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The Role of Technology in Building Competitive Advantage in the Digital Age in Indonesia

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Abstract

This paper explores the role of technology in building competitive advantage in the digital era through a case study on Tokopedia, one of the largest e-commerce platforms in Indonesia. Tokopedia has implemented various advanced technologies such as big data, analytics and the like to improve operational efficiency, customer experience, and product innovation. The impact of this technology adoption includes increased sales, user conversion, customer satisfaction, as well as cost efficiency and operational time. Recommendations for Tokopedia include continuing to innovate with advanced technology, optimizing customer experience, improving security and reliability, developing a digital ecosystem, utilizing big data for decision-making, and expanding markets. This paper shows that technology plays an important role in maintaining and increasing competitive advantage in the highly competitive e-commerce industry.

Keywords

Tokopedia; technology; competitive advantage; ecommerce; customers; product innovation



I. Introduction

In the ever-evolving digital era, technology plays an increasingly important role in shaping and strengthening a Company's competitive advantage (Bonnet & Westerman, 2020). Technology not only accelerates operational processes, but also opens up new opportunities for product and service innovation, improving efficiency and expanding market reach. Companies that successfully integrate technology effectively in their business strategies can gain significant advantages over their competitors (Saputra et al., 2019). One prominent example of utilizing technology to build a competitive advantage is Indonesia's leading e-commerce company, Tokopedia. As one of the largest e-commerce platforms in the country (see Figure 1), Tokopedia has become a prime representative of how technology is a key driver of success in today's business environment.

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Source: https://www.tokopedia.com/about *Figure 1. Main homepage of Tokopedia website*

In an increasingly complex and dynamic business environment, technology is no longer just a supporting tool, but has become a key foundation in business strategy (Haleem et al., 2022). This is especially evident in the digital age, where digital transformation has changed the entire business landscape. Companies that are able to utilize technology effectively have a clear advantage in facing challenges and taking advantage of opportunities (Saarikko et al., 2020). Tokopedia is one company that is able to use and utilize technology with a digital platform.

Tokopedia is now the largest e-commerce-based company in Indonesia, founded in 2009 by William Tanuwijaya and Leontinus Alpha Edison. Since its inception, Tokopedia has dedicated itself to providing an easy, safe, and reliable online shopping experience for its users by carrying out the Consumer to Consumer (C2C) model (Setiawan et al., 2020). However, what makes Tokopedia so successful in the face of fierce competition in the Indonesian e-commerce market. This paper aims to explore the role of technology in shaping Tokopedia's competitive advantage in the face of increasingly complex market dynamics in the digital era. This case study not only provides insights into how Tokopedia leverages technology to overcome challenges and expand market share, but also provides valuable lessons for other companies looking to strengthen their position in a rapidly changing business ecosystem.

The focus of this paper examines important aspects of the role of technology in building competitive advantage in the digital age and illustrates the relevance of the Tokopedia case study in this context. By understanding how Tokopedia successfully integrates technology into its business strategy, this paper hopes to provide inspiration and guidance for other companies in their pursuit of competitive advantage in an increasingly connected and digitized world.

II. Research Methods

The writing method in this article uses a literature review with a qualitative approach (Aspers & Corte, 2021). The focus of the study is related to competitive strategy and the use of technology in E-Commerce Companies in general to compare the findings with the practice in Tokopedia in particular, and media analysis. Analyzing media coverage and articles about Tokopedia to understand the company's image and public perception of its technological innovation.

III. Result and Discussion

3.1 Technology Implementation at Tokopedia

Tokopedia, as one of the largest e-commerce platforms in Indonesia, has implemented various advanced technologies to improve operational efficiency, customer experience, and competitive advantage (Yusuf et al., 2024). According to Kurniawan et al., (2022) and Panigoro et al. (2023) that Tokopedia has used technological innovation in the digital era in its business operations by utilizing:

a. Big Data and Analytics

Tokopedia utilizes big data to collect and analyze data from various sources, including user behavior, transactions, and interactions with the platform. According to Permana (2024) that by using data analytics, Tokopedia can use:

1) Personalization of User Experience

Data-based algorithms allow Tokopedia to provide product recommendations that are tailored to the user's preferences and shopping history.

2) Demand

Historical data analysis helps Tokopedia predict demand trends, which is useful for inventory management and marketing strategies.

b. Artificial Intelligence (AI) and Machine Learning (ML)

Dharmaputra et al. (2021) emphasized that AI and ML technologies are applied in various aspects of Tokopedia operations, such as:

1) Chatbot and Virtual Assistant

Tokopedia uses AI-based chatbots to provide 24/7 customer service, answer general questions, and assist in the purchasing process.

2) Fraud Detection

ML system is used to detect suspicious activities and prevent fraud, maintaining the security of transactions and user data.

c. Cloud Computing

Tokopedia utilizes cloud computing services to increase scalability and operational flexibility (Schrage et al., 2024) by:

1) Amazon Web Services (AWS)

Tokopedia uses AWS for hosting, data storage, and large-scale computing. Cloud computing allows Tokopedia to handle traffic spikes during promotional periods and shopping festivals.

2) Microservices Architecture

With microservices architecture, Tokopedia can develop, test, and launch new features quickly and efficiently.

d. Internet of Things (IoT)

IoT is used to improve logistics and delivery efficiency, Tokopedia uses it for:

1) Delivery Tracking

IoT sensors on delivery vehicles enable real-time tracking of package position and status, providing transparency to customers and optimizing delivery routes.

2) Inventory Management

IoT helps in inventory management with sensors that monitor stock items in real-time, reducing human error and stock shortages.

e. Payment Platform

Nilasari et al. (2022) asserted that Tokopedia developed a digital payment solution to facilitate transactions using:

1) OVO Integration

Tokopedia integrates OVO, an e-wallet platform, to facilitate fast and secure digital payments.

2) Tokopedia PayLater

This service allows users to make purchases now and pay later, increasing flexibility and convenience for customers.

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h. Blockchain

Although still in its early stages, Tokopedia is exploring the use of blockchain to increase transparency and security. In addition, Saeed (2023) said that Blockchain can be used to trace the origin and authentication of products, especially for premium products and imported goods, thereby increasing consumer confidence.

i. Augmented Reality (AR) and Virtual Reality (VR) Technology

To improve the online shopping experience, Sanda & Basalamah (2021) state that Tokopedia needs to implement AR and VR:

1) Virtual Try-On

AR features allow users to virtually try on products such as glasses or makeup before making a purchase, increasing customer engagement and satisfaction.

2) 360-Degree Product Views

VR technology provides a 360-degree view of the product, giving potential buyers a better idea of the product they are interested in.

j. SEO Optimization and Digital Marketing

Elizabet (2022) sees that Tokopedia consistently uses technology to optimize their presence in search engines and digital marketing:

1) Search Engine Optimization (SEO)

SEO algorithms are used to improve Tokopedia's organic search ranking on Google, attracting more visitors to their site.

2) Targeted Advertising

Using analytics data, Tokopedia runs targeted advertising campaigns to reach the right audience with relevant messages.

Thus, Tokopedia's implementation of technology has enabled the company to improve operational efficiency, provide a better customer experience, and create a strong competitive advantage (Melati & Dewi, 2020). By continuing to invest in advanced technology, Tokopedia is able to maintain its position as one of the major players in the ecommerce industry in Indonesia and expand its reach in the digital market.

3.2 Impact of Technology on Competitive Advantage

Fiati et al. (2021) explain that the specific impact of technology on Tokopedia's competitive advantage has three main aspects, namely (1) increased efficiency, (2) better customer experience, and (3) product innovation. The three main aspects can be explained in detail as follows:

a. Efficiency Improvement

Tokopedia in running its business can increase its efficiency (Paramaeswari & Sarno, 2020), especially in two ways, namely:

a) Otomatisasi Proses Bisnis

1) Logistics and Delivery

By leveraging IoT technology for real-time tracking and route optimization, Tokopedia can reduce delivery times and logistics costs. This ensures that products get to customers faster and more efficiently.

2) Inventory Management

Technologies such as IoT sensors and cloud-based management systems enable real-time stock monitoring, reduce the risk of stock-outs and inventory errors, and improve supply chain management.

b) Data Analytics and Big Data

1) Demand Prediction

Sophisticated data analysis helps Tokopedia predict product demand trends, thereby better managing inventory and reducing wastage.

2) Operational Optimization

By using big data, Tokopedia can identify operational areas that are less efficient and make targeted improvements, such as optimizing the payment process and product management.

b. Better Customer Experience

Tokopedia always emphasizes that a better customer experience is the key to success in a digital-based business. This is because, according to Zreik (2024) will have an influence on:

a) Personalization and Recommendation

1) Recommendation Algorithm

By using AI and machine learning, Tokopedia can provide highly relevant product recommendations to users based on their shopping history and behavior on the platform. This increases the likelihood of purchase and customer satisfaction.

2) Ad Personalization

Analytics technology allows Tokopedia to target advertisements more effectively, ensuring that the promotions users see are the ones most likely to be of interest to them.

b) Efficient Customer Service

1) Chatbot and Virtual Assistant

AI-based chatbots enable 24/7 customer service, answer common questions, and assist in the purchasing process. This reduces customer waiting time and increases satisfaction.

2) Real-Time Feedback

Technology enables real-time collection of customer feedback, which can be analyzed to continuously improve services and products.

c) Interactive Shopping Experience

1) Augmented Reality (AR)

Features such as virtual try-on and 360-degree product views enhance customer interaction with products online, providing a more immersive shopping experience and minimizing dissatisfaction due to products that do not meet expectations.

2) User-Friendly Mobile Application

Tokopedia develops intuitive and easy-to-use mobile applications, ensuring customers can shop conveniently anytime and anywhere.

c. Product Innovation

1) Data-Driven Product Development

a) Insights from Big Data

User data analysis helps Tokopedia understand market trends and customer needs, which can be used to develop new products and features that are relevant and in demand.

b) A/B Testing

Technology allows Tokopedia to conduct A/B testing on various product features and designs, so as to identify the best solutions that increase engagement and conversion.

2) Integrated Digital Ecosystem

a) Integration with Fintech Services

With services such as OVO and Tokopedia PayLater, Tokopedia expands its digital ecosystem, offering various payment methods that increase customer convenience and flexibility.

b) Open Platform for Innovation

Tokopedia provides APIs that can be used by third parties to develop additional applications, enriching the Tokopedia ecosystem with innovative new services and products.

3) New Market Penetration

a) Regional Expansion

Technology enables Tokopedia to expand its reach to new regions more efficiently, using data analytics to understand local markets and customize marketing and product strategies.

b) Digital Products

Tokopedia continues to develop digital products such as streaming services and digital content, which add value to users and open up new revenue streams.

It can thus be understood that technology has had a significant impact on Tokopedia's competitive advantage in several ways (1) improving efficiency, (2) better customer experience, and (3) innovating products. By continuously adopting and developing advanced technology, Tokopedia can maintain and enhance its competitive advantage in the digital era, staying relevant and ahead in the highly competitive e-commerce industry.

3.3 Tokopedia's Business Performance

Tokopedia's business performance is very good, especially after using digital technology. In less than 2 years, for example, when Tokopedia sold top-up credit as its first product, it has grown rapidly to 28 products (see Figure 1).

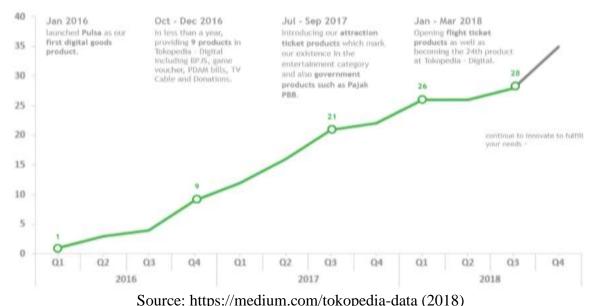
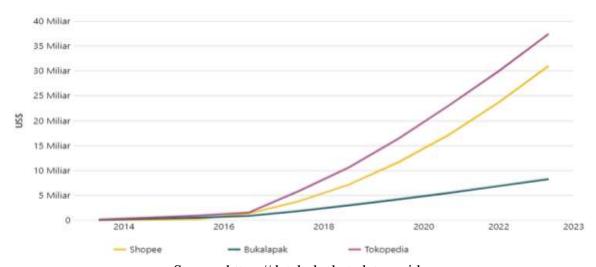


Figure 2. Growth of Tokopedia Recharge Prime Products

Figure 2 above illustrates that in January 2016, the first quarter of the launch of sales of 1 top-up product through digital transactions grew to 28 top-up products in the third quarter of 2018, exactly less than 2 years. This significant development occurred precisely before the occurrence of Covid-19, where digital transactions were not widely recognized by the public in Indonesia. Tokopedia really utilizes technology as a transaction medium, this can be seen in the development of transaction value which immediately skyrocketed from 2016 to 2023, from the initial transaction value of 5 billion towards 2023 it has almost reached 40 billion (see Figure 3).



Source: https://databoks.katadata.co.id

Figure 3. Transaction Value of Tokopedia, Bukalapak and Shopee 2014-2023

Companies that use the Business-to-Business Consumer (B2C) model, as in Graph 2 above, namely Bukalapak, Shopee, and Tokopedia, have become the pride of Indonesia. Tokopedia is the king among the three marketplace companies whose motto is technology facilitates, not hinders development (Putri, 2021). Tokopedia's impact on the economy in Indonesia is moncer, this can be seen during the pandemic (see Figure 4). Tokopedia encourages MSME players through empowerment (90%) to survive, rise, and be able to develop their business through digital adoption.



Source: LPEM FEB UI Research (2023) *Figure 4. Tokopedia's contribution to MSMEs*

During the Large-Scale Social Restrictions (PSBB), Tokopedia was able to provide opportunities for the wider community, especially for women to start their businesses. The percentage of women is even 5.4 points higher (18.6%) than men (13.2%).

Tokopedia dares to make technological innovations by utilizing big data to connect sellers and buyers. Ilyas (2020) in a release on Infotech emphasized that Big data shows a positive trend every year along with the development of the digital industry and the increasing number of players in the technology industry in Indonesia. Tokopedia as one of

the Indonesian technology companies can maximize the role of big data as a matchmaker between sellers and buyers. In addition, Rukmana (2022) sees that the success of Tokopedia's business performance in utilizing technology can be found in the development of Tokopedia sales for the March - May 2022 period. According to him, Tokopedia as a Local E-Commerce Pioneer in Indonesia has been able to sell 4 pantastis product categories, such as:

1. Health products

Tokopedia was able to sell Health products with a sales income of 5.4% in 2022, although the number of sales decreased by 15.2%. However, the market share jumped sharply by 54.2% from food supplements to health products in 2022 (see Figure 5).

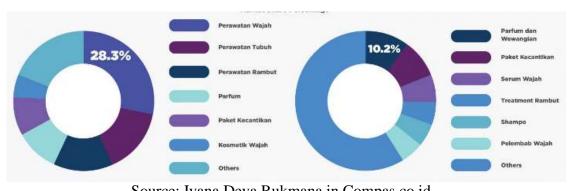


Source: Ivana Deva Rukmana in Compas.co.id Figure 5. Tokopedia Sales Data Health Category March - May 2022

Figure 5 also shows that the welfare category is the product with the largest contribution in the health category with a market share of 24.7%. This shows that Tokopedia's business performance is growing and developing.

2. Beauty Products

Beauty products on Tokopedia experienced a significant increase reaching 28.3% in market share, especially in facial care products. This can be seen in Figure 6 below:



Source: Ivana Deva Rukmana in Compas.co.id

Figure 6. Tokopedia Sales Data Beauty Category March - May 2022

In Figure 6 above, apart from facial care products, perfume and fragrance products gain the most market share of 10.2% followed by beauty package products and facial serums. Tokopedia is really earning a lot in this sector.

3. Food and Beverage Products

In Tokopedia, although food and beverage products in the first quarter of 2022 experienced a decline in revenue value and number of sales, which decreased by 33.3% and 31.0% compared to the previous quarter (see Figure 7). However, staples, especially food and beverage products in Tokopedia, remained at 25.4% of the market share. For the beverage category, Tokopedia customers seem to prefer coffee which reached 6%, compared to other products.

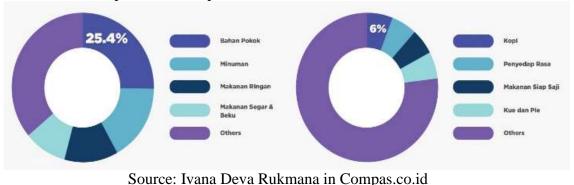


Figure 7. Tokopedia Sales Data Food and Beverage Category March - May 2022

4. Mother and Baby Products

Tokopedia is the pioneer of e-Commer for Indonesian local products. Tokopedia is one of the shopping "Malls" with an online concept and platform, allowing consumers and businesspeople to meet and conduct buying and selling transactions online as well. For example, in mother and baby products, Tokopedia got an increase in revenue compared to the previous quarter with an increase of 7.6%. This is inversely proportional to Shopee, which experienced a decline in sales revenue this quarter (see Figure 8).



Source: Ivana Deva Rukmana in Compas.co.id

Figure 8. Tokopedia Sales Data Mother and Baby Category March - May 2022

Graph 6 above confirms that the Formula Milk & Baby Food product category is the biggest contributor to market share with a contribution of 25.2%. As for the subcategory, Formula Milk is the market share winner with a similar portion, which is 25.2%.

Based on the results of Tokopedia's business performance, which was founded in 2009 and is headquartered in Jakarta. Tokopedia has now become bigger with the status of a unicorn startup and the decision to join Gojek to form the GoTo merger and enter the IPO. With a myriad of achievements and successes, it is no wonder that Tokopedia is touted as Indonesia's original leading e-commerce (Mishra & Valencia, 2023). The

adoption of big data and analytics technology allows Tokopedia to provide more accurate product recommendations and personalize the user experience, which in turn increases daily sales and user conversion rates. Customer satisfaction has also increased due to a better shopping experience (85 %).

IV. Conclusion

Based on the explanation provided, the conclusion can be drawn that Tokopedia's strategic adoption of technology has yielded substantial benefits across multiple dimensions of its business operations:

- 1. Sales and Conversion. The implementation of advanced technologies such as big data analytics has contributed to increased sales and improved conversion rates on the Tokopedia platform. This indicates that technological investments have directly impacted revenue generation and customer acquisition.
- 2. Customer Service and Security. Technology adoption has enhanced customer service experiences by providing personalized services and ensuring robust security measures. This has resulted in higher customer satisfaction and trust among users, critical for sustaining long-term relationships in e-commerce.
- 3. Operational Efficiency. Tokopedia has achieved operational efficiencies through technology, streamlining processes, reducing costs, and optimizing resource allocation. This efficiency gains contribute to overall profitability and scalability in a competitive market environment.
- 4. Users and Transactions. Technology has facilitated smoother user experiences and transaction processes on Tokopedia, fostering a seamless interaction between buyers and sellers. This has led to increased user engagement and transaction volumes, crucial for maintaining a vibrant marketplace.

Overall, Tokopedia's success story underscores the transformative impact of technological innovation in strengthening its competitive advantage in both the Indonesian and global e-commerce sectors. The continuous investment in advanced technologies not only enhances business performance but also positions Tokopedia as a leader in the digital economy, emphasizing the strategic importance of technology in achieving sustained growth and market leadership.

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