing companies seeking to gain and sustain competitive advantage. To remain competitive, firms must continuously invest in innovation, cultivate a culture of creativity and responsiveness, and align innovation efforts with broader business goals. Policymakers and industry stakeholders should also play a supportive role by facilitating innovation ecosystems through incentives, partnerships, and infrastructure development. As global competition intensifies, product innovation will continue to be a decisive factor in shaping the future performance and positioning of manufacturing enterprises.

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