

Artificial Intelligence Techniques in E-Commerce: The Possibility of Exploiting them in Saudi Arabia

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ABSTRACT

E-Commerce has transformed business as we know over the past few decades. The rapid increasing use of the Internet and the strong purchasing power in Saudi Arabia have had a strong impact on the evolution of E-Commerce in the country. Saudi Arabia is yet another country that will release artificial intelligence power to fuel its growth in the economic world. Recently, artificial intelligence (AI) applications that can facilitate e-commerce processes have been widely used. The impact of using artificial intelligence (AI) concepts and techniques on the efficiency of e-commerce, particularly has been overlooked by many prior studies. In this paper, a literature review was conducted to explore and investigate possible applications of AI in E-Commerce that can help Saudi Arabian businesses.

Keywords-- Artificial Intelligence, E-Commerce, Saudi Arabia

I. INTRODUCTION

E-commerce is a process of purchasing, selling, and marketing goods, things, various services by making use of the Internet (Treiblmaier & Sillaber, 2021). It means the internet networks are used as intermediaries between manufacturers and customers. Here we consider the web stores the heart of business and internet users are customers and buyers. The Internet gave a boost to e-commerce (Nag & Bajaj, 2005). Since the beginning of e-commerce, it has passed through multiple changes with the emergence of new and advanced hardware and software technologies, and it has developed substantially in recent years. Therefore, the buying and selling of goods and services electronically have increased in the whole world even in developing countries (Javid, Nazari & Ghaeli, 2019). Nowadays e-commerce sites are not restricted to electronic products such as TVs and mobile phones but also sell shoes, bags, and clothes. In addition, there are e-commerce platforms that sell daily basic products which are becoming more popular these days, specifically during the Covid-19 pandemic quarantine (Akgül & Danboyulu, 2021). E-commerce is a new economic activity that has emerged with the development of network and communication technology.

Essentially, it is the creation of a business based on information technology (Peng, Quan, & Peng, 2019).

E-commerce platforms make it easy to find product information discovery that allows for comparisons and decision-making. They aim to replicate consumer in-store experiences and interactions to influence purchasing decisions (Rosário & Raimundo, 2021). E-Commerce has some characteristics such as virtualization, low transaction cost, information interaction, high efficiency, flexible use, and transaction transparency. At the same time, it improves the potential consumer skills, expands the consumer group, accelerates the consumption demand, provides high-quality services, helps the manufacturers reduce the inventory level, accelerates the capital flow, and creates new opportunities (Ivanaj, Nganmini, & Antoine, 2019). The success of e-commerce relies heavily on effective communication between customers and retailers, rather than the drawbacks of internet latency for reliability and convenience purposes. That is, if a retailer's e-retail platform does not have sufficient technical infrastructure, the customer experience will be negatively affected, which may lead to a shrinking market share. To make up for the defects of this aspect, the system model of the Artificial Intelligence (AI) system and electronic commerce is used, and both reach the innovative optimization plan, which has a very reliable practical basis (Li, 2020).

Artificial Intelligence known as AI is one of the widest and most popular branches of computer science today which involves creating and building smart machines. These smart machines are constructed with the purpose that they will be able to perform the actions that can be performed based on human intelligence. We find AI is also used in the home and for other purposes such as E-learning (Soni, 2020). AI has the potential to collect and interpret vast quantities of data and to make active choices. Massive numbers of E-commerce firms have begun to introduce multiple types of AI to better understand their clients so that they can provide their customers with a better experience. It's now more than 60 years since the inception of AI which has resulted in important development that we can see in our economy and society today. E-commerce has made tremendous and unforgettable technological strides in the last few years. Customers love the ease of E-commerce and often

have ever-increasing demands for it. For E-commerce growth, AI opens new ideas and trends (Kumar & Kumar, 2021).

E-commerce spending growth in Saudi Arabia will create growth potential in the private sector, especially in the retail industry. In turn, this growth will create an attractive environment that is conducive to local and international investors in the sector. Improving national connectivity infrastructure and enhancing broadband reach and penetration will directly contribute to the growth of E-commerce in Saudi Arabia (Communications and Information Technology Commission, 2021). The Kingdom of Saudi Arabia is one of the leading adopters of AI technology. The nation, and the region, will face challenges as it continues to adapt and adopt the AI culture, which extends beyond just the cognitive method of human thoughts. As the country continues to diversify away from the oil dependence which had become an "addiction" for the country, start-ups sought encouragement and support to breakthrough into markets. With AI providing them the potential to leverage their product or service to the right consumer segment and focus their marketing efforts, the opportunity to scale operations existed. Thus, with modifications to culture, policies and practices, business regulations, and transparency (in terms of big data collection), AI and entrepreneurs could proactively serve the needs of consumers (Ahmed, 2019). According to a report by Internet World usage and population statistics in Saudi Arabia, the population is around 28,146,657 and about 6,380,000 Saudi citizens have Internet access (Al-Sobhi, Weerakkody & El-Haddadeh, 2011). Since 2000, there was substantial growth in the number of Saudis with Internet access of approximately 3090%. The Saudi government has shown significant interest in motivating e-commerce systems for enhancing local and regional businesses, mainly by structuring a legal framework for online transactions. Such a move would have a substantial impact on business flow and e-commerce in the Middle East.

In 2001, the Saudi Ministry of Commerce established an e-commerce Committee including members from multiple government agencies and the private sector. This committee's main task was to prepare plans and a general framework for enhancing factors affecting e-commerce development including education and training, IT infrastructure, payment systems, legislation and regulation, security needs, and delivery systems. In 2005, the mission of e-commerce development and supervision was transferred to the Ministry of ICT (Information and Communication Technology). The Saudi Communication and Information Technology Commission (CITC) has accomplished a comprehensive study of different aspects of Internet usage in Saudi Arabia in 2007, one of these aspects is e-commerce awareness and activity. This study reported that only 9% of Saudi commercial

organizations, especially medium and large companies from the manufacturing sector, were interested in e-commerce and only 4 out of 10 private companies had websites. This study also indicated that 43% of the customers were aware of e-commerce, but only 6% had ever bought or sold products online (Alabdali, 2018). Albliwi & Alsolami (2021) have explored the impact of COVID-19-derived factors on the Saudi Arabian e-commerce market. They have found that businessmen across the country have used a variety of strategies to go online during the pandemic to cope with the situation.

The COVID-19 outbreak has led to the rapid development of e-commerce in Saudi Arabia. The consumer's interest has been increased in online grocery and pharmacy purchases. Saudi Arabia's e-commerce market has grown dramatically, and it will continue to grow in the next few years. With the expectation that more than 6.34 million users will continue to shop online, and the number of online shoppers will increase to reach 19.28 million by 2022 (Zamil, Adwan & Areiqat, 2021). Currently, Saudi Arabia's e-commerce market is the biggest in the Middle East and North Africa (MENA) region (Song, Yang, Huang & Huang, 2019). This paper will have one primary objective, which is to pursue a review on the use of AI for E-Commerce to reveal the ways Saudi E-Commerce can use AI.

The structure of the paper is: Section 2 presents background about how AI can be integrated into an e-commerce system and the applications of AI in E-Commerce. Section 3 presents the methodology for the selection of the related research articles. Section 4 presents findings obtained from pursuing the literature survey. Section 5 concludes the paper by discussing the crux of the literature review.

II. LITERATURE REVIEW

This section highlights the contribution of some research studies that are related to the topic of this study. It discusses AI and the field of e-commerce.

2.1 AI and E-Commerce

In today's era, AI can be considered for every solution due to its clear benefits to humans. Also, it's easy to see why people are increasingly engaging with companies using artificial intelligence (Rabah, 2018). AI plays a vital role in the competitive world. Through AI, big problems can be solved in nanoseconds. E-commerce plays a crucial role because with the help of e-commerce, marketers can easily deliver the product into the hands of the consumers and save the consumers time to get the product more easily through an online payment. With the exploitation of AI tools, the E-commerce business easily captures the market, earns a profit, and timely fulfills the consumer's wishes, needs, wants, and desires. AI and E-commerce are collectively used by businessmen to increase sales because AI includes human beings' intelligence to be used in

machines and computer systems. Now our new generation saves time, gives the most importance to electronic transactions, and AI helps to provide more and more facilities to the consumers. AI helps to adopt an effective and economical manner and procedures for manufacturing quality products (Apple Academic Press, 2021). E-commerce has developed strongly in recent years. The rapid development of E-commerce brings convenience to consumers. To optimize operational efficiency, and improve the quality of service, the electronic commerce platform continuously explores new ways to meet more demands of consumers. The emergence of AI has opened up new ideas and patterns for the development of E-commerce and patterns. Its value to the electronic commerce industry will be Omnidirectional (Song, Yang, Huang, & Huang, 2019). AI provided the agility needed to thrive in a continuously changing and unpredictable environment, which would otherwise be ineffective through human intervention, especially when dealing in competitive global markets. By allowing entrepreneurs access to AI systems, manufacturing start-ups can change the volume of production rapidly, and employ dual-use strategies that permit high levels of preparedness without diverting finances into industrial investments. This, without the heavy initial requirement for lean manufacturing, does provide decision-makers with some flexibility for output levels. Finding the product-market fit also becomes easier through AI specialties such as audience segmentation and machine learning, to process raw consumer data into categorized customer segments. With advertisements by Facebook and Google already allowing businesses to pinpoint and target internet surfers to their value proposition, AI unleashes the ability to 'understand' and 'predict' customer behavior even before they log on to a website (Ahmed, 2019). AI and E-commerce have been used by businessmen and customers to create a benefit for them. Recently AI and E-commerce had both been related to each other. E-commerce has purely been based on consumers' timely changes in trends, customs, designs, and styles changed but with the help of AI, creative new ideas to identify consumers' buying behavior and, according to consumer's demands, products are manufactured. Every business wants to earn more and more profit; Goodwill and profit are based on sales of the goods and services through promotional tools and adopted effective advertising strategies for selling the product. The marketing strategy is part of E-commerce. AI and E-commerce are used by a company to reach its target market through various ways like through media, advertising, effective promotional campaigns, etc. (Apple Academic Press, 2021).

E-commerce is the major beneficiary of the increased use of AI to improve services' efficiency and quality. AI helps in reducing complications that may result from human errors. Thus, although AI may reduce employment opportunities, its benefits to organizations

are immense. Notably, AI is a formidable driving force behind the development and success of E-commerce. In E-commerce, AI systems allow for network marketing, electronic payments, and management of the logistics involved in availing products to the customers. Di Vaio, Boccia, Landriani, and Palladino (2020) note that AI is becoming increasingly vital in E-commerce food companies because it maintains the production sites' hygienic conditions and ensures safe food production. It also helps in maintaining high levels of cleanliness of the food-producing equipment. Suresh and Rani (2020) have identified the applications in the E-commerce sector such as real-time product targeting, visual search, AI-based hiring process, voice-powered search, assortment intelligence tool, conversational commerce, customer service, virtual personal shoppers, virtual assistance, AI fake reviews detection, AI-based sales process, customer-centric advertisements.

According to the growth model, the "baseline" scenario and "AI Steady State" scenario illustrated the potential impact of including AI as a new "factor of production". As per estimates, the Kingdom's economic growth rate could witness an additional 1.1 percent with gross value-add approximated at USD 215 billion for Saudi Arabia (Elsaadani, Purdy, & Hakutangwi, 2018). The Saudi Arabian spending on the AI market was valued at USD 164.98 million in 2020, and it is expected to reach USD 891.74 million by 2026. Saudi Arabia is yet another country that will release the potential of AI to fuel its economic growth plans. Saudi Arabia, one of the world's top oil producers, has now developed and implemented a national AI policy. However, KSA sees oil as a limited resource and thus is moving to other platforms for running its economies such as big data and AI. Therefore, it signed a Memorandum of Understanding with IBM, Alibaba, Huawei, etc. Saudi Arabia is seeking to establish itself as a technological leader and a global hub for AI knowledge networks. Saudi Arabia is partnering with leading technology multinationals such as GE, SAP, and Google to develop its capacities. Google plans to develop five innovation hubs around the country, to train tens of thousands in programming skills for advanced software and AI (Mordor Intelligence, 2020).

2.2 Applications of AI Technology in E-Commerce

AI technology has gradually developed into a powerful tool to boost sales growth and optimize E-commerce operations. At present, the application of AI in the field of E-commerce is mainly reflected in the following aspects: (Song et al., 2019):

1. Artificial Intelligence Assistant

An AI assistant (chatbot) whose primary function is to automatically respond to customer questions, respond to simple voice commands and provide product recommendations using a natural language processing system. Chat dialogs on E-commerce sites and mobile pages are based on machine learning algorithms programmed to communicate with

customers in a personalized manner. Chatbots can help consumers find suitable products, check the supply situation of products, compare various products, and finally help consumers to pay. If there are any complaints or questions, the chatbot can also help customers contact the corresponding service personnel. Consumers can talk to the robots through text, voice, and even pictures.

2. Recommendation Engine

The recommendation engine is a complete recommendation system based on a machine learning algorithm framework. Using AI algorithms can realize deep learning, statistical programming, prediction, and analysis of customer behavior, of massive data sets, and predict which products are likely to attract customers.

3. Intelligent Logistics

Intelligent logistics refers to a logistics development mode in which equipment and control are made intelligent by using information technology, so as to replace people with technical equipment. Compared with the traditional logistics mode, intelligent logistics can greatly improve service quality and operation efficiency. The concept of Intelligent logistics was first proposed by IBM in 2009.

4. Optimal Pricing

The current E-commerce industry is booming, even for small inventory online retailers, this kind of long-term continuous price adjustment is a big challenge.

AI technology, which can process big data quickly, has basically solved the problem of automatic pricing of a large number of products. With advanced deep machine learning algorithms, AI technology can continuously evaluate market dynamics and change the competitive environment to solve the problem of optimal pricing.

III. METHODOLOGY

Considering the potential importance of AI in the field of E-Commerce, we conducted a logical narrative review to uncover current AI trends related to e-commerce systems in Saudi Arabia. The following question of the research was formulated to attain this goal: *What AI applications or tools can be used in Saudi E-Commerce?*

The following keywords were used, derived from the research question above:

(Artificial Intelligence OR “Artificial Intelligence technology”) AND (Saudi OR “Saudi Arabia”) AND (e-commerce).

Saudi Digital Library, ResearchGate, and Google Scholar have been used to search and download the research articles. We ended up with about 85 articles. Figure 1 shows some additional criteria used to select related articles to be included in the literature review.

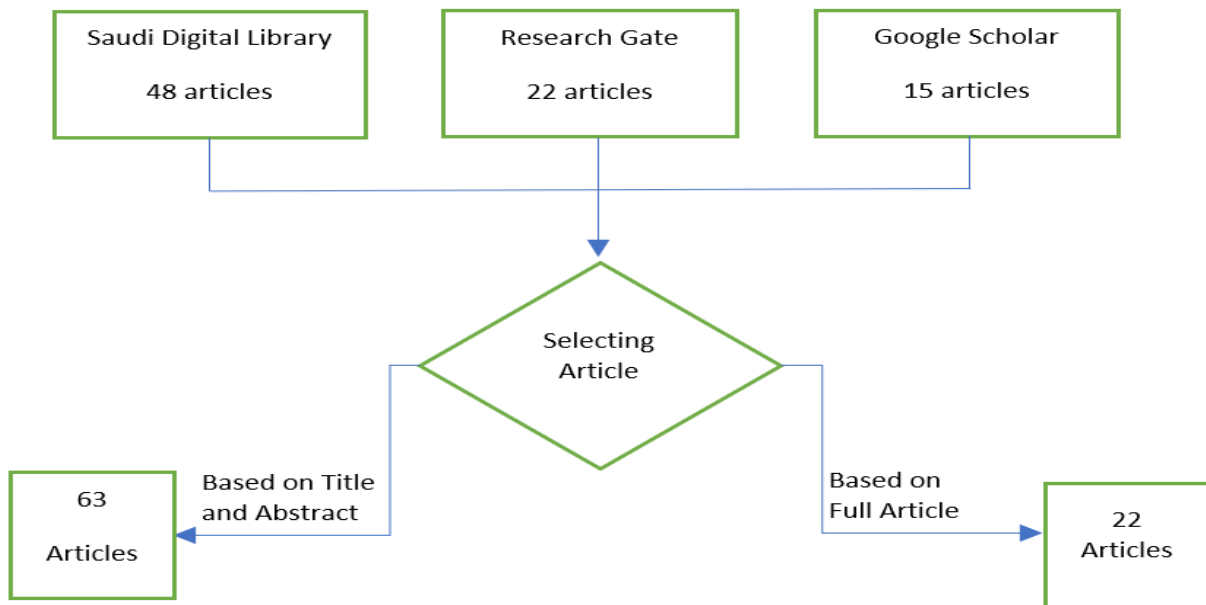


Figure 1: Selection of Articles

IV. FINDINGS

The following table presents the findings on the possibility of applying AI in Saudi e-commerce.

Reference	Study/Research Method	Findings
(Badiru,2019)	General	<p>The paper explained the role of AI in boosting and benefiting the e-commerce industry by applying and using AI techniques in various e-commerce areas, one of the important techniques is chatbots. Also, AI plays a vital role in Customer Relation Management (CRM), to achieve sales goals, automation, Product Content Management (PCM), and customer services.</p> <p>The authors forecasted that by the end of 2021, about 90% of customer interactions will be handled without humans.</p> <p>Some additional benefits have been discussed such as the use of AI in sales forecasting, providing the best service at the economic sale, and helping in marketing.</p>
(Lingam, 2018)	General	<p>AI has a great influence on the e-commerce sector, especially in inventory management and forecasting. Online retailers depend on six inventory strategies and the retailer can choose among these strategies according to his purpose.</p> <p>Machine learning is one of the best technologies used for inventory forecasting, it applies some algorithms that are accurate, and self-corrective in forecasting when compared with traditional techniques.</p> <p>Amazon, which is one of the online retail giants, has adopted machine learning technology and multiple AI software tools such as Apathy, Seller Active, Eco dash, etc. for inventory management and forecasting.</p>
(A. Vegesna, P. Jain, and D. Porwal, 2018)	New Proposed System	<p>A new chatbot system is proposed which is called (Ontology-based chatbot), this system will help the users to get the exact required information without a need for searching by users. After acquiring the required information, the user can log in to the website to buy any product. The proposed system can map relationships and retrieve data unlike traditional existing chatbots, and it allows the user to have full control over website search results.</p> <p>This system has been deployed successfully on Facebook and it is called Ontbot. The ontology template is developed using PROTÉGÉ Which retrieves data from the data source and when the data is retrieved successfully in the template the user can ask the bot some questions. According to the asked questions, NLP will organize the intent and other properties, and using this intent and properties a function call will be created using Python language. Finally, the user will receive the query answer from the chatbot.</p>
(Zhao, 2020)	Analysis study	<p>AI when applied to the e-commerce area it has proven it is wonderful results and is considered the main factor of e-commerce growth. There are multiple applications of AI in e-commerce and all of it has brought great benefits. These applications are:</p> <p>real-time product targeting e-commerce, visual search of a related image, voice searching application, optimal pricing recommendation, the personalized recommendation to the user, responding to queries, creating product description, filtering fake reviews of individual, and analytics and predicting sales.</p> <p>E-commerce will have a greater chance of success when using artificial intelligence technologies and AI would keep developing and providing new innovations for e-commerce.</p>
(Ghedia, Varisht, Gaurang Pansare, Dhaval Mehta, and Mhatre ,2017)	Analysis of used Algorithms	<p>Recommendation Engine is an AI system that can be used in e-commerce sites to filter items based on filtering how a user rates them. It digs, with the help of some algorithms, through a huge amount of data such as visits, purchases, ratings, etc. a lot of research has been done on collaborative filtering-based recommender systems; but these systems are not fit for e-commerce. The study found that using sessions instead of the entire user history and incremental session-based collaborative filtering techniques with forgetting mechanisms can help to solve problems. It has been found that using this technique can give more accurate user representation and much better</p>

		recommendations. In addition, the use of sliding windows besides forgetting mechanism to maintain fixed-size sliding windows used with user's sessions with a first in first out (FIFO) data structure.
(Billewar, Satish Rupraoji, Karuna Jadhav, V. P. Sriram, D. A. Arun, Sikandar Mohd Abdul, Kamal Gulati, and Narinder Kumar Kumar Bhasin,2021.)	Urban Indian Market	Retail has experienced a shift due to Covid-19. 3D e-commerce has come to dominate online retail because customers demand it. Both consumers and businesses get to benefit from "virtually try before you buy" with the help of applying augmented reality (AR) and Virtual Reality (VR) in e-commerce. These tools shorten the sales cycle by reducing the anxiety of customers and increasing customer satisfaction. In addition, 3D virtualization software can improve the shopper's experience. The experience of a virtual store is also promoted by an AR assistant that helps the users with the required information in audio form or using its avatar. AR and VR need a software technology that is available and has been implemented separately and the needed implementation is for merging the existing technologies into one.
(Bhuran, Ms Shreya, Ms Shubhangi Mundhe, and Prof Diksha Bhawe. 2018)	Description of Web-based project called StyleCracker	This research work is a new direction in the e-commerce world where it provides a new dimension to personalize the shopping experience of customers. This research presented how facial expression recognition system and image detection system contribute to a flexible face recognition model based on behavioral characteristics and physiological biometric features. The human face has physiological characteristics which can be associated with geometrical structures which can be restored as a template of base matching for the recognition system.
(Swapnil Nagare, Harshal Avhad, Piyush Jain, Prof. N. V. Sharma, Sagar Thakare, 2016)	New Proposed Application	The paper presents a new application for visual commerce which is called (Smart Snap). Visual commerce is an image-based search where searching is done based on image recognition and output is displayed by an application showing products from multiple online stores. Smart Snap works according to mobile visual exploration, users can get products directly from top e-commerce gateway by just scanning the products they need, and the application will give results.
(Mathew, 2021)	General Study	Artificial intelligence and service providers can collaborate to provide excellent customer service and at the same time increase productivity. In e-commerce, we can use AI to study a huge amount of data more intelligently and efficiently to expect customer behavior and provide each customer with useful recommendations. There are some substantial points about customers that should be considered by companies in the e-commerce industry. These points include customer satisfaction, customer loyalty, and providing the best customer service. They should be considered seriously by online retail companies since any business will suffer without customer loyalty and confidence, even if it has the most perfect website design.
(Kumain, Chaudhary, Joshi, 2020)	Review Study	Doing business online is one of the economic development aspects in any country. As e-commerce is a manner of handling business over the internet, security is one of the most important concerns in e-commerce. Security measures include not only users but also software and hardware. There are some common security issues in e-commerce systems such as replay attacks, phishing, illegal access, eavesdropping, and credit card fraud. Therefore, many algorithms and network protocols were developed to maintain e-commerce security.

V. DISCUSSION

Big data, data analytics, and artificial intelligence are the top trends nowadays. These new emerging technologies are restructuring and transforming almost all industries including transportation, education, manufacturing, healthcare, and e-commerce. Today, the Middle East region, including Gulf countries is considered the fastest growing e-commerce market internationally with an annual growth of 25%, faster than the global average. The top two Gulf countries having the highest growth rate in the e-commerce industry are Saudi Arabia and UAE.

Today, there is a rapid growth in AI, VR, digital health, and finance automation in Saudi Arabia and it is resulting from STC's (Saudi Arabia's ruling telecom service provider) \$500m technology investment fund. In addition, Saudi Arabia's Public Investment Fund has announced a US\$ 93 billion technology fund in partnership with Apple, Qualcomm, and Softbank to enhance robotics and AI Technologies. There are different ways in which AI, Big Data, and Data Analytics technologies can transform the e-commerce market in Saudi Arabia. Some of these ways are listed below:

- **Deliver customer-centric experience:** is the use of AI to efficiently re-attract customers by providing the products and services according to their needs and interests.

- **Harness the power of visual search:** enables users to find their desired products by simply uploading the image. This process leads to rich and engaging customer service and also shortens search time.

- **Enhance customer service:** this is a very important way in which e-commerce companies must offer immediate customer support for any queries, complaints, or requests by customers.

- **Utilize real-time analytics:** helps e-commerce platforms to benefit from real-time analytics to acquire a deep understanding of their target consumers. Businesses can use analytics to analyze, monitor, and measure main metrics in real-time like search volume, transactions, traffic, etc.

- **Boost efficiency and productivity of backend operations:** AI-powered bots and smart assistants are now implemented in various e-commerce firms in backend operations. For example, AI bots can pack ordered items, stack shelves, manage and monitor inventory data, and help human employees in a host of other tasks.

Over the past several years the Saudi Arabian economy has experienced unexpected growth. Vision 2030 and National Transformation Program together conceive multifaceted development of the economy. Along with preparing significant plans, to make this happen, driving growth of the small and medium-sized enterprise (SME) sector, enabling economic diversity, and the most substantial among these objectives is

supporting innovation and entrepreneurship. Developing the e-commerce industry as one of the tasks of the National Transformation Program will add more fuel to the Saudi economic development plan.

In Saudi Arabia, customer experience has improved obviously in recent years. In addition to providing customer service through traditional channels, companies are widely using AI-based virtual assistants or «chatbots» with deep learning abilities to respond directly to online customer queries or on the phone or help and support human agents. The accurate and scalable response system of these assistants will not only foster the customer experience but also reduces back-office costs and improves efficiency. AI plays a very significant role in providing new customer experiences. As the digital retail area constantly evolves, the need for innovative ways to target online shoppers is still something essential. For instance, the e-commerce giant Alibaba is offering online shopping experiences based on virtual reality. In this experience, the customers can use virtual reality headsets plugged into their phones and browse all the products provided by Alibaba.

VI. CONCLUSION

This paper presents the findings of a logical literature review related to the integration of artificial intelligence into the e-commerce domain. We can conclude that more theoretical research in the domain of applying artificial intelligence in e-commerce in Saudi Arabia is required. Judging from the common features of findings reported in selected papers presented in the previous section, there is high power to use artificial intelligence not only to enhance, reinforce and facilitate e-commerce activities but also to satisfy, attract and gain the power of customer service in Saudi Arabia. Cultural aspects may play a role even though this is not mentioned in the reviewed papers. Research needs to be done in Saudi Arabia context to find out what works best for the country.

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