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Impact of Industrial Technology 4.0 in Improving Service Quality and Customer Experience on E-Commerce Platforms

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e-commerce, industry 4.0, service quality, customer experience.

ABSTRACT

With the rise of Industry 4.0 technology, e-commerce platforms have the opportunity to enhance their operations and improve customer experience. Industry 4.0 technology, which includes the Internet of Things (IoT), artificial intelligence (AI), and blockchain, has the possibility to revolutionize e-commerce by enabling personalized, secure, and convenient shopping experiences. The aim of this research is to evaluate the affect of Industry 4.0 technology in improving service quality and customer experience on e-commerce platforms. This article is focused on impact industrial technology 4.0 on e-commerce for data collection. Finding relevant and reputable papers is the first step in creating this article. Then, the search results are sorted by title and abstract. If it is suitable, it is necessary to conduct a literature review and then make a comparison. It was found that industrial technology 4.0 has a significant affect on improving service quality and customer experience on e-commerce platforms. Moreover, the use of industrial technology 4.0 has also improved the personalization of services on e-commerce platforms. With the rapid advancements in technology, e-commerce companies have been able to leverage various tools and solutions to improve their customer service and operational efficiency. By adopting these technologies, e-commerce companies have been able to offer a seamless and personalized shopping experience to their customers, which has, in turn, resulted in higher customer satisfaction rates and increased sales.

INTRODUCTION

Technology is always developing and helping humans to meet their needs. In addition, technology also helps humans to easily complete a job so that they can save time and effort, especially shopping problems. The evolution of information and communication technology has had a major affect on the business industry worldwide, including in the e-commerce sector. In this digital era, e-commerce is one of the business sectors that is growing rapidly and is increasingly popular among the public. E-commerce makes it simple for customers to shop easily and comfortably without having to leave their homes. However, along with the rapid growth of e-commerce, there are also new challenges that must be overcome by business people in this sector. One of these challenges is

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how to improve the quality of service and customer experience on e-commerce platforms so that they feel more satisfied and return to shopping in the future.

E-commerce companies are starting to take advantage of Industry 4.0 technology to improve service quality and customer experience. Industry 4.0 is the concept of the fourth industrial revolution which combines technologies such as "the Internet of Things (IoT), Artificial Intelligence (AI), and blockchain". These technologies have great possibility to improve efficiency, personalization, and the customer experience. However, the application of Industry 4.0 technology in e-commerce also presents challenges such as large investment costs in infrastructure and the need for a skilled workforce to manage and maintain this technology. In addition, there are also concerns around data privacy and security, which must be addressed to ensure that customers' personal information remains protected.

The aim of this research is to evaluate the affect of Industry 4.0 technology in improving service quality and customer experience on e-commerce platforms. For reach objective research, task more carry on must resolved: What is industrial technology 4.0 and how is it being used in e-commerce platforms? How does the use of this technology impact service quality and customer experience? What are the key advantages and challenges of using industrial technology 4.0 in e-commerce platforms? What are the implications of this technology for businesses and customers in the e-commerce industry? In addition, this research can also help to identify challenges and solutions in implementing Industry 4.0 technology in e-commerce operations.

In study this, is applied method study such as: analysis literature and analysis multi-criteria decision. The implementation of the results of this study can be used for e-commerce, trade and service companies by choosing the right way to use the collected data and customer data analytics so that business process efficiency can be increased. However, there is a number of obstacles and challenges during operate study this. Because necessary rate and move on with more lots of data covering other factors that influence, research this can expanded and surveyed web -based processed in the future.

METHODS

E-commerce

The success of direct interaction plays an main role in the process of interaction between sellers and buyers in offline shopping. On the other hand, website design and usability play an main role in e-commerce business. Changes in the retail sector have been taken over by e-commerce. In this way, e-commerce can be defined as something related to the exchange of information, transactions of goods and services, including payments (Davidavičienė, 2020). E-commerce provides several products that can be purchased, not limited to one product. In addition, the products can be ordered through an online platform. There are various ways to pay, such as by credit card or other online payment methods. There are also various delivery methods, such as via POS, JNE, JNT, and so on. The following table contains the definition of "E-commerce."

Table 1. Comparison of definitions of the term "E-commerce"

Source	Definition
Huang, Dai, and Liang, 2014 (Huang, 2014)	"E-commerce allows electronic payments and transactional information to be transferred via the Internet"
Kannaiah, Desti, 2015 (Kannaiah, 2015)	"E-commerce offers a level playing field and consumers face the efforts of the e-tailers to present products/services"
Damak, 2018 (Damak, 2018)	"E-commerce is revolutionizing supply chain management and has enormous potential for manufacturing, retail and service operations"

Through e-commerce, sellers can provide information and services before selling and after selling an item or product that the buyer really needs so it can be said to be "a reciprocal relationship" (Rahayu, 2017). Indonesia is a country that has the potential to develop large e-commerce because its young people are used to using and transacting via the internet. In Indonesia, the evolution of

the e-commerce is quite good. This can be seen from the existence of many growing marketplaces and the increasing function of social media as social commerce (Aribawa, 2016).

Industry 4.0

Industry 4.0 is "a concept of chain organization and technologies terms, based on radio frequency concept, cyber physical system, the internet of things, service internet, and data mining, it is a new form of personalization". Industry 4.0 can be used to adjust products in a short time and at a lower price than companies who are doing the standardization, so that producers and customers create new value together with the aim of filling gaps (Y. Wang., 2017). So, all it can be with the usage of industry 4.0.

With industry 4.0, all matters related directly or indirectly to production will work together regarding digital data information technology so that it is integrated (Schuh, 2014). Creating intelligent products, procedures and processes is the main goal of industry 4.0. The top priority requirements in Industry 4.0 include "real-time monitoring of data, having instructions to control the production process, and monitoring the status of the products involved" (Almada-Lobo, F. , 2015). Industry 4.0 does not only consist of machines' communication, but also it has wider coverage. Industry 4.0 is "a comprehensive process that affects many fields, such as information technology." The difference from this revolution from other revolutions: : "It is the interconnection of technological developments by triggering each other, acting in coordination and the development of all areas under the influence of each other" (Bulut, 2017).

E-commerce in Industry 4.0

In the 1990s, the e-commerce business began, although it was not yet widespread enough, which is commonly referred to as "the era of e-commerce 1.0 which was still a catalog of goods". Then, followed by e-commerce 2.0, where "the period where the process of ordering and shipping goods, generally still using a website that can only be accessed using a computer". Then, there is e-commerce 3.0, namely "buying and selling carried out using mobile devices to date." Currently, there are many platforms that can be used to develop a business, such as Instagram, Facebook, Twitter, and so on. Ideas and efforts continue to be developed to keep up with existing technological advances. Until finally e-commerce 4.0 appeared, which was the industrial revolution 4.0 where technological evolutions involved the Internet of Things (IoT), Artificial Intelligence (AI), and blockchain. However, e- commerce 4.0 as part of the Industrial Revolution 4.0 is something that need to be faced. Mastery of technology is needed today to compete with others. In addition, if there are problems that arising from the system used or old system. It is also necessary to develop a new system. Mastery of technology in technology development can also be done in order to seize opportunities and get maximum results. Mastery of technology is needed to be able to keep abreast of current business developments. With technology, customers can to be more accessible so that customers choose to shop through applications on the device (Ramdani, 2020)

Table 2. Benefits technologies to enhance e-commerce

Technology	Examples of uses
Internet of Things (IoT)	"Improve consumer experiences, track inventory in real time, manage orders more effectively"
Artificial intelligence (AI)	"Order products online, track orders, and perform other ecommerce activities"
Blockchain	"Smart contracts can be used by online vendors to automate order fulfillment; supply-chain management; B2B e-commerce"

Internet of Things (IoT)

A study states that IoT is ready to be adopted by 70 percent of retailers worldwide so that the consumer experience can be improved. There are several ways regarding e-commerce activities that can be utilized using IoT so that human error can be reduced. In addition, it can also minimize waste, costs can be controlled, and scarcity can be reduced. For example, "a temperature monitoring sensor can be used to maintain an optimal temperature in perishable products and send out alerts

when certain conditions are met. With that in mind, it's no wonder that e-commerce companies have made huge investments in IoT" .

Artificial intelligence (AI)

The capacity to link up consumer order to in various sectors that are currently needed in the economy can be seen through the AI system (Di Vaio, Palladino, Hassan, & Escobar, 2020). There is an important role of AI, namely identifying customer needs, monitoring the business environment, and implementing suitable strategies, so as to fill the gap between consumer needs and quality services (Di Vaio, Boccia, Landriani, & Palladino, 2020).

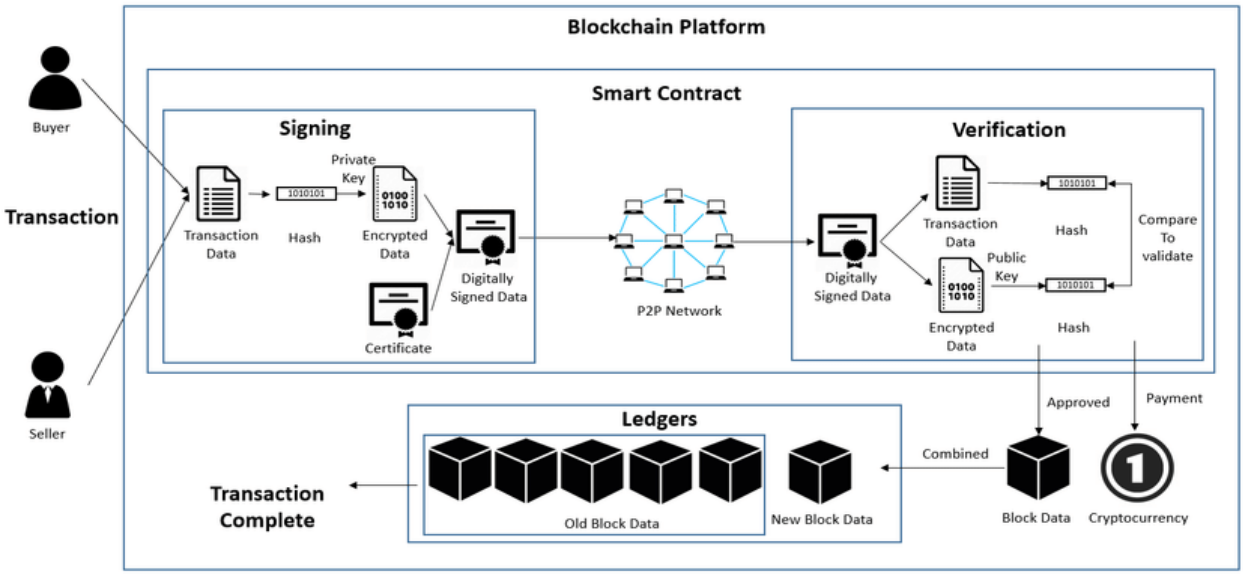
Benefits of AI in e-commerce (Tapan K., 2019):

1. "The customer visual search approach."
2. "Improve the sales process and retarget potential customers"
3. "A new level of personalization"
4. "Chatbots and virtual assistants. Improve recommendations for customers."
5. "Filter fake reviews"

Blockchain

Blockchain-based e-commerce offers several advantages such as "increasing traceability, tamper resistance, and ensuring trust is achieved without the need for centralized power, which means consumers have greater transparency and power." Smart contracts have several benefits such as preventing overbooking, preventing double-spending, lower transaction costs, and preventing fraud.

Figure 1. Blockchain as E-commerce Platform Architecture



Customer Experience

The results of buyer satisfaction can shape the customer experience. The touch point of entry is one of the most important factors affecting the customer's experience with the seller. The customer's emotional or rational perception plays a role in shaping a customer experience so as to attract customer interest in the products or services offered by the company.Communication with customers and other activities at different touch points have a significant influence on consumer purchasing decisions. Technology provides corporate communication with customers. This is a considerable development in big data analytics, AI, cloud computing, and so on (Rekettyea, 2020).

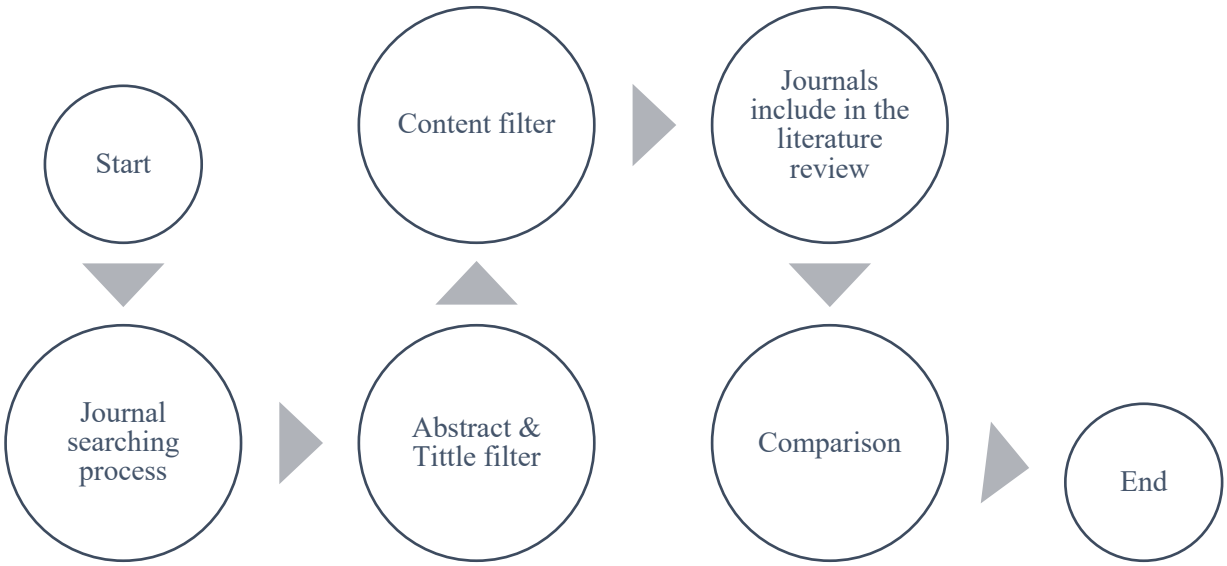
The company's innovation comes from the customer experience orientation (Bradley, 2015). The new ecosystem in industry 4.0 is the customer experience (Wiljén, 2015). Customer experience can make a significant impact due to sharing on digital platforms. The multilevel approach is owned

by the customer experience in the form of different ecosystems and competition such as dynamic experiences (Kranzbühler, 2018). Personalization development is an important aspect of digital disruption because experience is a personal cognitive part (Henfridsson, 2014). Customer experience is "part of virtualization to drive customer experience and virtual social connectivity powered by digital technology" (Parise, 2016).

Service Quality

Service quality is "how well the level of service provided is in accordance with customer expectations determined by the company's ability to meet customer needs and desires" (Tjiptono, 2016). So, service quality is "how far the difference between customer expectations and reality for the service they receive." Service quality is closely related to "customer satisfaction because it provides customers with opportunities to develop strong relationships with businesses." There is an assumption that if customers are satisfied with the service, they will be loyal and the response will be positive towards the business. The dimension of online shopping service quality is "the level of quality that effectively and efficiently facilitates customers in buying and selling products and services" (Afthanorhan, 2019). A good level of professionalism is also an important part of providing the best service which is the hope for online shopping customers. Finally, a service that can be customized based on customer needs is quality because the needs of each customer may be different, which will increase customer satisfaction when shopping online. That way, service quality is an important factor to increase customer satisfaction for online shopping (Risanty, 2021). The mechanism of this literature review is illustrated as follows:

Figure 2. Literature Review Methodology



This article is focused on impact industrial technology 4.0 on e-commerce for data collection. Finding relevant and reputable papers is the first step in creating this article, such as ScienceDirect, Google Scholar, Emerald, Scopus, and ResearchGate. Then, the search results are sorted by title and abstract. If it is suitable, it is necessary to conduct a literature review and then make a comparison. The purpose of this review is to explore and analyze existing research studies related to the topic. The review aims to identify the latest trends and developments in the use of industrial technology 4.0 in e-commerce platforms, and to examine how this technology is being utilized to enhance service quality and customer experience. Overall, the purpose of the literature review is to provide a comprehensive understanding of the affect of industrial technology 4.0 in improving service quality and customer experience on e-commerce platforms. The review aims to highlight the

potential of this technology to transform the e-commerce industry, and to identify areas for further research and development.

RESULTS AND DISCUSSION

Based on the literature review, it was found that industrial technology 4.0 has a significant impact on improving service quality and customer experience on e-commerce platforms. The integration of this technology into e-commerce platforms has led to the development of smart and automated systems that have enhanced the speed and efficiency of various processes such as inventory management, order processing, and delivery. This has resulted in a reduction in lead time and an improvement in product availability, which has led to an increase in customer satisfaction. Moreover, the use of industrial technology 4.0 has also improved the personalization of services on e-commerce platforms. By leveraging data analytics, machine learning, and artificial intelligence, e-commerce platforms can personalize the customer experience, tailor recommendations, and provide more relevant content to customers. This has led to an increase in customer engagement and loyalty.

The literature review highlights the potential of industrial technology 4.0 to transform the e-commerce industry and improve service quality and customer experience on e-commerce platforms. The use of this technology has led to significant improvements in efficiency, personalization, and customer satisfaction. E-commerce has undergone several phases of development since its inception, from e-commerce 1.0 (the first online stores) to e-commerce 4.0 (the current phase). E-commerce 4.0 involves the integration of various technological evolutions such as the Internet of Things (IoT), Artificial Intelligence (AI), and blockchain, which have significantly transformed the e-commerce industry.

The Internet of Things (IoT) refers to "a network of interconnected physical devices that can collect and exchange data." In e-commerce, IoT has enabled the development of smart logistics and supply chain management systems. IoT devices such as RFID tags, GPS sensors, and smart shelves can be used to track inventory and monitor product movement, leading to more efficient inventory management and faster order processing. The use of the Internet of Things (IoT) in e-commerce allows for a more efficient and accurate monitoring of stock and product conditions in real-time. IoT devices can be used to track inventory levels and automatically generate orders when stock runs low. This decrease the threat of stockouts, which can guide to lost sales and dissatisfied customers. In addition, IoT sensors can be used to monitor the condition of products during storage and transportation, such as temperature, humidity, and shock. This helps e-commerce companies to ensure that products arrive at the customer's doorstep in the best possible condition, which can improve customer satisfaction and reduce product returns. Moreover, IoT can be used to customize the customer experience by tracking customer behavior and preferences. For example, if a customer frequently purchases a particular type of product, IoT devices can be used to suggest similar products to the customer. This can lead to increased sales and customer loyalty. Overall, the use of IoT in e-commerce provides e-commerce companies with a wealth of data that can be used to improve service quality and customer experience. By leveraging this data, e-commerce companies can make better decisions, reduce costs, and enhance customer satisfaction.

Artificial Intelligence (AI) is another technology that has transformed e-commerce. AI algorithms can be used to analyze customer behavior and preferences, personalize recommendations, and optimize pricing strategies. AI-powered chatbots can also be used to offer 24/7 customer support, helping to resolve customer issues quickly and efficiently. The use of AI and big data in e-commerce can also help e-commerce companies provide a more personal and relevant shopping experience for each customer. Through big data analysis, e-commerce companies can study customer shopping preferences and behavior, and provide product recommendations that are more in line with these preferences. In addition, AI can also help e-commerce companies process orders and provide better customer service through chatbots and virtual assistants. Artificial Intelligence (AI) has the potential to significantly improve service quality and customer experience on e-commerce platforms.

i. Personalized Product Recommendations: AI algorithms can be used to examine customer data, such as purchase history, provide product recommendations so that they not only help customers find the products they are interested in, but also increase the likelihood of sales.

ii. Chatbots: AI-powered chatbots can be used to provide instant customer support, 24/7. Chatbots can answer basic questions, provide product recommendations, and even handle returns or refunds. This reduces the workload on customer service representatives and provides customers with a fast and convenient way to get their questions answered.
iii. Fraud Detection: AI algorithms can be used to discover fraudulent activity, such as fake reviews, fake accounts, and payment fraud. This helps to improve the overall trust and security of the e-commerce platform.
iv. Predictive Analytics: AI can be used to examine customer data to predict future behavior and trends thereby enabling companies to optimize their marketing strategies, product offerings and customer service.
v. Image and Voice Recognition: AI-powered image and voice recognition technologies can be used to improve the search and discovery experience on e-commerce platforms. Customers can use their voice or upload an image to search for a specific product, which can help them find what they are looking for faster and with more accuracy.

Overall, the use of AI in e-commerce can lead to improved service quality and customer experience by providing personalized recommendations, instant customer support, fraud detection, predictive analytics, and advanced search and discovery features.

Cyberattacks are a major concern for the growth of e-commerce. The rapid growth of the IoT is causing concern because its sensors carry sensitive information about their users. Transaction security in e-commerce and protecting customer personal data can be done using blockchain. One of the most well-known uses of blockchain is smart contracts to automate order fulfillment for the delivery of digital products. Blockchain technology can improve service quality and customer experience on e-commerce platforms in several ways. Firstly, blockchain can enhance the security and transparency of transactions on e-commerce platforms, thus reducing the risk of fraud and increasing customer trust. With blockchain, transactions are recorded in a decentralized and immutable ledger, making it difficult for anyone to manipulate the data. Secondly, blockchain can also facilitate faster and more efficient payment processing on e-commerce platforms. By using blockchain-based payment systems, e-commerce companies can eliminate intermediaries and reduce transaction costs, resulting in faster and more affordable transactions for customers. Thirdly, blockchain can also be used to track the whole supply chain process, from the source of raw materials to the delivery of finished products to customers. This level of transparency can help e-commerce companies improve their logistics and inventory management, resulting in better service quality and faster delivery times for customers. Overall, blockchain technology has the potential to transform the e-commerce industry by improving service quality, increasing customer trust, and reducing transaction costs. However, the adoption is still in its early stages, so more development and research is needed to find out the potential that exists in the e-commerce industry.

Even though Industry 4.0 technology has many benefits, there are several challenges that must be overcome in implementing this technology in e-commerce operations. These challenges include the high cost of implementation, the need for specialized technical expertise, and the potential for cybersecurity risks. It is important for e-commerce platforms to address these challenges to ensure the successful integration of this technology and to maximize its benefits technology has great potential to improve service quality and customer experience on e-commerce platforms. There are several major issues regarding the quality of online services. The first is the need to expand user-friendly e-commerce websites with easy purchases thereby creating higher satisfaction and loyalty. In the second, the quality of service, customer sensitivity, personalized service and quick response to complaints should be improved by the website manager. Thirdly, the website has a high level of security and meets privacy data protection requirements. This web service provides a standardized approach to support user retrieval of context-based information (Library, 2015).

The findings regarding Customer Experience Orientation show a strong relationship in the expand of Industry 4.0 business innovation. This shows that customer digital disruption is an important factor in maintaining a competitive advantage. In this digital era, customer experience becomes the input of the evolution of value chain to develop business model innovations. With a strong reputation, companies can attract customers and stakeholders to generate more value in

several activities. The development of strong customer relation is considered in personalizing customer requirement. These findings emphasize "the importance of personalization due to digital technology and virtualization which means that customer experience can be prioritized with strong customer relationships and personalization." In other words, "when customer experience is fulfilled by the firm, the customer would not consider the price and the brand of the firm."

CONCLUSION

Technology has tremendous potential in improving service quality and customer experience on e-commerce platforms. With the rapid advancements in technology, e-commerce companies have been able to leverage various tools and solutions to increase their customer service, decrease costs, and refine operational efficiency. For instance, technologies such as Artificial Intelligence (AI), the Internet of Things (IoT), and blockchain have been instrumental in transforming the e-commerce industry. AI-powered chatbots and virtual assistants have enabled e-commerce companies to provide personalized customer support and improve their response times. IoT sensors have made it possible for e-commerce companies to monitor stock levels, product conditions, and delivery schedules in real-time, thus improving their supply chain management and enhancing their service quality. Moreover, blockchain technology has made it possible for e-commerce companies to improve the security and transparency of transactions, reduce transaction costs, and streamline their payment processing systems. By adopting these technologies, e-commerce companies have been able to offer a seamless and personalized shopping experience to their customers, which has, in turn, resulted in higher customer satisfaction rates and increased sales.

The results of this study show that in the industrial era 4.0, personalized customer experience is increasingly important. This needs to be faced by the company because if it does not lose competitiveness. Companies must ensure that the customer's post-purchase experience is also positive so as to create loyalty during repurchase, and they immediately enter into the loyalty loop during the repurchase. The quality of an e-commerce website is "an important factor in attracting potential customers, encouraging first-time purchases and maintaining repeat purchases." An important component for consumers in choosing the most preferred website is its quality thereby generating more revenue for the service provider. Overall, technology integration has helped e-commerce companies to develop self-fulfilling their customer needs, improve the quality of their service, and stay competitive. As technology advances, we can expect more innovations that will certainly improve the customer experience and service quality.

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