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Internet of Things (IOT) Applications in The Retail Sector: A Focus On The FMCG Industry

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Abstract

This research explores the applications of the Internet of Things (IoT) in the retail sector, specifically focusing on the Fast-Moving Consumer Goods (FMCG) industry in North Republic of Macedonia. In today's competitive market, FMCG companies recognize the importance of consumer engagement and personalized marketing. The adoption of IoT in this sector shows great potential, but also presents challenges that businesses must address, such as operational costs and data security. The study was conducted in May and June 2023, using a methodology that involved administering a questionnaire to 100 FMCG companies in North Macedonia. The research aimed to investigate extent to which companies in the Fast-Moving Consumer Goods (FMCG) sector in North Republic of Macedonia are implementing Internet of Things (IoT) applications. The findings indicate that there is a promising level of awareness and adoption of IoT technologies among the surveyed respondents in the FMCG retail sector. It is evident that the industry is actively embracing technological advancements, with responders recognizing the value of integrating IoT into their operations.

Keywords: Internet Of Things, Fast-Moving Consumer Goods, Retail, Iot Technology

Introduction

Retailers are operating in increasingly oversaturated and highly competitive sectors. The history of retailers implementing different in-store technologies to achieve a competitive differentiation and advantage is dating back to several decades, explains Krause et al., (2010). Because of upward market need, nowadays, a huge number of emerging interactive technologies, many of which are enabled by the Internet, are forcing retailers to rethink the way they do their business and try to make them implement the new technology applications says Varadarajan et al., (2010). Chen et al., (2014) defines the Internet of Things (IoT) as a powerful data network comprised of internet-based devices like sensors, actuators, and radiofrequency identifications as well as different intelligent tools that are becoming an integral part of the Internet over time. In this case, the capability of the IoT to interconnect everything to the Internet for data exchange through digital gadgets using different protocols has helped in accomplishing various objectives of tracking, management, research, and smart identification products which have been and still useful in the Fast-Moving Customer Goods

(FMCG) retail sector. According to the research survey conducted by Nam and Pardo (2011), which focused on understanding the impact of e-business applications in different organizations laying within the retail sector, the study comprised adequate proof of how e-business has been productive for the FMCG industries. In addition, the author explains that through the IoT, inventory management for FCMG retails has been swift due to the availability of radiofrequency identification tags (RFID) which help allow retailers to automatically monitor their stock levels thus minimizing instances of having products out of stock to which in return reduces holding costs in the retails. This has therefore increased the operational efficiency of the different retailers as well as enhanced customer satisfaction by ensuring the availability of products in the retails.

In the opinion of Mohamed Ben-Daya et al., (2019), the IoT has facilitated the seamless integration of physical and digital elements which has enabled the optimization of supply chain operations, real-time tracking of inventories, and monitoring of customer behaviours in the retail sectors. Moreover, the researcher puts an emphasis on the significance of the capabilities of the IoT to the FMCG industry with respect to the low-margin nature and high volume of the particular industry. This implies that, from the study, the IoT has helped these industries in carrying out their daily supply chain operations which significantly impacted their performance within the retail sector. According to Li et al., (2011), the IoT has been a digital framework whereby we have multifunctioning actuators and sensors interlinked to look after the store environment constantly from a different view and operational points in the store while emitting virtual feedback to the retailers or concerned retail personnel. Furthermore, Manavalan and Bynagari (2021) explain the significance of the IoT in the FMCG sector cuts across to the growth of the retail supply chain. This was supported by an insight from Procter and Gamble's after utilizing the IoT in tracking the movement of their goods right from the production line to the retail shelves. In addition, the retailer is able to track the movement of their products right after packaging by embedding sensors in the product packaging to enhance traceability, and product authenticity and reduce the risk of product counterfeiting which in return builds the customers' confidence in the genuineness of their purchases. Through this attribute, the IoT has contributed to strengthening crisis response abilities in different retails, improving the service quality, and safety as well as building on the retail's security standards. Generally, Li et al., (2011), emphasis the significance of adopting effective IoT applications in the retail industry by emphasizing the need to recognize and comprehend the basic achievements behind adopting IoT technology in the retail industry. The potential of the IoT in the FMCG industry has enabled end-to-end visibility and traceability of the retail supply chain by making it possible to monitor the location of the products as they move through the supply chain. This has improved the efficiency of the supply chains from the ultimate results and enhanced customer satisfaction states Aryal et al., (2020). Namely the Smart Inventory Management which has streamlined the stocking process for FMCG retailers, improving operational efficiency as well as minimizing the risks of excess inventory as Souvik Paul, (2019) explains. As Ben-Daya, (2022) additionally stress that as a result of IoT, shelves can be equipped with sensors to monitor the placement and availability of the products while generating real-time data for the retailers for the optimized shelves layout, identification of popular products as well as prompt restocking of the items on the shelves. Through this, FMCG retailers can enhance the in-store shopping experience for their customers by having the products displayed optimally and always available.

Potential and growing significance of IoT solutions for FMCG retailers

The intervention of the IoT in the marketing sector has been a vital tool in enhancing customer experience in the FMCG retail sector. With the intervention of the IoT, retailers have been able to offer location-based product promotions and deliver personalized shopping recommendations based on individual shoppers' demands as they navigate the retail stores. In addition, IoT-enabled beacons and smart retail shelves have helped in changing the customers' perceptions of the retail's image as a result of the perfection of customer engagement, preferences, and minimal retailer-customer interactions. This therefore, not only does it delight the customers but also influences their purchase decisions in a positive way discuss Marek and Woźniczka (2017). Moreover, the comparison between how retailers used to market their new products before the intervention of the IoT reveals that the IoT has outsmarted the traditional methods of product marketing in terms of time-to-market for new products in the FMCG retail sector. This has been possible based on the IoT potential of gathering customer data from the interconnected digital gadgets and leveraging it to obtain immediate feedback on the product's performance and customer preference which can then be of use to the retailers. This, therefore, puts the retailers at a fast-response edge to the customers' demands from the market as well as launching demanding products ahead of their competitors state Wanga and Xiaoyang, (2022).

The significance of IoT solutions in the FMCG retail industry has a higher like hood of experiencing significant growth in the forthcoming years. While retail customer rises more demand for personalized and seamless shopping experiences, the IoT sector steps up to offer a respective solution to the delivery with respect to consumer needs. This, therefore, becomes significant to the retailers since they are able to understand consumer preferences by analysing the customer shopping patterns product-wise from the IoT data and formulating a marketing strategy targeting personalized offers to the consumers as discloses Đurđević, (2017).

Implementation of IoT in the FMCG sector in North Republic of Macedonia

The implementation of IoT technology in the FMCG sector brings significant benefits to product quality monitoring. By embedding IoT sensors within production facilities and storage units, businesses can continuously monitor environmental conditions that might impact product quality. Factors such as temperature, humidity, and light exposure can directly affect the shelf life and integrity of perishable goods. With IoT-based monitoring, companies can take timely actions to mitigate quality degradation, reduce the risk of product recalls, and maintain consumer trust in their brands state Lee et al., (2017).

Macedonian retail sector is dominated by small shops. Retail outlets vary from roadside shops and open-air markets to city storefronts and shopping centres. A few malls and departments stores can be found in the large cities. While many stores specialize, it is still common to find stores with an unusual mix of merchandize (bicycles sold next to paper products and small appliances, for example). There are few shopping malls in Skopje and many shops carry Western goods. Most consumer goods are imported by distributors who resell to retailers. A few retailers import goods directly for sale in their own outlets. North Macedonia's retail sector is dominated by small shops. Two large foreign supermarket chains are present in the market: Vero (part of the Greek Veropoulos group) and Turkish Ramstore. Local grocery retailers include Tinex, Kam Market and Kipper Market it is stated in the Privacy Shield report made exclusively for Doing Business in North Macedonia by International trade Administration of U.S.A. (2017).

In North Republic of Macedonia, as in many other regions, consumer engagement and personalized marketing have become essential for FMCG companies to stay competitive. While the adoption of IoT in the FMCG sector holds immense promise, it also comes with its share of challenges that businesses must address. One major concern is data security and privacy. As the number of IoT devices increases, so does the volume of data generated and transmitted. Companies must implement robust security measures to protect this data from potential cyber threats and ensure consumer privacy explains Schianch (2023). Moreover, Deepjyoti (2022) states, in the supply chain process of the retail sectors, the Internet of Things Technology has embraced seamless integrations between the physical aspects of the supply chain and the digital elements interfaced with the Internet. These integrations have facilitated optimized and swift supply chain operations which resulted in real-time inventory tracking as well as efficiency in monitoring customer behaviours. Generally, the IoT within the high and low-margin nature of the FMCG industries has been indispensable in streamlining the supply chain operations which significantly impacts the overall retail performance.

Another challenge is interoperability and standardization. The IoT ecosystem comprises various devices, protocols, and platforms from different manufacturers. The lack of universal standards may result in compatibility issues and hinder seamless integration across different IoT devices and systems. Businesses need to carefully evaluate and choose IoT solutions that are compatible with their existing infrastructure to avoid costly implementation errors state Petrovski et al., (2019). Furthermore Jankulovski et al., (2021) explains, the initial investment required for IoT implementation can be substantial, especially for smaller FMCG companies in North Republic of Macedonia. Beyond the cost of acquiring and installing IoT devices, businesses must also allocate resources for employee training and system integration. Despite the upfront expenses, companies that successfully embrace IoT technology can benefit from long-term cost savings, increased productivity, and improved customer satisfaction.

Methodology

This academic paper aims to investigate the extent to which companies in the Fast-Moving Consumer Goods (FMCG) sector in North Republic of Macedonia are implementing Internet of Things (IoT) applications. To achieve this research objective, a quantitative research approach was employed, utilizing a structured questionnaire as the primary data collection tool. The questionnaire targeted top executives from various sub-industries within the FMCG retail sector.

A total of 100 top executives from FMCG companies in Republic of North Macedonia were selected as respondents for this study. These executives were chosen for their strategic roles and decision-making authority within their respective organizations, making them well-informed about IoT implementation initiatives. The data collection process took place between May and June 2023 through an online questionnaire. The questionnaire was distributed to the selected respondents, who completed it within their work environments. Participants were informed about the research's purpose and assured that their responses would remain confidential and used solely for research purposes. Strict confidentiality measures were implemented to protect the anonymity of the respondents and their organizations.

The questionnaire was designed to capture relevant information about the implementation of IoT applications in the FMCG sector in Republic of North Macedonia. The questionnaire included both closed-ended and Likert-scale questions to gather quantitative data. It covered

various aspects related to IoT adoption, such as the level of awareness, current implementation status, perceived benefits, and challenges faced during implementation.
Once the data collection phase was completed, the collected responses were processed and analysed using the R Statistical Software.
Ethical considerations were diligently addressed throughout the research process. The study adhered to the principles of informed consent and ensured that participants were fully aware of their voluntary participation and the confidentiality of their responses. All data handling procedures were conducted with strict adherence to data protection and privacy regulations.

Discussion Of The Results

The questionnaire indicates that all respondents are well-aware of IoT and its related technologies in the context of smart retail. This high level of awareness is promising and suggests that the FMCG industry is keeping up with technological advancements. A vast majority of respondents (86%) consider cost reduction as the primary goal of implementing IoT in the retail industry. Increased operational efficiency closely follows this objective. Moreover, an overwhelming majority (91%) believes that implementing IoT can lead to higher profit margins, indicating the potential financial benefits for retailers. High implementation costs are identified as the primary challenge associated with IoT implementation in the retail industry. A smaller percentage of respondent's express concerns about decreased customer loyalty and reduced data security. Retailers need to address these concerns to foster widespread IoT adoption. A majority of respondents (94%) currently use IoT in their stores, reflecting a positive trend of IoT adoption. The remaining 6% plan to implement IoT for their first projects in the future, indicating a growing interest in adopting IoT technologies.
The respondents' perception of the retail industry in the North Republic of Macedonia varies. Some view it as stagnant and traditional, while others see it as competitive, diverse, and flourishing. This diverse perception highlights the varying degrees of technological readiness and innovation in the industry. Respondents believe that IoT can significantly improve customer experiences in the retail industry. A large majority (75%) emphasizes the importance of a seamless checkout process, followed by those who see real-time inventory tracking (13%) and personalized shopping recommendations (12%) as drivers of better customer experiences. While QR Code/Barcode and self-checkout are more commonly adopted IoT technologies, advanced technologies like RFID, Blockchain, Augmented Reality, and Machine Learning are less frequently used. This indicates the potential for further exploration of these advanced technologies in the FMCG retail sector. Respondents believe that the availability of low-cost IoT devices is crucial for successful implementation. Additionally, reliable internet connectivity and strong data privacy policies are seen as essential factors in ensuring successful IoT adoption. Inventory management is identified as the retail process stage with the most significant potential impact of IoT implementation. Only a small percentage of respondents consider marketing and promotions, product development, and after-sales service as stages with significant IoT impact.
Most respondents consider technological dependence and system failures as the top potential risks associated with IoT implementation. Privacy invasion, data breaches, and cyber threats are also perceived as risks, albeit to a lesser extent. Retailers can gain a competitive edge by enhancing the in-store shopping experience, according to the majority of respondents. A smaller percentage believes that offering personalized and targeted marketing campaigns can also be a differentiating factor. Increased sales and customer loyalty are the main motivations behind implementing an IoT approach in the retail FMCG industry,

as perceived by a large majority of respondents. Other motivating factors include improved supply chain management and enhanced product quality control. The majority of respondents believe that IoT implementation can contribute to sustainability efforts by minimizing food waste and optimizing supply chain efficiency. Other sustainability benefits include facilitating energy management and enabling smart packaging and labeling solutions. The respondents represent various roles within their companies, with Retail Marketing Managers being the most prevalent. This diversity ensures a comprehensive understanding of IoT adoption perspectives. Moreover, they have varying years of experience with their current companies. A significant portion (74%) has worked for 10-15 years, indicating a mix of experienced and newer professionals contributing to the questionnaire.

Conclusion:

The questionnaire results on IoT applications in the FMCG retail sector I North Republic of Macedonia reveal a promising level of awareness and adoption of IoT technologies among respondents. It is evident that the FMCG industry is actively keeping up with technological advancements, with all respondents demonstrating a good understanding of IoT and its related technologies in the context of smart retail. Cost reduction emerged as the primary goal of implementing IoT in the retail industry, additionally, the overwhelming majority believes that IoT can lead to higher profit margins, highlighting the potential financial benefits for retailers. However, challenges remain, with high implementation costs being the primary concern for of the respondents. Addressing these cost-related challenges will be crucial to foster widespread adoption of IoT in the retail sector. On a positive note, a significant majority of respondents already use IoT in their stores, indicating a positive trend of IoT adoption. Moreover, the interest among the remaining is to implement IoT for their first projects in the future shows a growing inclination towards adopting IoT technologies. The diverse perception of the retail industry in the North Republic of Macedonia, ranging from stagnant and traditional to competitive, diverse, and flourishing, highlights the varying degrees of technological readiness and innovation within the sector.

Respondents recognize the potential of IoT in enhancing customer experiences. The majority emphasizes the importance of a seamless checkout process, followed by real-time inventory tracking, and personalized shopping recommendations. Although QR Code/Barcode and self-checkout are more commonly adopted IoT technologies, there is potential for further exploration of advanced technologies like RFID, Blockchain, Augmented Reality, and Machine Learning in the FMCG retail sector. For successful IoT implementation, respondents highlight the critical role of availability of low-cost IoT devices, reliable internet connectivity, and strong data privacy policies. Inventory management is considered the retail process stage with the most significant potential impact of IoT implementation. As Nam and Pardo (2011), mention in the literature, inventory management for FCMG retails has been swift due to the availability of radiofrequency identification tags (RFID) which help allow retailers to automatically monitor their stock levels thus minimizing instances of having products out of stock to which in return reduces holding costs in the retails. The perceived risks associated with IoT implementation primarily revolve around technological dependence and system failures, while concerns related to privacy invasion, data breaches, and cyber threats are seen to a lesser extent. To gain a competitive edge, retailers should focus on enhancing the in-store shopping experience, as indicated by the majority of respondents, along with offering personalized and targeted marketing campaigns. Increased sales and customer loyalty are identified as the main motivations for implementing an IoT approach in the retail FMCG

industry, according to a large majority of respondents. Finally, respondents believe that IoT implementation can contribute to sustainability efforts by minimizing food waste, optimizing supply chain efficiency, facilitating energy management, and enabling smart packaging and labelling solutions.

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