A CASE STUDY OF THE BENEFITS OF THE IOT IN THE QATARI RETAIL INDUSTRY

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ABSTRACT

Technological advancements have led to the creation of new paradigms like the Internet of Things (IoT). These technologies are moving the digital space into a period where they will power billions of devices leading to the transformations of products and services provided by businesses. Therefore, the main purpose of this study is to explore the benefits of deployment of the Internet of Things (IoT) in businesses using the case of the Qatari retail businesses.

The study assumed an interpretivism research philosophical stance and an addictive approach to theory utilising the Technology, Organisation, Environment model to guide the research. The research data were gathered using a qualitative approach utilising semi-structured interviews as the method of data collection. Accordingly, the heads of information technology in the selected retail industry businesses in Qatar were interviewed to answer the main research questions.

The findings uncovered that retailers in Qatar are using the IoT devices such as sensors, scanners, beacons, smart shelves, personalisation alerts, and FRIDs to enable their key business operations and processes. Even though the Qatar retail businesses are not concerned about the specific IoT devices utilised, the benefits of their deployment established from the study include automation of business processes (Technological benefits), efficiency and personalisation of customer requirements (Organisational benefits), and increased collaboration and supply chain optimisation within the entire Qatar retail industry (Environmental benefits). As such, the results of the study agree with the TOE model that technology, organisation, and environment are the driving forces behind technology adoption and utilisation. Finally, among practical implications, a collaboration between software developers and the retail industry project professionals will ensure that the IoT artefacts are designed with security mechanisms, thus enhancing the security and safety of the information gathered from the IoT devices. Further, the study offers guidance on the theoretical elements that contribute to the benefits of utilising the IoT in Qatar retail businesses.

Key Words: Internet of Things, project management, project professionals, deployment, adoption, implementation

INTRODUCTION

The IoT is the linking of objects, things, or devices via actuators, sensors, and the Internet (Dijkman *et al.*, 2015). The actuators, sensors, and the internet are utilised not only for the tracking of objects, things, or devices but also permit in sensing their surroundings and reporting to humans or machines.

In 2016, the IoT was confirmed to be one of the major technological advancements in history since objects are currently moving from being computing devices to a period where they power billions of devices daily (Gerpott and May, 2016). It is, therefore, against this reason that the study seeks to establish the benefits of the IoT in retail business operations since it is set to be the power behind the revolution and transformation of services and products offered by businesses (Ashton, 2009). In fact, Dlamini, (2017) approved that the IoT has affected the majority of businesses by transforming the traditional ways of undertaking their operations to the current digital ways.

According to La Marra *et al.* (2017), the IoT is anticipated to intensify new opportunities for technology ushering in new services and applications that will utilise the opportunity it provides. For business activities, Palattella *et al.* (2016) submit that the IoT does not only offer efficiency and effectiveness but also provides immense opportunities and financial returns. In addition, Caputo *et al.* (2016) approved that the IoT is transforming the business environment and creating new competitions

and that businesses that will be able to cope with the ever-changing environment are those that will be able to anticipate the changes and develop ideas, services, and products that will meet the future demands. With these transformations, retail industry project management professionals need to keep themselves abreast with the latest innovation that is poised to increase the connectivity of their work environments.

Over the past few years, technology has been advancing, ushering in new paradigms such as the IoT (Gubbi *et al.,* 2013). According to Ahmad *et al.* (2020), approximately 35% of retail industry businesses in Qatar will invest in the IoT in the next 3 years, while Tully *et al.* (2016) predicted that by the year 2020, businesses would change following the interconnectedness of devices and things. This confirms Dlamini and Johnston (2016) who alluded businesses that will be able to leverage the IoT will grow exceptionally and gain more compared to others in the same market, as long as they are willing to alter their business structure and processes.

Subsequently, Balaji and Roy (2017) submitted that the IoT is reshaping the retail industry, providing new opportunities to retail businesses and their customers. And given the increase in competition in the retail market, several retail businesses have opted to leverage the IoT in order to improve their business operations and gain market share (Longo *et al.*, 2013). This is because the IoT provides businesses with the capacity to become more effective and efficient, and hence improving their revenue. For instance, Kim *et al.* (2015) pointed that the IoT permits automated

checkouts, which will possibly reduce the number of cashiers by approximately 75%, translating to a yearly profit of about $455 billion in 2025. Again, according to Caputo *et al.* (2016), the IoT provides retail industry businesses with the capacity to penetrate and create new markets, thus heightening their competitive advantage.

Similarly, besides allowing for informed decision-making due to better collaboration and efficiency in data collection (Tang *et al.*, 2018), Lee and Lee (2015) established that the use of the IoT allows for ease of tracking of project resources since the smart devices are capable of sensing and responding to what is around them and in their network, thus decreasing the need for human involvement, reducing the cost of operations, minimising errors, and increasing response time.

However, despite these benefits, Prasher (2018) recognised that there are inadequate researches, which have investigated the benefits of the IoT on the retail industry operations. In the same vein, Dijkman *et al.* (2015) and Coetzee and Eksteen (2011) argued that the IoT's challenges such as privacy and security issues impede the full realisation of the benefits offered by the IoT in the retail industry.

Alternatively, besides the retail businesses striving to comprehend the behaviours of their clients, particularly when they are in-store in order to offer them better products and services, improve their in-store experience, and heighten sales and margins (Balaji and Roy, 2017), the IoT is believed to affect the way the normal business operations are conducted and offer various benefits to businesses such as enabling vital

functions like payment, tracking and tracing, and security among others (Andersson and Mattsson, 2015).

Therefore, the main purpose of this article is to investigate the benefits of the deployment of the IoT to implement business operations with the case of the Qatari retail industry businesses. The paper placed primary importance on the potential benefits of the IoT in retail businesses in Qatar and the subsequent research questions were formulated.

1. What are the effectiveness of existing adoptions of the IoT in the Qatari retail industry businesses?
2. What are the benefits derived from the implementation of the IoT in the Qatari retail business operations?
3. Can the use of the IoT influence project success and how can the Qatari retail businesses maximise its effectiveness?

Accordingly, the following research objectives were intended to be achieved:

1. To evaluate the existing adoption of IoT for the management of projects;
2. To identify the PM process and environments that will potentially benefit from the deployment of IoT;
3. To develop a 'roadmap' for the successful implementation of IoT for PM in the retail sector.

The organisation of the article is as follows. Section 2 reviews past studies with regard to the topic identified in the introduction. Section 3 describes the research methodology. The results and analysis are deliberated in section 4. Section 5 presents the conclusion by making a summary of the findings, which answer the main research question. The last section presents the

general conclusions and implications of the findings to researchers and practitioners.

LITERATURE REVIEW

This section reviews past studies on the application of the IoT in PM in order to paint a picture of how it is transforming the traditional ways of managing projects to the current ways. Accordingly, the papers on the theme of the IoT were searched following Garrido *et al.* (2012), which was carried out as below:

Resources for Conducting the Search: Several databases were utilised to conduct the literature review. The primary ones that were utilised to collect the pieces of literature included UCT online library database, Google Scholar, PubMed, and Scopus.

Type of Literature: Academic books, selected academic journal articles, conference papers, and business reports.

Publication Date: The range of the dates that were considered for the research was from 2012 to 2020, with a few considerations for older dates.

Language: Because most academic researches are written in English (Garrido *et al.*, 2012), the search for the literature for this study was restricted to English language texts only.

Key Search Terms: The following keywords were utilised in the search: the IoT, the utilisation of the IoT in businesses, the use of the IoT in retail business operations, benefits of the IoT in business operations, e retailing, and conducting literature review among others.

Background Discussion

While there are several definitions of the IoT such as connecting things and people at any time and in any place with anything or anyone via a network or service (Perera *et al.*, 2014), integration of different technologies with the capacity to work together to attain a common goal (Atzori *et al.*, 2010), a dynamic global network infrastructure equipped with self-configuring abilities (Ferretti and Schiavone, 2016), and a new paradigm where objects or things containing sensors, tags, actuators, and RFID are connected via a unique addressing scheme allowing them to interact with each other to attain a common goal (Zancul *et al.*, 2016), the present study embraced the definition put forth by Haller *et al.* (2014). According to the authors, the IoT refers to the seamless integration of physical objects into the information network, and such that the physical objects become active players in business operations. This definition of the IoT met the purpose of this study since the research intends to evaluate the potential benefits of the IoT in retail business operations, paying closer attention to the business activities, processes, and operations within retail industry businesses.

Scope of IoT Usage in Businesses

Russo *et al.* (2015) examined the regulations and scope of the IoT in contemporary companies through a revised theory of the topic between the years 1985 and 2015. The authors intended to establish the benefits of the application of IoT technologies in an economic system and

learn how to manage such benefits. The study established that the IoT is expected to bring enormous benefits both in projects and in the entire organisation. The benefits anticipated as highlighted in the study include improved collaborations among the project stakeholders, enhanced communication, efficient management of project resources, and better management of project life cycle. However, the project was limited in scope since it only reviewed the literature covering a short period, thus it will be important to evaluate the most current researches in order to be acquainted with the new opportunities realised from the adoption of the IoT in PM.

Similarly, Yuan and Cheah (2019) researched the application of the IoT to deliver low-cost and accessible healthcare services to patients in Malaysia. The authors utilise TAM and DOI models to understand the diffusion and degree of acceptance of the IoT in the public. Further, the study sought to identify the barriers that impede the deployment and application of the IoT in the healthcare system. The study found out that the application of the TAM model was appropriate in understanding the adoption of the IoT in healthcare operations. However, several barriers, which include lack of talents in the use of IoT, the readiness of the system, regulations, and handling of a large amount of data in projects, were found to impede adoption and implementation of the IoT in the management of health care operations. However, the results of the study could not be generalised since they were only limited to the Malaysian healthcare system. Thus, the importance of this current study utilising the TOE framework as opposed to TAM and DOI as used in Malaysia in order

to establish how the innovation can benefit the retail industry as well.

Gregory (2015) also utilised the TAM model to study the application of the IoT in a retailing environment. The author establishes that the application of IoT improves the shopping experience in the retail industry because the innovation has a positive impact on the employees' perception of usefulness, behavioural control, ease of use, and subjective norm. Nevertheless, the study ought to have incorporated the cost of implementation since this is poised to affect the profits realised, and the eventual success of the projects. Other factors that should have been included in the model as suggested by Mital *et al.* (2018) included control issues, perceived risks, self-efficacy, technology context, and organisation culture. Accordingly, the previously mentioned facets are vital in evaluating the success of a project resulting from the deployment of the IoT.

Balaji *et al.* (2018) studied the innovation of the retail industry using the IoT approach to give insights into its roles in the industry. Accordingly, the study approved that the IoT improves customer satisfaction by enhancing their shopping experience through customised and personal interactions. Nevertheless, the study did not establish the benefits of the specific IoT devices in project management given that they are the enablers of the innovation.

The Benefits of the IoT in Retail Businesses

The undeniable and primary benefit of utilising the IoT is its capacity to affect and possibly alter daily processes of its use (Atzori *et al.*, 2010). According to Bi *et al*.

(2014), the IoT provides the capacity for businesses to get information concerning physical objects that are not easily accessible, offers more information to businesses, thus resulting in innovation, productivity, and high efficiency.

Subsequently, Domingos and Martins (2017) contend that the majority of the benefits provided by the IoT will be realised internally in the businesses, presenting key terms like "intranet of things", which describes the use of the IoT to collect data for business value. In addition, the IoT produces voluminous data and information such as customer profiles and behaviour which provides information for businesses regarding the activities of their customers that can be capitalised to enhance business marketing activities (Dlamini and Johnston, 2016; Solima *et al.*, 2016).

Caputo *et al.* (2016) added that the IoT permits retail businesses to trace and track their products and allows the businesses to monitor them with the information obtained from the technologies. In turn, the businesses will be able to ensure production efficiency since there is a consistent flow of data and information between the suppliers and the businesses. In fact, Geschickter et al. (2015) argue that retail businesses sell different products and that the IoT enhances the supply chain management of those products as well as lowers the complexity of the amount of information and data that businesses handle and the transactions carried out.

Therefore, the benefits provided by the IoT in retail business operations include the reduction of data acquisition costs because objects, devices, things, or machines work in collaboration and share resources due to

available data that were previously unavailable as the IoT will have the capacity to interact with people and real-time data from various objects, machines, or things for better decision-making (Domingos and Martins, 2017). Caputo *et al.* (2016) also established production effectiveness and efficiency improvement, equipment safety and security enhancement, and asset optimisation as the benefits derived from the deployment of the IoT. Moreover, through the innovation offered by the IoT, Perera, *et al.* (2014) argue that the retail industry businesses can enter and create new markets and heighten their competitive advantage.

Therefore, from the literature review conducted, a few gaps can be identified. Firstly, a large percentage of businesses around the globe will utilise the IoT to enable their business operations going forward. However, the literature is lacking on how the Qatari retail industry businesses will embrace the trend and whether the reviewed literature is true for the Qatari retail businesses. Secondly, the reviewed literature evaluated the benefits of utilising the IoT in retail businesses, yet, they did not evaluate the benefits of using the IoT in the Qatari retail industry businesses, that is, whether these benefits hold for the Qatari retail business contexts as well.
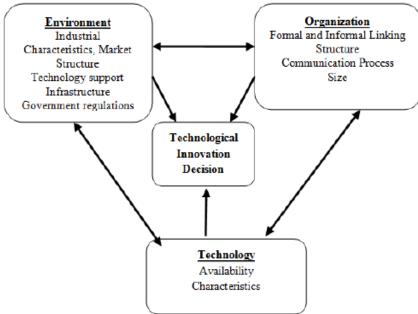
Theoretical Framework

The Technological, Organisation, and Environment (TOE) model (illustrated in figure 1) was used to guide the present study. Accordingly, the model has three dimensions (Technology, Organisation, and Environment), and that the paradigms have been useful in studying the adoption and implementations of various innovations such as Radio Frequency Identification

Tags (RFIDs), cloud computing, and enterprise resource planning (ERP) solution (Awa *et al.*, 2016). Regarding the technological context, all the internal and external technologies available to the businesses are considered (Gutierrez *et al.*, 2015). These technologies include specialised human resources which entail people in the business that have knowledge and expertise to utilise the IoT and the structural aspect which considers the technological infrastructure within the businesses (Gutierrez et al., 2015). Thus, for this study, the IoT forms the technological context.

The organisational context entails the business features like scope, trust, size, technology readiness, managerial structure, and the number of slack resources at the disposal of the business (Gutierrez *et al.*, 2015). This element fits the definition of the study because the research considers the organisation as the Qatari retail business. On the other hand, environmental context involves the market where the business operates which includes competitors, the industry, government dealings, and access to resources (Khosrow-Pour, 2013). For this study, the environmental context was Qatar. Therefore, the framework was deemed appropriate to understand the adoption and application of the IoT in the Qatari retail businesses.

Figure1: TOE Model (Source: Tornatzky, Fleischer and Chakrabarti, 1990).

MATERIALS AND METHODS

This section discusses the justifications of the research methodology, which include the methods of data collection and analysis utilized in the study to answer the research questions.

Research Methods

The study adopted a subjective ontological stance, which requires the researcher to meet the research participants and interview them in order to extract the meaning from the data collected from the interviews (Saunders *et al.*, 2009). Therefore, to better comprehend how the IoT has benefitted the Qatari retail industry, the researcher opted to interact and interview the research participants. Given the previously mentioned purpose of the research and the objectives formulated, a confirmatory research approach was established to fit the

purpose of the paper. The approach implies that the researcher has a theory, and the main objective is to confirm whether the theory is supported by the facts. Thus, the paper assumed an abduction approach to theory using the Technology, Organization, and Environment model. The approach, also known as theory testing intends to examine a proven theory and make inferences of a phenomenon (Saunders *et al.*, 2009). Therefore, the study employed the TOE framework's dimensions to establish the deployment and application of the IoT in the Qatari retail industry.

Subsequently, the paper adopted a qualitative research strategy. The strategy, which is a non-numerical method of data collection, is appropriate in narrowing down large fields of research into a single topic that can be studied easily (Creswell and Creswell, 2017). It seeks to deduce the meaning and provide a deep understanding of a specific problem or situation (Mohajan, 2018). Given that, the IoT is an emerging innovation globally, and particularly in the retail industry, it was imperative to conduct in-depth research to establish how it can be deployed and applied in the retail industry. The method allowed the researcher to discover the hidden and related social aspects of the research problem as well as revealing hidden meanings entrenched in peoples' views. Therefore, qualitative research was deemed appropriate for the research.

Similarly, the study used semi-structured interviews to collect data from the interview participants (see appendix 1 for the complete interview protocol). The interview questions were categorised based on the TOE model dimensions and the review of the literature. The method was vital for the research since it permitted the researcher to have control and the capacity to challenge the answers given by the respondents. In this regard, the study collected data from seven retail industry project professionals in Qatar since they were believed to be the key decision-makers about technology deployment in their organisations. Thus, the study compiled information that was considered adequate to comprehend the situation under investigation (Yin, 2013), that is, the benefits of the applications of the IoT in the retail industry. Moreover, in selecting the research participants, the researcher made sure that they were experienced project professionals in the retail industry as shown in table 1 below.

Table 1: Respondents' Profile

Position of the Participant	Industry	Years of Experience
Environment Manager	General Merchandise	10
General Manager: IT	Furniture	7
IT Solutions Executive	Pharmacy, Health and Beauty	5
Regional IT Executive	General Merchandise	7
Head of IT: Central applications	General Merchandise	8
IT Operations Analyst Retail System	General Merchandise	3
Chief Information Officer	Fashion	6

Research Context, Data Analytic Techniques, and Interpretations

The study collected data from retail companies in Qatar since the industry was confirmed to have more prospects for the adoption and implementation of the IoT going forward. For instance, the IoT market size in the country's retail sector has been projected to reach approximately $573 million in the year 2022 up from $172.5 million in 2018. Similarly, in the recent past, there has been a substantial growth of new malls in the country, which has positioned it as a prime destination for a high level of occupancy giving the industry a lot of potential for the adoption of IoT innovations. Again, the growth of e-commerce in the GCC countries has compelled the country's retail sector to adopt and implement the IoT innovations in order to position itself for the benefits anticipated in the region. Thus, it will be imperative to analyse the benefits resulting from the deployment of IoT in the country's retail environment.

The study thematically analyse the data collected by categorising and comparing the interviews to identify the themes that emerged from the data. The analysis followed the six steps of conducting thematic analysis, which include data familiarisation, generating initial codes, searching, reviewing, defining, and naming of themes, and write-up (Braun and Clarke, 2006). Furthermore, the purposive sampling technique was utilised by ensuring that the retail companies that use the IoT innovations in Qatar were adequately represented, thus enhancing the reliability of the research findings (Shah, Corley, 2006). Again, the anonymity of the research participants was protected because research data were gathered through various online platforms and later transcribed without images and that the researcher was the only person in charge of the processing and storing of the data. The interview data were carefully reviewed to identify the main existing IoT artefacts and their applications in the retail industry environment. Interestingly, the majority of the interview participants converged in their explanations of the existing IoT devices and their benefits in enabling their core business activities.

RESULTS AND ANALYSIS

This section of the paper is dedicated to the results and analysis of the findings from the study. The results are presented in two sections based on the research questions: the existing adoption of the IoT in retail business operations and the benefits attained because of deploying the IoT.

Concerning the first objective, the study establishes several existing adoptions of the IoT and their effects on the Qatari retail businesses as deliberated in the subsequent discussions.

The study revealed that the participants are not so much concerned about the specific IoT but rather the results of using the innovations as well as taking into account what technologies will fit to ensure that the processes are attainable as stated by the Environment Manager. However, the IT solutions executive confirmed to be using RFIDs in their malls to help them with stock count as well as tracking the movement of their merchandise. This also conforms to the general manager IT that scanners, sensors, RFIDs, and beacons are among the IoT devices that the Qatari

retailers are looking at utilising in their business operations. This approved Atzori *et al.* (2010) that several technologies are present to enable the IoT and that these technologies work in collaboration to provide IoT capabilities.

Similarly, the study established that most of the retailers in Qatar, particularly those in the fashion industry use IoT devices, which include 'gesture controls' and 'magic mirrors' to improve the in-store experience of their customers. As the chief information officer (fashion) put it, "we use magic mirrors and gesture controls in place of changing rooms, and these have enhanced the customers' journey in our stores." This confirmed Bi *et al.* (2014) that the IoT is used to automate business operations and make them easier.

Nevertheless, it is also revealed that the IoT is not a complete set to establish effective solutions to businesses since they still need modifications, configurations, and integrations with back-end systems. The respondent (regional IT executive) stated that having an effective IoT business solution requires back-end integration software, warehouse, and stock management system. This finding is in agreement with the TOE framework that for businesses to effectively and efficiently utilise the IoT, the business information infrastructure ought to change to integrate various functions over different platforms (Gutierrez *et al.*, 2015).

Concerning the second objective, the study approved several retail industry business processes affected by the innovations in the Qatari retail industry. For instance, the IT solutions executive noted accurate fulfillment and the automation of back-

office functions such as finances and customer expectations as the important activities that have been transformed by the adoption of the IoT in their organisation. He further noted that without the innovations, the company would not be able to access its app for tracking the customers' orders in order to establish whether they are going to be on time or not. The above-mentioned concur with Bughin et al. (2013) that businesses that utilise the IoT are using it to execute their complex operations and allow their systems to make independent decisions based on sensor reports offered by these systems.

Furthermore, the findings approved that the Qatari retailers use the innovations to understand the in-store journey of their clients, providing a platform for engaging with them. The Supply chain manager-special projects noted that they have been enabled by the innovations to take a full online journey, where they are now able to better understand their customers in regards to their location in the stores, time taken in a given section, and any other information about them. This information approves Gregory (2015) who pointed that businesses are utilising the IoT to enhance their customer experience, which creates a new paradigm of 'Internet of Me.'

Nevertheless, the chief information officer had a contrary opinion, stating that they have no IoT in their current system that implements new business operations that they have not been undertaking. This information reveals that the IoT only allows retail businesses to efficiently execute the existing business activities rather than enabling new business processes (De Senzi Zancul *et al.*, 2016). On his side, the regional IT executive argued that besides

enabling efficient execution of business operations, the IoT innovations have had more significant opportunities in their organisation.

Subsequently, the study revealed that the IoT technologies have enabled the automation of the supply chain, thus unlocking unimaginable potentials in the storage and distribution of goods in the industry (Brody and Pureswaran, 2015). Accordingly, the use of robots to pick and distribute items in the distribution centers has reduced the number of human workers (Murray *et al.*, 2016), thus reducing cost and increasing efficiency as alluded by the respondent (supply chain manager-special projects). Further, from the response by the IT solutions executive, it is apparent that with the IoT, it is possible to increase collaboration with other retailers both within and outside Qatar, particularly those who supply or sell their products to the final customers, thus increasing collaborations in the global retail industry.

Regarding the third objective, the study established several benefits ranging from technological to environmental resulting from the deployment of the IoT in retail businesses in Qatar.

With regards to technological benefits, it became clear that the utilisation of the IoT aids in automating the business process which accelerates growth within the retail industry businesses (Uhl *et al*., 2016). Accordingly, automation allows the industry to become flexible when making decisions, thus increasing business efficiency. According to the chief information officer, "the IoT artifacts allow us to scale and drive efficiency since they allow for the automation of most of our operations." This information concurs with Caro and Sadr (2019) that automation using the IoT permits businesses to be easily scalable because as the businesses grow, they will require a small number of people to perform the tasks as the tasks will be carried out by enabling the IoT devices. Further, respondents confirmed that the automation of retail operations allows the industry to hold the right amount of stock, thus avoiding shortages and overstocking through the use of various IoT devices. For instance, according to the IT operations analyst-retail system, the IoT sensors have enabled the tracking of merchandise and stock levels, and the timely delivery of information to the retailers. This confirms Qu *et al.* (2016) that the use of the IoT permits businesses to be in sync with their surrounding in real-time. The IT solutions executive also stated, "The IoT sensors are enabling us to automate inventories such that we can understand and manage stock movement, and hence keeping the right amount of stock." Furthermore, the chief information officer noted that the IoT innovations have enabled them to receive more clients visiting their stores without causing them unnecessary time wastage and increase the speed with which they attend to them because of the reduction in processing time and better stock management. According to this response, it can be affirmed that retailers benefit through the use of the IoT in such areas as trend analysis, quick response to problems, efficiency, and creating smart products, thus creating a cognitive retail environment (Vermesan and Friess, 2013).

Concerning organisational benefits, most of the respondents converged on the efficiency and personalisation of customer

requirements resulting from the adoption of the IoT. With regards to efficiency, the results establish faster repairs, shorter turn-around times, implementations at the fingertips of the retailers, and faster information, enhancing the decision-making in the organisations. According to the head of IT acquisition and infrastructure, the shopping experience of their clients has been improved since the promotional products have been positioned based on the customer journeys, thus increasing efficiency in the stores. On his side, the IT solutions executive opined that efficiency has been their main benefit from the deployment since the IoT devices give them real-time notifications on their retail activities. From these responses, efficiency is the primary benefit of IoT in retail business operations. It offers the retail industry businesses the ability to automate their decision-making, which results in faster repairs, turnaround time, implementation, and information at the fingertips of the retailers, thus generating better margins and allowing control in the business (Dalenogare *et al*., 2018).

The study further found out that the IoT has allowed retail industry businesses to personalise their customer requirements. As stated by the respondent (regional IT-special projects), the IoT devices are used to gather unique information about various customer segments, allowing the businesses to sell unique products tailored to the customer requirements. This has had the impact of increasing sales since the retail industry project professionals are equipped with ready information concerning the demands of the customers (Dijkman, *et al.*, 2015). Again, from the response by supply chain manager-special

projects, improvement in customer experience has been the greatest benefit attained from the deployment of the IoT in the retail businesses since the devices have allowed them to place the products conveniently where customers can easily locate. This confirms Balaji *et al*. (2018) that the IoT devices are used to analyse the locations frequently visited by customers in the retail stores, thus optimising those locations. This information echoes the IT solutions executive who noted that through the deployment of IoT innovations in their firm, they have been able to personalise the products they offer based on customer demands.

Concerning the benefits to the entire retail industry environment, the study approved increased collaborations and supply chain optimisation within the entire industry. This is because the innovations allow collaboration among suppliers and the centralisations of business departments that exist across the world. For instance, the general manager, IT stated that the innovations have benefitted their supply and demand because of the increased connectivity they offer. In addition, there has been increased interdependence in the retail industry environment as in the case of vendors supplying the industry with products and truck companies that deliver the industry's items within and outside Qatar.

CONCLUSIONS AND IMPLICATIONS

This section of the paper offers the conclusions and practical implications of the findings on practice.

General Conclusions

The results have revealed that the IoT artefacts currently utilised in the retail industry include scanners, sensors, beacons, personalised alerts, and RFIDs. These devices are used to automate retail stores, understand the popularity of certain products, and inform when the items need to be restocked, monitor retail industry resources from any form of theft, and inform customers of the products available in the shops. This confirms Lee and Lee's (2015) observations that the deployment of the IoT technologies can make the tracking of a project's assets seamless since the devices can sense what is around them and in their network, notwithstanding their locations. This also helps in reducing the need for human involvement in the management of project activities, which helps in minimising costs and reducing manual errors.

Similarly, the study established that the IoT artefacts aid in the management of retailing companies' business operations in such ways as attracting customers' attention and personalising their shopping experience. Contrary to Dascal and Dror (2005) that the IoT artefacts could replace human workers, it can be concluded from the study that they aid their activities, which further conforms to the observations made by Del Giudice (2016). This means that the retail industry project professionals need to leverage these innovations in the management of their activities.

Subsequently, the findings of the study uncovered that the Qatari retail industry businesses are not particularly interested in the benefits of using the IoT technologies, but rather they develop new business processes and the IoT technologies come in as the enablers of the processes. The findings further established that the RFID tags are the most widely utilised IoT devices for tracking goods and stock. Other devices include beacons, scanners, and actuators. Nevertheless, there are various IoT devices that retailers are looking at utilising which can be employed to attain a common goal.

The findings further revealed that the IoT is not a single technology, but rather a range of artefacts that are intended to enable core retail industry business operations like automation, accurate fulfilment, checking footfall in the stores, self-checkout technologies, and gathering customer information, thus leading to more sales. For this reason, retailers consider the IoT as an opportunity. Nevertheless, it is also important to note that the IoT is not a complete solution since the study uncovered that the technologies still need to be configured, integrated, and modified with the business systems in order to realise their full benefits.

Finally, the study discovered that retailers are utilising IoT technologies to create self-sufficient customers as well as to create more efficiencies for the business and customers. Accordingly, the IoT is transforming the physical business operations into efficient digital activities while at the same time enabling the retail businesses to digitise, sell, and deliver their products more virtually. Thus, the retail industry businesses are realising great benefits in the utilisation of the IoT technologies in this concern.

Implications for Practice

In investigating the benefits of the IoT in the retailing environment with the case of the Qatari retail sector, the study brings forth several recommendations that project professionals and practitioners working in the industry can take into account in order to better reap the benefits from the innovations.

Firstly, retail industry organisations ought to have a clear comprehension, strategy, and implementation plans when deploying the IoT. This is because employees and other people within the organisations are the key contributors to the successful deployment of the innovation, and without such efforts, it will be less beneficial (Feldman *et al.*, 2016). Again, retail companies are required to embrace the deployment of the IoT in the industry in order to succeed in the current digital era as noted by the majority of respondents. This implies that in the years to come, the IoT will become a threshold requirement for retail companies that intend to thrive (Percudani and Batrawi, 2017).

The study further suggested that project-based organisational structures are becoming a threshold requirement for companies and that the scenario is expected to escalate in the future since the retail industry customers are increasingly demanding customised products. Therefore, with the deployment of the IoT, the role of retail industry project professionals is anticipated to change concerning the technical and soft skills demanded. Because of this, they ought to understand the applications of the IoT devices because their flexibility determines the successful deployment of the

innovations. The surest way of implementing this is through continuous learning such as following the latest publications in the field like the International Journal of Internet of Things and Cyber-Assurance and IEEE internet of things journal and among other latest publications in the field.

Further, this study established that the intention of deploying the IoT is to create value for investment to the retail industry stakeholders. This is because a company that does not generate profit from investments will not thrive (Barney and Hesterly, 2005). Given that, the current business environment has become volatile, dynamic, and competitive; its goals have also changed resulting in the complexity of the operations, thus the need for systems to deal with the complex organisations' needs (Feldman *et al.*, 2016). This implies that retail industry professionals need to improve their IoT skills and competencies in order to enhance data utilisation. What's more, important capabilities such as stronger analytical skills by roles and expertise should be inculcated before the adoption and implementation of the innovations.

The findings further reveal security (cyber-attacks and legal complications) to affect the deployment of the IoT innovations. This, therefore, implies that project professionals in the industry need to collaborate with software developers so that the devices are fitted with security measures such as passwords and end-to-end encryption. This will ensure that the information collected from the IoT devices is secured, thus enhancing the benefits from the deployment. Similarly, retail companies need to consider protecting the information

collected from IoT devices by embedding them into technology architectures. Even though doing this could be a costly undertaking, the industry needs to devote additional resources for it because of the benefits that will be achieved in the long run.

Theoretical Contribution

The main contribution of this study is that it contributes towards the connection of project management and the IoT, pointing out the benefits of the IoT in the Qatari retail industry businesses. The study connects the pieces of literature and superimposes their scientific concepts with those of the TOE framework on the benefits of the adoption and implementation of the IoT in the Qatari retail businesses, thus presenting a helpful theory that can be used to evaluate the adoption of the IoT in retail business operations.

Limitations of the Research

In essence, all studies are associated with some limitations (Saunders, *et al.*, 2009). For this present study, the following limitations were identified. Firstly, besides the difficulty in assessing the respondents, the study intended to work with the heads of information technology in selected retail businesses in Qatar. However, time constraint was an issue because the selected respondents had busy schedules. Secondly, the study only considered retail industry businesses, which form a small type of business in Qatar. Therefore, the findings of the study may not be generalised to all business types. Again, the sample of the research participants selected might not have had all the information required on the topic.

Future Research Directions

This section presents the propositions for future research in order to ensure that the findings that have not been deliberated in this current study are uncovered for practice and/or for theory building.

Firstly, it is important to carry out a quantitative study and collect responses using a positivist philosophical stance. This is significant because positivist collects research data objectively, and hence they are not part of the data collection methods, which would possibly result in different findings. Another future research study would involve collecting and analysing data in a different market, as opposed to retail, since different markets are characterised by different dynamics and that their response to technology is different. Lastly, in the case where inter-pretivism research philosophical stance is also utilised, a researcher can adopt a multiple case study as a data collection method as opposed to a single case study as was adopted in this present study.

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APPENDIX 1: INTERVIEW QUESTIONS MATRIX

Thank you for devoting your time to take part in this research. Beginning let me share the research theme with you. The main objective of the paper is to investigate how the IoT can be deployed to implement business projects, specifically in the retail industry. You have been chosen as a participant in this research because you are in charge of technology adoption and implementation in your organisation, which the study is using as a representative company. I sincerely hope your knowledge and experience in the company can significantly contribute to attaining the objective of the study. The interview will be open-ended and is based on your knowledge and experiences, thus all the answers to the research questions are correct. In addition, your answers will be held with the highest level of anonymity and confidentiality. You also have the right to withdraw from this project at any time without explaining the reasons for doing so.

> According to Gregory (2015), the IoT is transforming the retail industry, providing new opportunities to businesses and their customers. Again, Martin et al. (2013) established that the increasing competition in the retail market has compelled many retail industry businesses to use the IoT to gain market share.

Sub-problem	Research questions	Source of data	TOE framework	Type of data	Analysis
The first sub-problem was to investigate the existing adoptions of the IoT within the Qatari retail businesses.	RQ1: What are the existing adoptions of the IoT for the management of the Qatari retail businesses?	Q1. What technologies are utilised for the IoT in the Qatari retail businesses? Q2. What business processes are affected by the IoT in the Qatari retail industry? Q3. How is the IoT utilised in the Qatari retail environment?	*Organisational context* - how the adoption of innovation is affected by internal constraints: available resources, management support, employees competencies	Semi-structured interviews	Thematic Analysis
The second sub-problem was to investigate the benefits derived from the implementation of the IoT in Qatari retail businesses.	RQ2: What are the benefits derived from the implementation of the IoT within the Qatari retail industry	Q4. What are the technological benefits realised from the IoT in the Qatari retail businesses? Q5. What are the organisational benefits realised from the adoption of the IoT in the Qatari retail industry?	*Technological context*- perceived usefulness of the innovation, derived relative advantage, complexity and compatibility of adopted technologies	Semi-structured interviews	Thematic Analysis

		Q6. How does the IoT benefit the Qatari retail environment?	with the business needs		
The third and final sub-problem was to state the challenges that hamper the successful implementation of the IoT in retail businesses so as to develop a roadmap towards successful implementation	RQ3: How to develop a roadmap for the successful implementation of the IoT within the Qatari retail industry?	Q7. What technological challenges hinder the successful implementation of the IoT in Qatari retail businesses? Q8. What are the organisational challenges that hinder the successful implementation of the IoT within the Qatari retail businesses? Q9. What are the challenges affecting the adoption of the IoT within the Qatari retail environment?	*Environmental context-* account for the impact of technology on the overall industry development, competitors, partners, but also governmental policies and regulations in the field	Semi-structured interviews	Thematic analysis

Nayef S. Al-Nabet graduated from two of the top UK universities; I got my Bachelor Degree in Computer Science with Security and Forensics from Cardiff University. In addition, I have had my Master degree in Project Management from University of Portsmouth. I am a qualified project manager with extensive knowledge in Computer Science field capable of overseeing large scale and high value projects within the given budget. With over 5 years of experience, I hold a notable customer satisfaction record due to my ability to meet project objectives within the stipulated budgetary requirements. Over the years, I have achieved a consistent record of successful implementation of best practices to reduce costs, improve efficiency, and increase productivity.