Internet of Things: Reformation of Garment Stores and Retail Shop Business Process

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1 Introduction

In order to define the concept of the IoT, it's important to understand the meaning of the Internet. The internet can be defined as a worldwide system that connects computers via the concept of computer networks, specifically using the Internet protocol suite (TCP/IP). Furthermore, the IoT surpasses the concept of Internet by proposing a system to connect not only smart devices such as computers and smartphones, but also it enables normal devices that are not technologically advanced such as kitchen devices, medical devices or light bulbs to interact and make decisions spontaneously with each other without the interference of humans. Therefore, IoT embedded sensors and other devices can be considered as physical devices to make the communication possible with the Internet through physical or wireless networks [1].

Related concepts of IoT existed since the 1970s. However, in 1999, Kevin Ashton, a British technology expert, first created the term IoT, and it was intended to describe a new technology connecting the technology of radio frequency identification (RFID) and the technology of Internet. Nevertheless, the term IoT received

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no attention until 10 years after. Huge international companies started using the term to establish new strategies for their technologies.

Moreover, IoT was invented to guarantee efficiency, speed and accuracy for users through their lives, instead of relying on people to manually input commands to machines, requiring more time, extraordinary effort and attention to details, which is difficult for human beings to have all at one time and for long periods of time. Therefore, IoT has become of great importance since it supports the concept of self-automation by performing at a high level around the clock. Specifically speaking, IoT has recorded some significant life-changing experiences in the retail stores through some of its applications including smart shelves, robot employees, beacons and much more [2].

2 Current Issues in Garment and Retail Store Methodology

In physical garment and retail stores, stores sell clothes of different companies from different countries. Some stores are branches of the official companies while others are not. Many stores get clothes from wholesale with customers being completely unaware. Upon looking at these clothes, it is quite evident that some are indeed fake brands. The meaning of fake brands is having stores sell clothes with the trademarks of different companies, when, in reality, the clothes have no affiliation with their official companies whatsoever. The fake brands also use materials that are not durable and are not good to use for long time periods. Despite that, these fake brands share the same prices of the original pieces made from the official companies while costing much less to produce. The main issue is that some customers buy clothes without checking the authenticity. For example, customers fail to ask themselves what type of clothes they are looking at. Which company made them? How much should it cost? Customers should be able to fully recognize these fake shops and avoid them. Another main issue is that numerous garment and retail stores do not provide information about their clothes, including the type of clothes, the company that originally made them, details about sizes and average height and weight that fits to the person. This type of information should be presented to the customer. The quality of colour of clothes is also important to look at. Most fake brands are made of low-quality materials and colours. Once washed, the clothes begin to change in colour. If original brand clothes were to be put in washing machines alongside fake brands, all clothes will be affected by the colours of the fake brand. The third issue of garment stores is that some stores do not provide payment by card while simultaneously not having any change. Numerous customers face issues attempting to pay the stores for the goods they attempt to purchase. For example, the ATM is far away from the store; the consumer will waste their time going to ATM machines and coming back to the store to pay, thus reducing number of customers. Some people simply do not like carrying cash. The fourth issue is that some garment stores do not provide services to the customers, including lists, regulation and sticker with the price of the items. Also, some sellers are unhelpful to customers; in those cases, the customer feels uncomfortable buying. Finally, business people should choose the best location for the garment stores.

Stores located in main cities and malls, where many people come, are far more likely to generate traffic. Stores also need great logos potentially using laser lights to attract customers. Advertising is the best way to attract customers, some locations of garment stores are not in main places where people go to every day, and owners do not have enough budget to make advertisements of their garment stores. In this case, they are unable to achieve any profits and eventually go out of business. Figure 1 shows the current methods of garment and retail store shipment.

The sales of online purchases are increasing and all the industries are focusing on new technologies and integration of IoT to their garment and retail shops. Figure 2 shows the statistics of retail electronic sales in the United States from the period

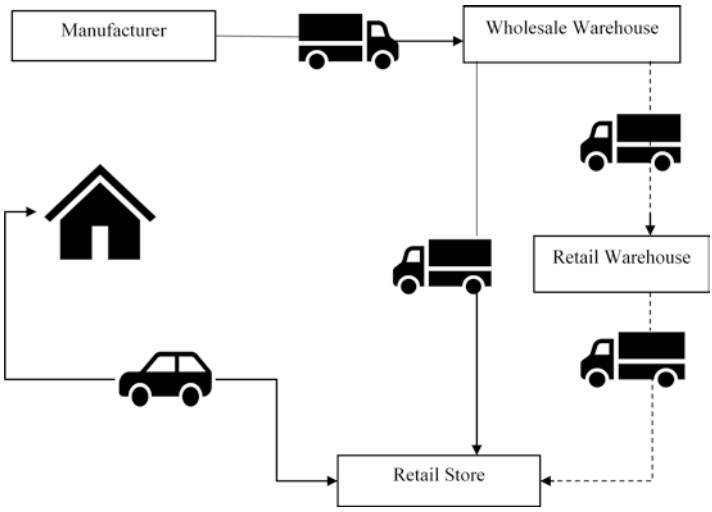

Fig. 1 Traditional retail product

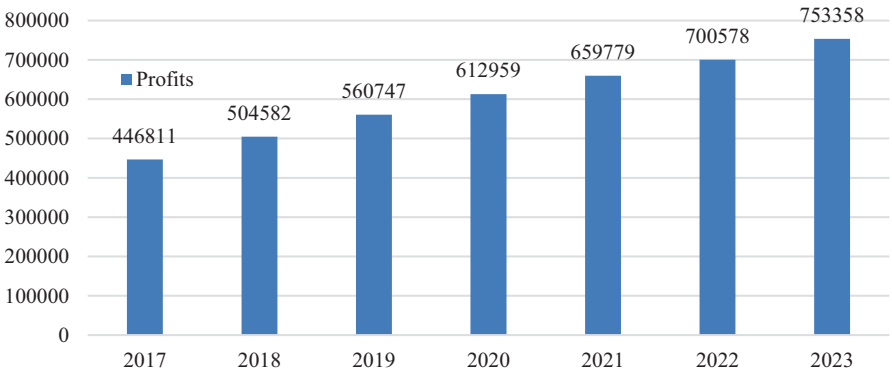

Fig. 2 Retail sales in the United States in years 2017–2023

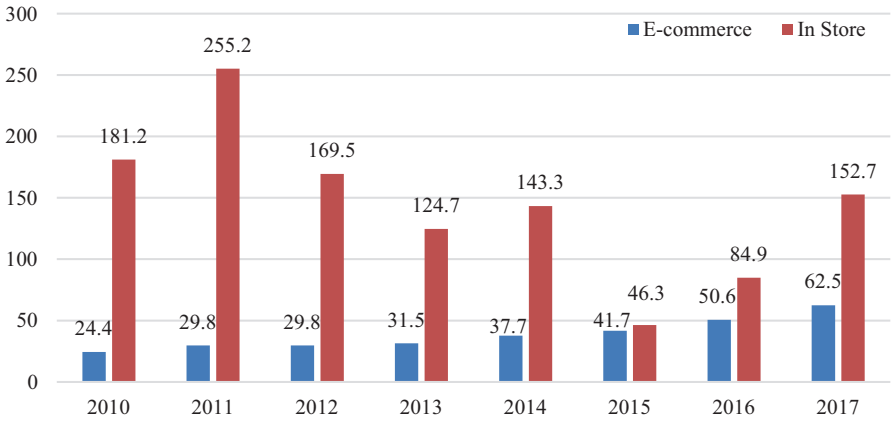

Fig. 3 Comparison between E-commerce and in-store sales (in US dollars)

2017–2023 [3]. Figure 3 shows the online versus in-store shopping up to 2017 [4]. Clearly in-store purchases are still dominant which has more justification to incorporate IOT in stores for a smart shopping experience.

3 Challenges for Using IoT in Garment and Retail Shops

Privacy and security are the primary challenges linked with the IoT solutions. The access to the consumer database offers retailers many opportunities to defraud the customers and increases the chances of cyberattacks [5]. Further, many retailers do not have the basic setup and network to handle large chunks of data generated by IoT. Consequently, the retail stores require significant infrastructure changes to accommodate Internet-based retail. Considerable investment is required by the retailer when it comes to IoT implementation. This is the primary reason that retailers still weigh the advantages of IoT systems against the cost of implementation [6].

Park and other authors published a study concerned with the interactive digital signage application [7]. This classic IoT application functions by receiving direct command from both machines and humans. Additionally, it creates a wireless environment to integrate all commands the system receives. Different issues can arise from this approach such as data collision, scalability issues and high cost and complexity of deployment. Therefore, another technology is introduced to resolve these issues; the technology utilizes the concept of container-based distributed virtual client architecture that avoids all previously mentioned issues by controlling the flow of data on different domains and processing them effectively. Finally, the results of this study have shown that the cloud-based server architecture takes the request from each user, which is then sent to the digital signage server resulting in less dependency on the distance with an average of 50% for all customers.

Moreover, another research by Grewal et al. focuses on analysing the different methods that enable the IoT in the retail industry [8]. The business model is one of the fundamental factors in the online retail industry. It proposes identification and organizing the data received from customers according to different business models, resulting in efficient performance when data is needed for analysis. Another method is the virtual mall technique, meaning the creation of large platforms by websites to host brands and merchants online such as Amazon. Also, the aggregator method is the use of data collected from retailers and collaborating with them in creating trading environments between sellers and customers. Lastly, the search agent method provides an extremely fast and optimized service to provide a software to search for your item accordingly.

The study done by Balaji et al. proposes that IoT will grow the co-creation value in the retail industry [9]. Data was collected from 289 customers that experienced the technology of IoT in the retail industry. Using data analysis techniques and the result of measuring the partial least squares (PLS) equation, it was possible to find that some essential elements had the largest impact on the customer feedback and the increasing value of the co-creation which are the ease of use, the superior functionality, the aesthetic appeal and the presence. Figure 4 shows the IoT value of co-creation concept with the business platforms, platform interoperability and educational platforms.

Qing et al. discuss the RFID technology and its implementation in the retail industry. Specifically, the RFID is used to create technology to support the idea of smart shelves that can be used in the retail industry to make a significant contribution to increasing sales, enabling auto-generated reports about products for managers

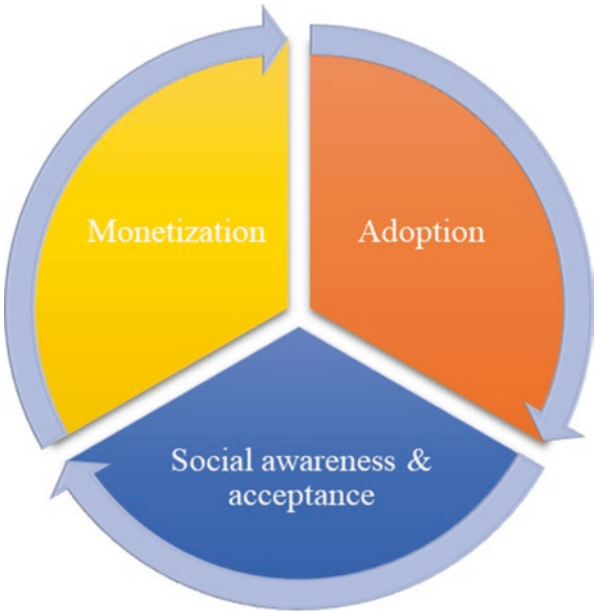

Fig. 4 IoT value of co-creation concept

as well as consumers. In addition, it is extremely comfortable for both the sellers and the consumers. The RFID consists of three fundamental pieces including an antenna system, a multiplexer and a reader or writer; thus, these important elements enable a direct connection with the system, providing data and information about the availability of products, their location, expiry date, etc. [10].

Elliot and Fowell investigate the experiences of customers who shop through the Internet to determine the possible factors that may promote or inhibit the habit. The authors collected data using open questionnaires that focused on several parameters [11]. This included ease of use, convenience and the ability of the model to meet their demands. The findings revealed that customers were satisfied with 70% of the services provided, particularly regarding the extensive amount of available goods, convenience and customized service. However, issues concerning security and the ease of use of the platform emerged. Nevertheless, many people were willing to complete their shopping online. Therefore, the article is crucial in demonstrating how the Internet has improved the ability of retailers to meet the needs of their customers with convenience.

Burnes and Towers examined the development of Omnichannel retailing within the fashion industry and how its knowledge could influence smart cities. Customers are given the ability to select different convenient ways of purchasing a product, such as identifying a product and ordering it online or visiting a showroom to confirm its specifications. By establishing a physical presence, the authors contend that retailers have the option of selling more products to a consumer than in a virtual world. The researchers used deductive reasoning to arrive at this conclusion. Hence, the paper addresses the importance of physical infrastructure even in the age of the IoT [12].

Bilinska-Reformat and Stefanska identify the target market when integrating the IoT with the retail market and garment stores. The researchers used critical analysis of existing literature and observation of young customers in retail chains in Poland to collect the necessary information. According to the findings, young customers have embraced the use of technology in their shopping. As a result, several retail chains began integrating their services with the IoT when targeting this market. The article is crucial in examining the target market for retail firms that have integrated their services with IoT [13].

Many people are discouraged from using the Internet for shopping due to problems with privacy and security. Brill investigates ways in which a person could build trust and maximize benefits despite the challenges associated with the IoT. The author uses an exploratory research style to make assumptions and arrive at conclusions. The author states that increased stringent policies could increase accountability and transparency amongst firms that deal with big data, which would reduce the challenges affecting the IoT. Therefore, retail companies can establish stronger legislation to protect a client's privacy and security, resulting in the enhancement of the integration of the IoT in this sector [14].

Shankara, Mahanta, Arora and Srinivasamurthy study the influence of the IoT in the retail industry. Notably, the authors critique available literature to investigate how the IoT has revolutionized garment stores and retail sectors, thus enhancing

profitability. According to Shankara et al., technology will result in a paradigm shift and the data collected will facilitate the creation of knowledge that can contribute to value added. As such, the article highlights the benefits of integrating the IoT in garment stores and amongst retailers [15].

Dlamini and Johnston explore the usefulness of the utilization of IoT in the retail industry and stores [16]. The authors explore existing research to gather appropriate data and draw conclusions. The authors find out that the intensive use of the IoT in garment stores and the retail industry is attributable to its unique ability in identifying products, ease of communication and the ability to provide real-time information [17]. For instance, the use of sensors could be used to track the shelves with the highest traffic; this knowledge can be of advantage in increasing sales. The information gathered by IoT devices can be analysed to understand consumer behaviour and shape marketing strategies. Additionally, customers could use the technology to track the location of specific products, while retailers could use it to replenish shelves. Therefore, the article provides vital insight into the applicability of IoT in the retail industry.

Today's marketplace is described as a competitive market. Every consumer is looking for the easiest way to purchase products. IoT is the highest-trending technique that retailers are using to set their businesses on the right track. However, they are faced with many challenges in the industry. Retailers need to be informed about the input data from the server including coming and going customers, the purpose of coming into the store and how that translates to the revenue of the store. The procedure of buying by using the IoT procedure is based on sensors. Whenever the sensor has caught the items, it will import the product to the application as a message including name, unit and colour set. After that, the seller will be informed about ongoing and outgoing customer transactions even if the buyer were to refund the items.

Certainly, whenever technology techniques are published, retailers are expected to think about new capabilities including organization and technology areas. This technology should be in well-chosen areas with the appropriate cultures, knowledge and structure to secure and assure the rights of the business. Moreover, the IT department is not enough to save the market; the business department is another aspect of this field required to make the organization strong and survive by having new ideas and solutions for marketing the products [18].

4 Proposed Methodology

There are many new looks of clothes provided by a handful of companies such as American Eagle and sport clothes like Nike and Adidas. In the business activities, nowadays social media is one of the marketing tools used to increase business sales, clothing companies making accounts on Facebook, Instagram and Twitter to introduce their products. This activity makes it easier for customers to search for new clothes based on their interests through online shopping instead of physically going

to shops. Some shops post their social media handles on the door or on the desk. One of the reasons that makes online shopping less efficient than traditional shopping is the customers need to customize materials of garments they purchase meaning they need the "feel and touch experience". Price is one of the attributes that attracts customers to online stores. Customers' brains rely on visual attention to process information that promotional websites present for the setting and product. Some clothing retailers use Facebook as their primary shopping website allowing consumers to order via email or phone. Additionally, some clothing stores with Instagram accounts post links of their websites or Facebook accounts. This is how the marketing works and achieves sales through social media. As physical shopping moved to online shopping, it has become easier in modern days. There are many mobile applications that are designed for shopping for clothes, electrical devices, food, etc. On mobile applications, *JOLLYCHIC*, *SHEIN* and *NAMSHI FASHION*, all popular in Arabian gulf countries, are known as the top applications of shopping. The customers can choose their size, colour and colours and feel like they are designing their own clothes.

Another technology is the beacon devices, which are devices installed with low-energy Bluetooth that gets activated within limited range of the network. Therefore, beacons become handy when customers enter the area supported with this technology. Upon entering places such as malls and markets they will be notified of discounts of sales and special offers to make them more likely to enjoy real-time experiences in shopping. Also, beacons provide retail companies with customers' updates and data to provide customized services and grab customer's attention [19].

Figure 5 shows the proposed model to use of IOT in the garment industry. As shown in Fig. 5, a customer can use his/her access to the Internet to make online

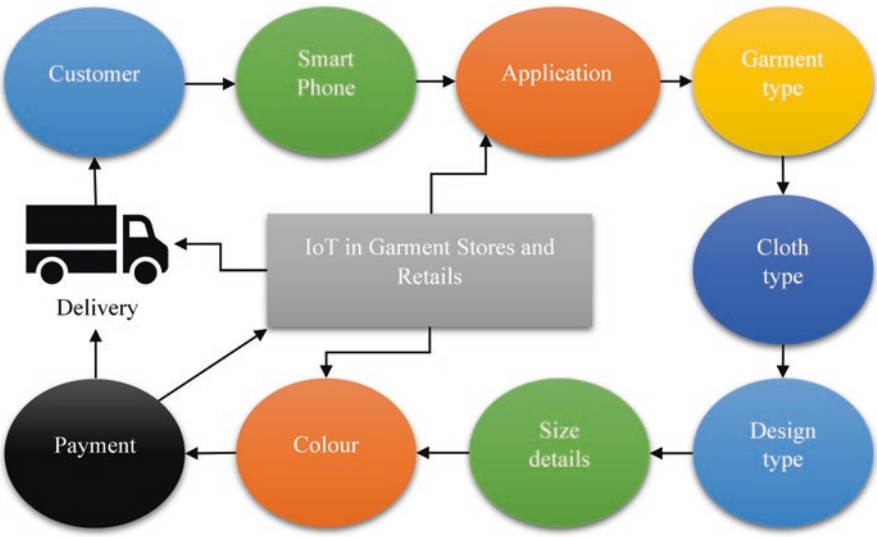

Fig. 5 Proposed model for usage of IoT technologies for online garment stores

purchases detailing garment type, design, size, etc., and make the payment. This shopping experience is coordinated through the use of IOT including shipping and tracking of the item until it is delivered. User interface (UI) is one of the most important strategies in developing store applications and making them successful. The user should fully understand the information provided to browse for their needs, for example, organizing and accessing the database using tabs and lists, search button and account creation. This study has been done by Andrea Savage who created the *iOS Application for Inventory in Small Retail Stores* [20]. As technology has improved and many applications have been designed to serve users, most people have become dependent on their smartphones as part of their daily lives. They can understand types of products without asking the seller. However, there are many people that do not use smartphone technology, who are mostly old people; they prefer to go to stores and "shop traditionally" instead of shopping online. They like to see everything directly rather than seeing it on a monitor. Some garment and retail stores provide sewing services for customers, with measuring giving body sizes.

Smart shelf technology is a convenient inventory management system and one of the most outstanding applications of IoT. Smart shelf wireless system generates real-time updates to its system that can be accessed by employees. It notifies employees about information such as products' availability and expiration dates. In addition, the technologies used to keep track of the products include built-in weight sensors within the shelves. Also, it requires RFID readers and tags placed on each product to help optimize the system and send notifications to the system when products are not organized to their assigned shelves accordingly. Therefore, this system performs and deals effectively with the huge amount of data it collects and analyses it automatically [21]. Figure 6 shows the integration of RFID as middleware of IoT-based garments and retail shops.

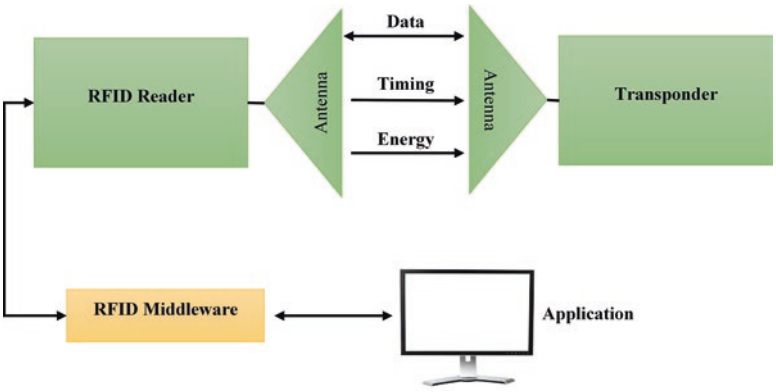

Fig. 6 The integration of RFID in retail shops

5 Benefits

With the advancement in technology, the IoT implements hi-tech sensors to collect and analyse data for retail and garment stores and further facilitates necessary actions [22]. The contemporary customer wants to understand how the product was made and how can it be maintained. The IoT can permit retailers to communicate about a specific product and can also enable them to meet the customized need for the product: for example, what types of cloth are used in the T-shirt? Where is it made and by which company? How long can it be used? What is the average of appropriate height and weight for the person who will wear it? These are the most important information for the customer.

IoT offers the garment stores and retailers the chance to refine the purchasing process of the customers in a store. The IoT could allow incorporation of elements such as customized pricing based on the acquisition history and brand loyalty. The retailers can efficiently collect their orders and track individual items through the supply chain, which will give details of each product and arrival time easily [23]. IoT also safeguards the retailers with fraud identification and loss prevention. Counterfeit products make up approximately 5–7% of the total world trade. Moreover, brands expend considerable resources to curb such fraudulent occurrences. So, the IoT is used to track brands and identify the counterfeit goods while averting the fraudulent sales that use their brand name.

Further, IoT technology can offer a clear overview of the stocks and thereby facilitate the optimization of the brand's storage and automatic replenishment of their stocks. What makes it more efficient is that these actions are aligned to the needs of the customers. It also enables retailers to target high-end clients. Before entering a store, customers often perform comprehensive research about the products they wish to purchase. The stores can keep a record of the browsing history of their customers, their visits, purchasing patterns, the amount they spend, to develop a productive relationship. Moreover, for a personalized experience, the store staff can recommend options based on the browsing record and previous purchases made by the customer at the store. The garment and retail stores can use IoT to understand the needs of their customers better and improve customer services [24].

IoT has become a relationship of the digital world with the real world. Key determinants for IoT is value of co-creation, coinciding with rapid improvement in information technology (IT) the last few years. IoT has become more active in our daily lives. While IoT is still under development and upgrading, it is generally known that the IoT is a pattern where technology equips networking, identifying and processing in order to gain communication with other devices through the Internet to perform desired tasks. IoT is recognised amongst the top techniques of technology that are expected to create business breakthroughs in the beginning of the 2020s. McKinsey expects of the 2020s the existence of over 30 million IoT objects, which will have an effectiveness that guarantees the US $11 trillion per year by 2025. While the area of applications for IoT technology is vast, it is also one of the most prominent areas of business sales including retail industries. For the concept of IoT in smart

networking objects, it is tagged with unique identifiers as a quick response code or RFIDs. A German grocery retailer (Dohle) uses smart carts to provide information of products at the store, which enables checkout without wasting the time of waiting for retrieval information in exact time. Therefore, retailers can develop and improve retail systems using IoT technology, creating real-time experiences and interaction with customers. IoT technology can help buyers make their decisions and positively contribute to their overall shopping experience [9].

IoT has existed for several years now. It was introduced by the MIT audio-ID centre. In the future internet, there are many terms to characterise the future development of the network. There are services of IoT like 3D Internet. Moreover, the collaboration will continue, and more efforts of countries will increase the development of IoT like Japan and the United States. From the economic perspective, the future Internet will depend on websites to optimize economic services, allowing garment and retail stores to save parts of their budgets. There will be multiple services through the Internet; these services will make the difference between high-level business service and low-level sensor services in the IoT. The purpose of IoT is to make contact between the physical world and representation of the information system; this is how IoT is described [25]. Campolargo et al. speak about converging technologies for smart environments and integrated ecosystems; the book predicts the future of IoT services, such as garment stores, workplaces, restaurants and hospitals. All machines can communicate with each other using sensors including computers, embedded system machines, smart discs, etc. These sensors allow all devices to retrieve information and databases from other devices and access them; auto-accessing information can save money while completing the process faster than humans [26].

6 Conclusion

In conclusion, this chapter discussed the concept of IoT in the retail industry by analysing the most common and efficient methods and technologies. Technologies include RFID smart shelf, interactive image technology (IIT) and low-energy Bluetooth beacons. Therefore, IoT enables the direct connection between objects or even humans and objects. It creates a great opportunity to manage and deal with numerous data that is increasing over time, which normal humans cannot deal with due to their limited capabilities and limited time. However, machines do not have time limits if designed efficiently and kept on routine maintenance. Machines do not get tired either which makes a major difference between humans and machines with respect to their performance, quality and speed. Moreover, each technology was discussed while exploring their advantages, disadvantages, results and other supporting techniques used to implement and utilize them accordingly in effective ways. In addition, many of the studies discussed in this paper have implemented different experiments and studied cases where they took into consideration the feedback from customers who experienced the impact of IoT in the retail industry.

The results indicated that many customers are satisfied with the services provided by these technologies, whereas some customers had concerns regarding their private information and how retail companies make use of their personal information.

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