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Review Of Transforming Grocery Shopping with Artificial Intelligent: A New Era of Convenience

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KEYWORDS

Artificial Intelligence (AI), Retail, Grocery Shopping, Online and Offline

ABSTRACT

This research article offers a unique perspective on the use of artificial intelligence (AI) in grocery shopping. Grocery shopping is in a transformation phase due to e-commerce growth and significant influence of technology leaders. Artificial Intelligence has been a contributing factor in this transformation through data analytics as applied to standardization and decision making, and particularly, it can now do it autonomously and efficiently. Global digitalization through the internet and smart devices such as smartphones can be identified as the key operating systems for grocery shopping evolution. Customers empowered by smart devices have experienced a massive change in their overall shopping experience, expectations, habits of shopping, and searching for different stores. In this article, discussions will emphasize several noteworthy innovations, as well as AI, big data, Internet of Things (IoT), chatbots, and robots as part of the retail evolution and have changed the shopping experience. The article discusses what several authors have said about AI and profitability and the strategic implications for roughly the customer and the retailer. By discussing the potential advantages AI can provide the retail industry, the article discusses the emerging implications of AI as a reputable asset in grocery shopping success and apart of growth.

1. INTRODUCTION

The grocery and food retail industry occupies a vital position in the global retail sector. Statista (2022) predicts that by 2027, the industry's market value in several leading European countries, such as Germany, UK, and France, will reach a quite staggering $901 billion. However, the industry is continuing to go through major changes. The conventional way to shop for groceries is changing as the distinctions between offline and online become increasingly indistinct (Kamel et al., 2021). Therefore, an integrated online and offline strategy is becoming a prominent trend for the future. This blending of channels is bringing new digital initiatives and technologies to the shopping experience (BCG, 2022). For instance, emerging technologies (ET) such as artificial intelligence (AI), machine learning (ML), and advanced analytics are becoming, as we

note, game-changers in modern retail. More specifically, traditional supermarkets can take advantage of these technologies to enhance both the online and offline experience for consumers by increasing engagement through online channels (Läubli et al., 2021; Shankar, 2018).

In the last twenty years, aspects of the retail sector have markedly changed, propelled largely by online channels. Online channels have changed and affected many categories across the retail spectrum, as retail business models evolved and the as variety of channels increased (Sorescu et al., 2011). By comparison, the disruption online channels have caused in food retailing has been less significant than the disruption other industries have seen, such as travel. However, the continued expansion of additional online sales channels (e.g., mobile channels, social media) means the retail sector is constantly changing, and traditional food retailers face increasing pressure to adjust their capabilities to compete (Savastano et al., 2019). Current movement across the industry appears to increasingly reflect centre of gravity in choosing between online -v- and offline -v- or no retailing (Rigby, 2011; Schedlbauer, 2020).

In addition, retailers can utilize technology to increase brand recognition, encourage customer loyalty, and ultimately create value (Hoogveld & Koster, 2016). However, the incorporation of modern retailing strategies has challenges, including organizational alignment, corporate culture and internal processes (Gitter et al., 2020). As technology advances, grocers can seek ways to overshow technology to grow their markets, engage customers differently, and ultimately improve profitability.

Through technological methods, AI, ML, and advanced analytics enable grocers to make data-informed decisions and operate more efficiently and effectively. Examples of technology include stock management, demand forecasting, pricing, and personalized deals (Verscheueren et al, 2021). To encourage the use of these features, it is critical that grocers get customers to collect data through a dedicated app that customers have on them during each trip to the grocery store. Customers, with the help of AI/ML technologies, benefit from price visibility, personalized grocery shopping, and an improved overall shopping experience. These programs give customers more touches with grocery stores, and in return, collect more information before shopping (Kuijpers et al., 2018).

In the current landscape, shoppers are required to rethink their strategies, processes, and approaches to product development. Shopping centres are developing smart technology in order to boost customer satisfaction, provide pre-emptive service, optimize responsiveness to customer demand, and remain competitive in an era of AI and Big Data. Whether an organization is involved with e-commerce or brick and mortar retail, AI has been proven to handle various forms of descriptive data, such as images and videos, as well as countless sources of customer behaviour and reactions to consumer experiences. A result has been the emergence of big data, consisting of a large volume of data coming from a variety of sources and following unique patterns of data. This data also includes the ability to record facial expressions from buyers and sellers, creating the ability for semantic processing to influence the operation of businesses. For example, during a retail purchase, multiple types of data are evident, i.e., transactional data (e.g., how much the product costs), customer data (e.g., how old the customer is), and even environmental/data. If one wants to proactively and accurately predict product demand, systematic identification of consumer data needs to happen, as well as the analysis of consumer data analysis regarding purchase behaviours. This means that effective data management has become a recognized challenge and area of growth in the retail operating space. To that end, companies are utilizing new and reliable data mining algorithms to provide those companies with new opportunities to store and evaluate consumer data analysis to increase overall productivity, performance and profits due to data analysis.

OBJECTIVE

- To provide an overview and description of the artificial intelligence (AI) in grocery shopping.
- To estimate the scale and scope of AI adoption in the grocery shopping
- Detailed information regarding the major factors influencing the growth of the AI in Grocery Shopping.

THE NEED FOR CHANGE:

It is widely acknowledged that change is an inevitable part of the retail industry. Gone are the days when retailers could simply sell what they wanted to sell. Today, retailers must compete on multiple fronts beyond price alone. Convenience and consumer experience have emerged as the two critical battlegrounds for brands, both in offline and online retail environments. Artificial intelligence (AI) presents a valuable opportunity for retailers to greatly enhance and personalize the customer experience, while also realizing significant gains in productivity across various business functions, including warehousing, delivery, head office operations, and online and physical outlets. In a highly competitive market, retailers cannot afford to lag behind. However, implementing and advancing AI within a business is not without its challenges. Securing buy-in from senior management, who may lack technical or data backgrounds, selecting the right partners, and finding staff with the appropriate skill sets can all pose significant hurdles.

The most effective applications of AI occur in conjunction with other technologies and in collaboration with people within retail businesses. This means viewing the deployment of AI not merely as the development of isolated technology, but as part of a broader process of transformation. AI enables brands and retailers to understand consumers in new ways, leveraging data from smart devices, browsing cookies, facial expressions, preferences, and lifestyles. This synthesized information can

then provide better recommendations to facilitate faster and more informed decision-making.

2. LITERATURE REVIEW

To review topic of Artificial intelligence in grocery retailing a set of articles were searched from google scholar. The search terms were “Grocery shopping, Retail and Artificial intelligence” with in topic search terms were “Big Data” and “IoT”. “Computer science”, “Business management and security” and “Engineering” were the subject area for Research. This resulted in 64 documents from which all 64 were citied and done comprehensive review

The literature review delves into the grocery shopping, exploring how new strategies, specifically modern retailing coupled with technology, impact both the customer experience and grocer strategies. It examines the evolution of industry trends, delves into the theoretical underpinnings, and explores the implications of modernization on the grocery shopping experience. Furthermore, the review provides an in-depth analysis of technology terms such as AI, ML, and advanced analytics. It also discusses the implementation of both online and offline approaches and AI integration within the customer journey. Based on the gathered information and outlined findings, potential scenarios for the future of physical grocery stores are formulated.

The review revealed a diverse range of studies focusing on the implementation and impact of AI in retailing. Various research methods were employed to explore the effectiveness of AI strategies. These methods included quantitative, qualitative, and mixed methods approaches. These approaches provided insights into different techniques and tools used to enhance efficiency, reliability, and operability in the retail industry. Consequently, relevant articles were identified that shed light on the management aspects of AI in retailing. These studies utilized various methodologies, such as interpretivist approaches, case studies, mixed methods approach, as well as the Elastic Net approach and sentiment analysis, to assess the effectiveness and implications of AI implementation.

The grocery market in India was estimated by a Red-Seer report, last year, to be around $790 billion by 2024. A new report, however, estimates a larger market size than $850 billion by 2025, with the CAGR between this period being 8%.

By utilizing technological methods such as artificial intelligence (AI), machine learning (ML), and sophisticated analytical techniques, grocers can use a variety of AI algorithms in combination with advanced analytics tools to streamline and optimize their operations. Technology allows consumers to experience faster checkouts without cashiers, as well as in-store navigation support, hyper-personalization, and dynamic promotions. Overall (Läubli et al., 2021; Reinartz et al., 2019). Mobile applications for shopping online, as well as home delivery and curbside pick-up, further enhance convenience in the shopping experience (Läubli et al., 2021).

As the grocery store industry evolves to be more technology-focused in the future, it is vital for its customers to adjust to the evolving technology. To understand how individuals accept new technologies, Davis (1989) proposed the Technology Acceptance Model (TAM) (Lou & Li, 2017). When thinking about the future of grocery stores, it is important to create a seamless experience that is easy to use that the consumer finds useful. Recent studies have found that perceived ease of use has a positive correlation to perceived usefulness when shopping for food online (Bauerová & Klepek, 2018).

The retailing industry has dramatically changed in recent years, largely because of new technology and digitalization in the industry (Ying et al., 2021). Digitalization refers to the shift from analogy to digital means, for example, the move away from traditional in-store shopping to full online shopping, as well as other new ways of value creation (Hagberg et al., 2016). This has changed the way retailers relate to each other, suppliers and customers. Today, e-commerce is no longer a novelty, but a critical strategic component to remain competitive in the retail space (Reinartz et al., 2019).

Setting up a fully developed online and offline shopping environment entails changes to the underlying infrastructure, namely, ensuring that physical stores and warehouses have modern equipment to operate such. It also requires properly trained personnel specialized in information technology (IT) to run these projects effectively. Overall, retailers must remember the end goal of both the online and offline framework, which is to streamline the shopping touchpoint across both the physical and online environments, while ensuring both sides earn value (Frazer & Stiehler, 2014; Piotrowicz & Cuthbertson, 2014). In any consumer-cantered approach, the customer's central importance to company processes takes a different meaning (Hoogveld & Koster, 2016). An alignment between organizational structure and organizational strategy must then occur; ensuring internal departments and all customer touchpoints coordinate effectively (Diconium, 2021).

AI-powered retail enables grocers to bridge the gap between online and offline by delivering a seamless experience across multiple channels (Schedlbauer, 2020). Recent statistics indicate that online shoppers not only make more frequent purchases but also tend to spend two to two and a half times more compared to traditional shoppers (Novosel, 2021).

The grocery industry is undergoing rapid change and faces challenges such as low profit margins on products. Establishing a loyal customer base while maintaining competitive pricing is a complex balancing act for grocers aiming for long-term competitiveness. In the past, grocers relied heavily on economies of scale, leveraging their purchasing power and larger quantities to negotiate better deals with producers (Christensen, 2001). However, as the industry became more consolidated, economies of scale ceased to be a significant competitive advantage. Scholars have highlighted alternative ways for companies to gain a competitive edge (Barreto, 2010). The understanding of competition and its impact on firms has evolved, with Schumpeter (1942) describing a cycle of "creative destruction" where innovative entrants surpass existing firms

(Schumpeter, 1976). In a highly competitive environment like the grocery industry, relying solely on capabilities is insufficient to maintain a competitive advantage. Instead, a firm's resources and capabilities should be dynamic and adaptable to rapidly changing environments (Barreto, 2010). The concept of dynamic capabilities, building upon the resource-based view (RBV), emphasizes the firm's ability to integrate, develop, and reconfigure internal and external competencies (Teece, Pisano, and Shuen, 1997). Although dynamic capabilities do not provide a comprehensive theory for competitive advantage, they offer valuable insights for ensuring a firm's long term competitiveness in fast changing industries (Barreto, 2010).

Starbucks serves as an exemplary company that adeptly adapts to environmental changes, boasting a robust online and offline strategy widely regarded as the best in the retail sector (Wallace, n.d.). To enhance communication with customers and gain insights into their preferences, Starbucks developed a mobile app offering exclusive discounts and complimentary beverages to loyal patrons. Each purchase earns customers stars, which unlock promotions and discounts upon reaching specific thresholds. This approach fosters customer engagement and enables Starbucks to gather valuable data as customers navigate the app. Furthermore, app users can conveniently place orders in advance, save favourite drinks, and utilize the app as a digital wallet for seamless checkouts (Honigmann, 2022; Starbucks, 2022).

The Starbucks example showcases the successful implementation of both online and offline services. Similarly, the grocery shopping can explore additional services beyond reward programs. Introducing AI and advanced analytics can enhance engagement and streamline operations within grocery stores (Verscheueren et al., 2021).

This section elucidates the technological foundations of advanced analytics, AI, and ML. Furthermore, it delves into the applications of these technologies in grocery stores and their respective advantages. AI, ML, and advanced analytics are highly discussed topics today, offering substantial potential benefits for grocers in the future. Estimates suggest that the global annual value of AI in the retail sector ranges from $400 to $800 billion (D'Auria et al., 2021). Advanced analytics refers to the semi-autonomous or fully autonomous examination of data using highly trained techniques and tools. These techniques encompass various practices such as data mining, machine learning, forecasting, predictions, pattern matching, and statistical analysis, among others. Advanced analytics serves as an umbrella term encompassing numerous technologies within the field of AI, employing techniques to facilitate decision-making for companies (Gartner, 2022).

The term "AI" was introduced by Alan Turing in the early 1950s through the concept of an "Imitation Game," where an interrogator attempts to differentiate between a machine and a human based on their responses to questions. Even at that time, Turing envisioned machines capable of rivalling humans in displaying what we perceive as intelligence (Turing, 1950). McCarthy (2007) defines AI as "The science and engineering of creating intelligent machines, particularly intelligent computer programs. It relates to the task of using computers to comprehend human intelligence, but AI is not confined to biologically observable methods" (McCarthy, 2007).

In simpler terms, AI refers to the capacity of computers and machines to mimic human thinking, perform tasks resembling human capabilities, and assist in decision making processes (Copeland, 2022).

AI and ML are often used interchangeably, but they are distinct concepts. ML is a subset of AI (Satavisa, 2021), focusing on algorithms that autonomously learn from historical data, identify patterns, and enhance performance. These patterns are then utilized to make predictions. A prime example is the Google search engine. Similar to AI, ML relies on data as its fundamental basis for effective functioning. ML boasts various applications and continuously evolves in its. For instance, ML can reveal insights, improve user experiences, and anticipate customer behavior (Ray, 2019; Senders et al., 2018).

The technological tools mentioned above (AI, ML, and advanced analytics) are no longer newfangled techniques. According to Gartner's market research in 2017, major retail players like Amazon and Walmart are recognized as "AI Leaders," while prominent European grocery chains such as Carrefour, Aldi, and Lidl are categorized as "AI Niche Players," indicating their limited utilization of AI technology in their operations. Therefore, it becomes increasingly crucial for grocers to invest in new technology (Weber & Schütte, 2019).

On the demand side, AI can be utilized to better understand customer behaviour, make product recommendations, improve the in-store experience, and enhance customer satisfaction (Shankar, 2018; Shankar et al., 2021). For example, the multichannel strategy of using mobile apps allows grocers to use AI to better understand consumers. AI can help with product recommendations based on past purchases by using different ML and AI models (such as predictive and prescriptive models), which depend on historical sales data as input. Even more, advanced analytics tools can help grocers suggest pricing and predict customer purchases (D'Auria et al., 2021; Grewal et al., 2017).

The research conducted by Y. Li and H. Fleyeh examines the use of sentiment analysis in Twitter data, a well-known microblogging platform that is also commonly utilized for sentiment analysis research. The authors collected tweets that mentioned the term "IKEA" during the periods that IKEA stores opened in various cities. The analysis included a sentiment analysis in English and Swedish, noting that unlike the English sentiment analysis, the Swedish sentiment analysis had been studied.

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To investigate public opinions, the authors employed the elastic net approach to analyse the sentiment of the tweets. The

study crawled tweets from local users containing "IKEA" to gather a dataset for further sentiment analysis. The sentiment analysis framework, as involved vocabulary-based methods for English tweets, leveraging their effectiveness and validity in various applications. However, the study highlights the limitation of sentiment analysis in Swedish tweets due to the absence of a sentiment lexicon in the Swedish language. Consequently, sentiment prediction for Swedish tweets can only be achieved using AI-based strategies.

The study utilized sentiment labelled Swedish tweets as training data, where classifiers were employed to associate sentiment labels ("positive" and "negative") with individual words in the tweets. The performance of these classifiers was evaluated, and the best-performing classifier was used to predict the sentiment of Swedish IKEA-related tweets.

In earlier research titled “Shopping with a robotic companion” by F. Bertacchini, E. Bilotta, and P., sentiment analysis was applied studying artificial intelligence in retail. Specifically, a human-robot companion called NAO was used to collect conversations provided in real time, and the field researchers used sentiment analysis to understand customer mood and emotions during shopping experiences interacting with the robotic assistant. Two approaches were pursued Ozkaya et al (2018): (1) the a priori method, with an observed sample of chats and the research team generated a list of tags, verbs, modifiers, and sentences associated with six specific emotions (based on the previous lived experience of the field researchers with the robotic assistant), which was dataset for training the AI module; and (2) the emergent method, where the dataset of six specific emotions was used with working with three basic sentiment categories (positive, neutral, negative), so that patterns and emotions are released without restrictions. In both methods, the AI module associated behaviour patterns and emotions with speech.

The studies demonstrate the utilization of sentiment analysis in varied scenarios. Y. Li and H. Fleyeh's study informs us about the sentiment analysis with Twitter data on IKEA stores focusing on the difficulties and opportunities of analysing sentiment in a range of languages. F. Bertacchini, E. Bilotta, and P. perform similar research concerning sentiment analysis within the discipline of retail, by using a robotic companion to gauge sentiment as customers were shopping. Both studies underscore how sentiment analysis can aid us in understanding customer sentiment and feelings in relation to improving customer experience in the retail environment.

In the paper "Experiencing the AI emergence in Indian retail, early adopters' approach" by R. Seranmadevi and A. Senthil Kumar, a quantitative research method is used to explore the role of Artificial Intelligence (AI) in the retail sector. The authors employed a disproportionate multistage judgment sampling technique to survey 610 respondents located in four capital areas of India including Tamil Nadu, Kerala, Karnataka, and Telangana. The data collection period was in the first quarter of 2018.

The customers in the four cities provided primary data using structured online surveys. The study dealt with the approach of early adopters because specific AI technologies were present primarily in the capital regions of these states and not across the entire region. Instead of stickily determining preferences for the study, the research design utilized a descriptive approach to help describe the customers' views regarding the emergence of AI in the Indian retail market. It is important to mention that the study is not extended to the entire southern part of India and is only applicable to the capital cities of four states. The study obtained a sample size of 610 respondents. Various appropriate statistical methods and tools were employed by researchers to analyse the data and findings. The abbreviation "AI" indicates the two uses of AI technologies in retail – online and offline. The study also examined the impact of AI on quality (service), customer relationship management (CRM), and big data, and evaluated the use of AI and "load" technologies for quality assessment-based inquiry. The study also considered the impact of the above conditions on the intention of retailers and customer satisfaction and used structural equation modeling (SEM) through AMOS software (version 20). The hypotheses testing was reasonable to assess the impact of AI on customer satisfaction and retailers' intentions.

In summary, the quantitative research has examined by R. Seranmadevi and A. Senthil Kumar has provided valuable information about the early stages of the adoption of AI in the context of the Indian retail sector. The examination of an individual geographic area and the application of quantitative statistical analysis procedures help to improve understanding of the impact of AI technologies in a variety of impacts in the retail sector.

The review paper by G. Santoro et al. titled "Big data for business management in the retail industry" employs an interpretivist approach. The authors justify this approach by stating that it is appropriate for the subject matter as there is limited available knowledge on how firms utilize and manage big data in the retail industry. The case study method is particularly relevant for addressing questions about the "how" and "why" of a specific topic.

To achieve the objectives of the study, a purposive sampling technique was used to select high-performing organizations in the retail industry. These organizations were then contacted to inquire about their willingness to participate in interviews and their approach to big data implementation. Five organizations were available for interviews and showed a keen interest in the research topic. These organizations had actually implemented big data in their processes and activities. The case selection criteria included being a high-performing retail firm and having implemented significant big data platforms or initiatives to some extent. One firm was excluded as it had not deployed big data like the others. The remaining four firms had been utilizing big data in their operations for at least one year prior to the interviews.

The analysis of data began by reviewing each firm's mission, vision, values, and strategies as well as overall history. This was cross-referenced with the data sourced through the interviews and the results were analysed. If there were gaps in information, follow-up correspondence was made with the firms via email and/or phone. To offer anonymity and prevent misinterpretation, the analysis was offered as an anonymous case-study. According to the firms, anonymity was desired to refrain from exposing key decisions and viewpoints as there were only a handful of successful firms in a concentrated industry, they desired to remain anonymous. An anonymous case-study also allowed for the respondents to give more honest and genuine information. The authors noted that the four retail firms had each been utilizing big data analytics extensively and consistently throughout their processes. The interviewees stated that big data analytics is a significant feature of the retail industry, particularly in marketing and logistics functions, and will only grow in importance.

Taken together, the use of the interpretivist stance in this review paper allows for both a detailed investigation of how retail firms are involved with big data and the rationale behind their action. The case study method provides a good basis for examining real-life situations, and empirical findings show that big data is essential to the retail industry.

ARTIFICIAL INTELLIGENCE IN GROCERY SHOPPING

Grocery retailing is an important function and a key part of the total retail industry. Of all digital technologies, Artificial Intelligence (AI) is likely to play the biggest role in retailing. AI continues to change the way retailers communicate and work with consumers, and how consumers are making selection decisions. In this regard, retailers and consumers alike are rapidly finding value in AI assistants that exist in contexts such as Siri on the Apple iPhone, Watson from IBM, Cortana from Microsoft, Alexa from Google, and Deep Mind from Alphabet.

AI receives stunning responses and feedback from shoppers, whether they are shopping online or in the store. Shoppers can truly make informed decisions as they compare different products, learn exactly where the item is positioned in the store, and gauge the different brands available. These same responses can then also be turned into structured datasets that utilize visual, text-based, and facial expressions to conduct predictive analytics to predict consumer demand and buyer behaviour.

In-store customer behaviour can be monitored through technologies such as Beacons, Closed-Circuit Television (CCTV), Radio Frequency Identification (RFID), and Near Field Communications (NFC) in a similar way as clickstream behaviour is measured in online channels. RFID technology has the most well-known application in retail and logistics, and it serves as a foundational technology for the Internet of Things (IoT). IoT is said to be a transformative technology across nearly all industries, but its adoption and implementation is still at a nascent stage, underscoring the need for adaptation in practice across a variety of sectors.

Furthermore, Seranmadevi and Kumar emphasize that AI operates in the background, collecting and processing customer data to build robust big data structures and enhance big data analytics. The success of these analytics relies on appropriate training for skilled personnel. Big data is vital in the paradigm shift toward the industry 4.0 revolution, particularly for online companies' decision support. It enables the transformation of data into valuable information, which can be effectively utilized to offer personalized customer services both online and in-store.

In summary, AI is reshaping the retail industry, enabling enhanced customer experiences, data-driven decision-making, and personalized services. The adoption of AI technologies, combined with effective use of big data, holds immense potential for retailers in the era of industry 4.0.

APPLICATION OF ARTIFICIAL INTELLIGENCE IN RETAIL:

Retailers, particularly those operating offline, are facing constant changes in customer behaviour. To stay updated and provide low-cost alternatives to e-commerce, retailers are turning to the application of Robots that can efficiently maintain shops, perform both back-end and front-end operations, and provide real-time shelf updates at a low management cost. The International Federation of Robotics reports a significant increase in the adoption of robotics in the market for social, professional, and domestic use. The once-fictional concepts of Artificial Intelligence and augmented reality are now becoming a reality.

Artificial Intelligence is widely recognized as a process that involves understanding human behaviour and integrating neurological principles into machines, enabling them to act smarter and assist humans based on their own understanding. Machine learning and Reductionism are transforming the way machines interact with each other and with humans. IBM and Molnar G's concept of Smart Shopping highlights the use of software-based robots, known as bots, which are programmed to perform specific tasks. There are two types of bots: chatbots, commonly used on websites to assist with frequently asked questions, enhance user experience, and collect data; and conversational bots, such as Apple's Siri, Google's Alexa, Microsoft's Cortana, IBM's Watson, and Amazon Echo, which possess the ability to understand the intent of questions and learn the user's preferences.

The Internet of Things (IoT) is a powerful technology that is transforming the retail sector. By collecting data using a network of electronics, sensors, and software, IoT allows for machine-to-machine communication with cognition and reasoning. To put it simply, IoT is when the internet interacts with devices. Retailers can utilize IoT by accessing a large amount of unique data for process improvements and enhanced customer satisfaction. Examples of IoT smart devices include Bosch Home

Connect ovens, Samsung smart washers and dryers, Nest thermostats, Ring video doorbells, SimpliSafe security systems, smartphones with GPS and accelerometer sensors, and RFID products.

Additionally, businesses are more and more adopting AI technologies as they translate science fiction to real life. Augmented reality and virtual reality offer real-time experiences for users through simulators, VR training sessions and flight simulators. AI is also being used to develop driverless cars and employ drones to deliver products. For example, Amazon is currently examining delivering packages using drones and companies such as Tesco, Walmart, and Target are using deep learning algorithms to observe customer behaviour in real time and create individualized offers. Even McDonald's has implemented automated kiosks to remove the need for cashiers and customer representatives.

To sum up, the use of Artificial Intelligence within retail is disrupting the industry through operational efficiencies, personalized customer experiences, and innovative technologies like the IoT, augmented reality, and virtual reality. Retailers are using AI to improve processes, collect and analyse data, and offer creative solutions to improve customer satisfaction.

S. No	Company Name	About the company	Technologies
1	Amazon	The online retail giant offers both consumer and business-oriented AI products and services, and many of its professional AI services are built on consumer products. Amazon Echo brings artificial intelligence into the home through the intelligent voice server, Alexa	Big Data, IoT, AI, Machine Learning, AWS, Cloud
2	Walmart	Walmart is a multinational retail corporation that leverages AI and data analytics to optimize its supply chain, enhance customer experience, and improve inventory management	Data Analytics, AI, Machine Learning, Robotics
3	Tesco	Tesco, a leading UK-based grocery retailer, utilizes AI to analyze customer buying patterns and personalize recommendations. Their virtual assistant helps customers with shopping and offers personalized deals	AI, Machine Learning, Data Analytics, Virtual Assistant
4	Instacart	Instacart is an online grocery delivery platform that employs AI algorithms to optimize order fulfillment and provide real-time updates to customers	AI, Machine Learning, Data Analytics, Logistics
5	Ocado	Ocado, a UK-based online supermarket, integrates AI and robotics in their automated warehouses to enable efficient order processing and delivery	AI, Robotics, Automation, Data Analytics
6	Big Bazaar	Big Bazaar is a leading hypermarket chain in India that utilizes AI-driven solutions to analyze customer preferences, optimize inventory management, and offer personalized promotions	AI, Data Analytics, Inventory Management
7	Spencer's	Spencer's Retail is a prominent retail chain in India that leverages AI-powered systems for demand forecasting, shelf optimization, and improving overall operational efficiency	AI, Machine Learning, Demand Forecasting, Operations Management

8	Grofers	Grofers is an online grocery delivery platform that employs AI algorithms to optimize route planning, manage inventory, and enhance the overall delivery experience for customers	AI, Machine Learning, Logistics, Route Optimization
9	Flipkart	Flipkart, one of India's largest e-commerce platforms, utilizes AI and data analytics to personalize user experiences, offer product recommendations, and streamline the delivery process	AI, Data Analytics, Personalization, E-commerce
10	Blinkit	Blinkit is an emerging grocery delivery startup that leverages AI-powered algorithms to optimize delivery routes, manage inventory, and provide real-time updates to customers	AI, Machine Learning, Logistics, Route Optimization

3. CONCLUSION

This research paper concludes that the convergence of online and offline realms is driven by changes in consumer shopping behaviour, demands, and expectations. Grocery retailers must willingly embrace innovative technologies to meet these evolving consumer needs; otherwise, they risk experiencing declining sales and revenues. Companies have started integrating Artificial Intelligence (AI) into their business processes, which not only boosts their operations but also provides valuable insights based on the collection of distinctive data from smart devices, RFID, Robots, Chat Bots, Conversational bots, Big data, Facial expressions of consumers, IoT, and other smart and innovative technologies. These technologies support machine learning, deep learning, Artificial augmentation, Intelligence, and Virtual reality.

From all the forces affecting the grocery retail segment, it's clear that grocers need to create a substantial online extension of their business for future success. Though brick-and-mortar stores will remain centrally important to grocery operations, grocers will need to deliver a multichannel (online and offline) experience that combines advantages of both physical and online marketplaces. Shopping through a combination of online and offline channels leads to more spending by consumers and more profits for grocers. Plus, engaging consumers with artificial intelligence-based technologies can stimulate shopping more frequently--regardless of age or geography.

However, the current phase of AI implementation is still in its nascent period, which has created a gap in the experience and strategy for the best use of AI based on individual business needs. The failure to build direct, personal relationships with customers is simply not a viable option in the new retail world. The strongest benefit retailers can obtain by using AI is the precise and efficient collection and analysis of customer data to use that information to their advantage. AI has already started impacting the retail sector, and in the years to come, we will see further improvements in the customer experience and productivity levels.

However, retailers who wish to leverage these technologies to their fullest potential - to catch up with retailers or brands like Amazon and Walmart - still have a way to go. For retailers to thrive in this age of AI, they need to keep researching and utilizing AI solutions tied to their own business goals and customer-centric approaches.

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