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Internet of Things and how could affect E-commerce and Retail businesses

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ABSTRACT

Day by day our world and our future are reshaped. The fast pace of technological evolution and the incredible inventions and innovations have digitized our era and the deep disruptive changes are obvious in people's lives and businesses. The new wave of change introduces us the Internet of Things which refers to the physical objects being connected to the internet using unique identifiers and automatically exchange data. This technology is going to be the biggest hit on e-commerce. With the popularity of online shopping on the rise, the merger of those two is going to totally change what we knew for e-commerce up until today. The IoT is an evolving concept, a real revolution which is going to change the DNA of the businesses. The aim of this study is to determine how the new wave of IoT can affect e-commerce and retail businesses. With this research we want to reach the peoples' consciousness about the new future trends and explain the impacts on customers' and businesses experiences. Therefore, the research questions are the following: "How Internet of Things could positively affect retail businesses and retail e-commerce?" and "Which are the major challenges for businesses and consumers?"

The research questions are answered through a systematic literature review and are validated through a case study with IKEA Company. The literature research strategy is demonstrated through a schematic search string. Based on this review, the dissertation posits that IoT can positively and negatively affect e-commerce and retail businesses. The results of the study are presented on two matrix tables. The beneficial contributions of IoT are presented on the first matrix table which indicates that customer satisfaction and business optimization are the greatest offers of IoT in electronic and business retailing. The second matrix table depicts the challenges and reminds that opportunities come with a risk and in this case matters of security and privacy are analyzed. The validation of the literature results is done through a qualitative research method conducting with an unstructured interview and a questionnaire with the sales manager of IKEA Thessaloniki. The results of the case indicate that every company perceive the potential opportunities and challenges with a different manner, based on their strategies and goals.

CONTENTS

ABSTRACT	2
CONTENTS	3
1. INTRODUCTION	4
1.1 Background Study	4
1.1.1 Internet of Things (IoT)	4
1.1.2 E-commerce (EC)	7
1.1.3 IoT & E-commerce	8
1.2 SCOPE OF THE STUDY	9
1.3 STRUCTURE	9
2. RESEARCH METHOD	10
2.1 Research Questions	10
2.2 Research Strategy	11
2.3 Study Selection per Database	12
2.3.1 Science Direct	12
2.3.2 DBPL & IEEE	12
2.3.3 Harvard Business Review	12
2.4 Search String Analysis	13
3. LITERATURE REVIEW	14
3.1 The booming of IoT technology	14
3.2 IoT & Businesses	16
3.3 IoT & Retailer – Customer Relationship	18
3.4 IoT, Logistics & Supply Chain Management	19
3.5 IoT & E-commerce	21
3.6 IoT Challenges & Risks	23
4. OVERVIEW OF LITERATURE REVIEW	25
5. CASE STUDY ANALYSIS	27
5.1 IKEA DESCRIPTION	27
5.2 Interview	28
5.3 Questionnaire	30
6. DISCUSSION & RESULTS	31
7. CONCLUSION	33

1. INTRODUCTION

In this chapter we present the basic concepts of our study, the scope of the dissertation and structure that was followed. The subchapters are categorized as: Background study (1.1) Scope of the study (1.2) and Structure (1.3).

1.1 Background Study

1.1.1 Internet of Things (IoT)

In the beginning of the 21st century we witnessed the booming of technology. Every day new inventions flourish and new Internet communication technologies are invented. We are living in a digitalized world, where everything is connected to the internet and people communicate mostly through social media networks. Every problem that we face it can be dealt over the internet or with the usage of a smart device. As the years go by, the percentage of internet usage is growing. According to Statista (2017), nearly 3.5 billion people used the internet for browsing the web in 2016. These numbers can show us the high penetration of internet and internet technologies in our daily life. With the advent of internet our lives have changed, our communication, our entertainment and the way that business is operating. For this reason, researchers try to invent new technologies which will make our lives easier and will make the world simpler.

In the perspective of making the people life easier, an upcoming invention has settled the ground, Internet of things. Internet of things is one of the hottest topics of our century. This concept has been analyzed from many researchers, universities and academics. However, IoT is not a recent topic. In the latest of the 20th century, Kevin Asthton pioneered by using for the very first time the term Internet of things in his presentation at Proctor & Gamble Co. The whole concept behind the idea of the coined term was the linking of the idea of radio frequency identification (RFID) to the new trend Internet. On 1999, Kevin Asthton wrote an article in RFID journal in which he introduced the brave new world of Internet of things and described it as a

world where sensor technology and RFIDs could foster the dynamic of computers gathering all the information by itself, communicating and computing without the human involvement.

Throughout the ages, science has evolved and there is an increase in the number of research studies concerning the internet of things. While more and more researchers investigate the theme of Internet of Things, still there is not a convergence of views in the terminology of this concept. This discordance of opinions is based on the theory that many of the terms include only some basic building blocks of the IoT and not the whole picture of what exactly constitutes this concept (Atzori et al. 2016). Many definitions have been given with the one of the most characteristic to be the one that gave the Lopez research which defines the IoT as a system that “things” of the physical world, which have any kind of sensors attached to them, are linked to the Internet through wireless and wired connections (2013). Although there is a diversity of definitions, most of them uses a common base of describing IoT in which the physical items are interconnected to the world of Internet (Haller, 2010).

As it is already mentioned, IoT is not a new player in the arena of internet communication technology. All these years, technology has evolved and IoT has undergone all these changes adapting its format and transforming its features in the new technological environment. Researchers have shed the light on new ICT technologies like cloud computing and big data which are going to have an impact on IoT idea and will bring us closer to a whole new idea of an innovative technology (Atzori et al, 2016). As far as the research study of Atzori goes, the IoT evolution is divided into three generations. The first generation is related to the concept of RFIDs and sensors. In the second generation there is a decrease in the number of using “tagging solutions” instead the use of web services and interworking, transforming the items into “things” that are connected into to the web like being a host. The third generation introduces us in the future internet in which the objects around us will take the advantage of new technologies (cloud computing) and will be transformed into objects that will create their social network independently from people and will take the aspect of “people, content and service centric” (2016).

Our world is full of data. We produce every day a vast amount of data without knowing it and most of them remain untreated. James Cortada of IBM has said that

“We are at a different period because of so much information”(Aakanksha Chopra et al. 2015). All these information can change our world. If we analyze all these data, we can gain experience in many areas of studies. This is one of the main reasons why more and more information technologies are invented. Technologies can literally change our life by providing us new data and simultaneously wisdom with the processing of them. With the advent of IoT not only is our life changing because of the new data production but also because of their decoding and the wisdom that we gain. Except for the life changing, our societies also get influences from the arrival of IoT technology. More specific, Floris and Atzori (2015) believe that many IoT applications have invented in order to serve a vast amount of areas and transform them to “smart”, for example medical services, cities, transportation, business, security and environment. This technology will assist our society to activate its potentials communicating in a better way and using the information for commonweal. Finally one of the main areas that will be benefited is business.

According to Lopez Research (2013), IoT can assist businesses to increase the degree of effectiveness, gain knowledge and wisdom from “things” and finally boost the business activities in order to fulfil the customers’ needs. In particular, the application of IoT in business has as ultimate goal to achieve the enhancement of current procedures and cost saving. There are many departments inside a business that have applied IoT technology with the purpose of managing in more effective way a series of activities like CRM, the process of manufacture and sale and the overseeing of the product throughout its lifetime . As time go by we will be witnessing more and more departments within a business to adapt its operations in the new IoT technology which will lead to the creation of new business model, changing the existing form of it (Buchere and Uckelmann, 2011). Thus, IoT can completely change a firm and transform it in a “smart business”. From now and on, firms must take into consideration what consequences could have the adoption of IoT technology in its business model and align its strategic choices with that (Högnelid and Kalling, 2015). Finally, considering that the businesses will adopt IoT technologies they will be more competitive and according to Bucherer and Uckelmann they will ensure better perceptibility and command in its operations (2011).

1.1.2 E-commerce (EC)

The advent of information technologies and innovations in communication technologies signalled the dawn of electronic commerce. E-commerce is not a new concept but its impact was evident to us in the last decades. According to Wigand the term of e-commerce was established at the decade of 70s and up until now there are a lot of ways that are used in order to describe this concept with the more characteristic to be the e-business and e-market (1997). Throughout the years many researchers have investigated this concept giving many different definitions. Poong believes that the definitions that have been given till today depend on the background of every analyst (2006). However, all these perceptions for e-commerce can be included in one definition. Tian and Stewart described this concept as the form of any economic activity that is being done through cybernetics (2008). The more internet technologies flourish the more the EC notion will be set in. All these communication technologies in connection with the explosion of World Wide Web gave as the enlargement of electronic commerce which finally led us to a new digital era where people are just a click away from any commercial activity.

E-commerce can be divided into two types: B2B and B2C. When a firm performs a commercial activity with another business associate, through an electronic communication network then it's a Business to Business e-commerce. When companies have any kind of transactions with consumers then it's a Business to Consumer e-commerce. However, even if the B2C concept is more familiar to us, B2B concept is the one that rules in the ecommerce world bringing more earnings (Tian and Stewart, 2008). In 2017, more and more businesses tend to adopt e-commerce practices in order to be adapted in the new digital era and exploit the opportunities that offer. According to Gunasekaran, e-commerce enables businesses to achieve a higher level of financial effectiveness and produce more income (2002). The economic efficiency of businesses can be achieved taking into consideration the seven unique e-commerce features that Laudon and Traver proposed: "Ubiquity, global reach, universal standards, richness, interactivity, information density and personalization/communication". However, these 7 features do not only help businesses to increase their revenues but also customers to have access in the global market and complete their commercial transactions through the World Wide Web.

1.1.3 IoT & E-commerce

The joint of Internet of Things and E-commerce is becoming more of a reality. Both of them are dominant players in our technological world and they are going to reshape the traditional business and retail processes. The knowledge of this fast-moving world is a powerful advantage and the adaption of IoT in e-commerce can be characterized more than a revolution. It goes without saying that as the devices become more connected e-commerce will level up. Undoubtedly, there are numerous opportunities of this union and the possibilities for new e-commerce experiences will be endless. Initially, IoT can enhance e-business operations by tracking the customer's orders through RFID, balance the supply demand process and introduce new revenue streams by providing specialized e-services. In addition, the automation of smart devices can increase the customer satisfaction by the automated ordering of products that require consistent renewal. Moreover, connected products provide valuable data which can give useful insights for the customers' preferences and personalized information. In that way, retailers can influence customer decisions and customer's can receive customized experiences (Evans, 2017).

One of the biggest IoT innovations which is tightly connected to e-commerce is the Amazon Dash. At the touch of a button and with the help of wi-fi connection you can order specific products that need replenishment. The IoT technologies can also be used in order to boost the retail commerce. Smart shelves can be used in order to alert shop owners when the quantity of products runs out of stock and smart mirrors enhance the customer shopping experience by letting consumers virtually try on clothes. Finally, beacons and digital signage improve the retail process by sending targeted notifications on the mobiles phones and presenting targeted ads and prices to its customers when they visit their favourite store (Meola, 2016).

However things can go wrong with the IoT technology. Security is the major threat in such a technology and cyber criminals can exploit the vulnerable smart devices and have access to client's items. So, before an e-business decides to apply the IoT technology with the purpose of outstanding and attracting more customers, it must take a lot of things into consideration, in order to ensure the business and customers' safety.

1.2 SCOPE OF THE STUDY

The main objective of this research is to introduce the relation between Internet of Things and Electronic commerce and by extension with retail businesses. The overall objective is to analyze the role of Internet of Things in the optimization of business and to explore how IoT technology can have a positive impact on e-retailing as well as the negative side effect of IoT. To achieve the aims of the study, a systematic literature review is followed. The final results of the research are presented in two matrix tables which analyze the opportunities and the challenges of IoT in e-commerce and businesses. The limitation of the study is that IoT is not analyzed from the technical point of view because of the lack of knowledge in this field. Moreover, out of scope are industries that are not affiliated to the retailing. Adequate in depth study was not possible due to time limitation. However, a future work, with an analysis of a case study regarding IKEA Company is going to be implemented in order to test the results of the literature review

1.3 STRUCTURE

The dissertation is divided in seven chapters with each chapter discussing a specific topic. *First chapter* (Introduction) contains three subchapters that deal with the background of the research, the scope and the structure of this study. *Chapter two* (Research method) discusses the methodology that is followed in order to develop the systematic literature review which again is divided in four subchapters. Each subchapter can be compared to a step which leads on the fourth subchapter, the construction of a search string analysis. So, first subchapter presents the research questions. In the second subchapter is discussed the research strategy that is followed and the third subchapter gives an overview of study selection analyzing each database separately. *Chapter three*, with title Literature review, revolves around the influence of IoT in businesses, customers and electronic commerce. The subchapters deal with a different sub-topic. The first subchapter explore the booming of IoT , subchapter two to five discuss the positive impact of IoT on businesses, retailer and customer relationship, logistics and supply chain management and finally e-commerce. The last subchapter analyzes the potential challenges and risks that are looming with the advent of IoT. In *chapter four*, the literature review is schematically depicted. Two

matrix tables interpret the basic positive and negative aspects of IoT in e-commerce and retail businesses respectively, as an overall conclusion of the research. The next chapter, *chapter five*, analyzes the case of IKEA and it is constituted by three subchapters. The first subchapter provides useful information for IKEA Company, the second subchapter presents the interview with the sales manager of IKEA Thessaloniki and finally, the third subchapter depicts the questionnaire that was filled in from him and the results of it. Subsequently, on *chapter 6*, the results of the literature review, interview and questionnaire are examined. The *chapter seven* provides conclusion about the study. The last sections are the references of the scientific papers and articles that have been used.

2. RESEARCH METHOD

The following chapter discusses the methodology of the study. In subchapter one (2.1) are analyzed the research questions that were established. In subchapter two (2.2) is presented the research strategy and in subchapter three (2.3) is analyzed the process of study selection per database. In the final subchapter (2.4) is presented a search string and it is analyzed the way that was established.

2.1 Research Questions

To determine the expected affection of IoT in business and e-commerce we followed a meticulous review of literature.

In order to complete our systematic literature review we identified two research questions. The research questions help us to determine the content of our literature, choose the right studies for our survey and create a frame which will aid in supporting our case study and our conclusions. The goal of this study is to discover how IoT could positively or negatively affect the retail businesses and by extension the retail e-commerce. We therefore define the following research questions:

1. How Internet of Things could positively affect retail businesses and retail e-commerce?
2. Which are the major challenges for businesses and consumers?

2.2 Research Strategy

In order to actualize the first research method we concluded to follow a systematic literature review with the guidelines that were proposed by (Dyba et al., 2007) and (Kitchenham, 2004). In addition, in order to validate the results of the literature review we will conduct a qualitative case study in association to IKEA Company. The process that was followed the following:

1. Define search terms
2. Select sources (digital libraries) on which to perform search
3. Application of search terms on sources
4. Selection of primary studies by application of inclusion and exclusion criteria on search result

Keeping in mind the goal to cover the longest range of relevant publications, we distinguished and used four broadly utilized electronic libraries, specifically:

- IEEE
- Science Direct
- DBLP
- Harvard Business Review

After the analysis of the scientific papers and articles a qualitative case study was implemented which was supported by the person knowledge as I am working in this company, by an interview with the Sales Manager of Ikea Thessalonikis and with the filling in of questionnaire. The questionnaire was based on the final tables of the literature review.

2.3 Study Selection per Database

We began our search for papers in the above databases on August 2016 by using keywords in relation to the topic of the dissertation. An initial series of keywords were supplemented with the purpose of being the best answer of our research questions. The search query that is used in our search strategy was: “E-commerce and IoT”.

2.3.1 Science Direct

Applying in Science Direct the keyword “E-commerce and IoT” and searching in abstract, title and keyword, the database returned 5. The number of results was limited so we decided to apply the keyword in all fields. The results gave us 554 papers where most of them were completely irrelevant because they were focused on the technical and engineering side of the IoT and in different industry fields as well. Because of this irrelevance it was easy to distinguish and remove those entries whose title was not relevant to our review and as a result it remained 50 papers. Scanning the abstracts of them we get 20 papers and by scanning the full text only *7 papers were beneficial to our research.*

2.3.2 DBPL & IEEE

On DBLP database the keyword (E-commerce and IoT) returned only 4 results where 3 of them were duplicates and in one of them we did not have access. In IEEE database we used the keywords E-commerce and IoT and by applying the filter of “metadata only” we got 32 publications. This made our research more rigorous and in that way we ensured that the selected papers will be appropriate for our study. After scanning the titles, we selected 15 scientific papers and by scanning the abstracts the amount of potential studies was reduced to 11. In the end, reading the full text of them we selected *9 publication that were relevant to our review.*

2.3.3 Harvard Business Review

Finally, in Harvard business review electronic magazine we used the keyword “IoT and business” in order to cover a wide range of articles related not only to opportunities but also to challenges”. In this search the filter of digital and magazine article was applied. As a result, we had 57 hits but only 6 of them could be used

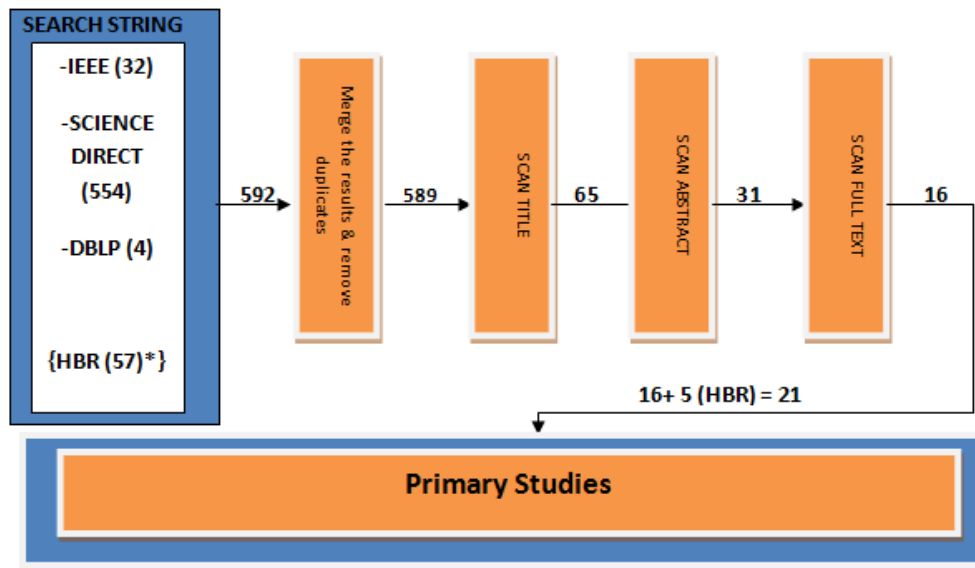
because of the limited access that we had. Scanning the titles we picked 6 articles but only 5 of them were finally useful for our study.

2.4 Search String Analysis

The procedure for selecting the primary studies for this review was conducted on October and November 2016. Therefore, this review mainly includes studies that were published before that month. In figure 1 is presented the search string that was applied in data sources.

- In the first step, after applying all the above limitations, the final number of publications was 592. The 5 articles from the HBR magazine are added up only in the total of the primary studies.
- In the second step, after the merger and the removal of duplicates (3) the number of publication is reduced 589.
- In the third step, scanning the titles, irrelevant publications was removed and this left 65 studies (The main cause of this deviation is the big number of irrelevant studies that we acquired from our research on the science direct database)
- In the fourth step, the scanning of the abstracts reduced the amount of potential primary studies to 31.
- In the last step, reading the full text of 31 studies we concluded to 16 studies that was the first final set of primary studies.
- The total number of primary studies is 21 taking into account the HBR articles.

Figure 1



3. LITERATURE REVIEW

The following chapter will discuss the beneficial aspects of IoT and the imminent challenges that may occur by the usage of this technology. In initial five subchapters opportunities of IoT in businesses, supply chain management and logistics, retailer customer relationship and e-commerce are explained (3.1-3.5). The final subchapter (3.6) presents the potential challenges and risks of the IoT operation.

3.1 The booming of IoT technology

In 21st century, technology is at its best. Much changed in our world due to technological advances in combination with internet explosion. Changes happen not only because of breakthroughs but also because of the vast majority of internet users. The daily usage of internet has an impact on new business opportunities and new information. We all produce data via the internet. We produce data even when we are walking. All these data can offer to our world valuable information and analyzing them could enhance our daily life.

Data is everywhere. However, the most valuable data are those that can be transferred through the web. Some years ago, this could happen only with the human intervention. Today, everything tends to be automated and nearly every product is connected through the internet. This has happened because of a huge breakthrough; The Internet of Things.

IoT converted many things into smart-things using advanced technology. In more detail, the last few years, internet of things moved toward our lives noiselessly on account of the accessibility of remote correspondence frameworks like RFID, WiFi, 4g etc. which have been progressively utilized as innovation driver for pivotal shrewd observing and control applications (Sicari et al.2014). There are a lot of terms that could describe the exact meaning of this technology and could help us to understand the whole idea in depth. According to Kshetri (2016), Internet of things is the system of physical “things”, from gadgets to people, implanted with hardware, programming and sensors which are given interesting identifiers and have the capacity to exchange information over the Web with insignificant or no human mediations. In other words, this technology allows physical objects to communicate and trade data with the purpose of fulfilling a common goal.

From socio economic point of view, IoT is bringing principal changes in supply chain, financial, ecological, human services, social and political domains in the creating scene. Thoroughly, the interconnected “things” can assist businesses to upgrade their operational productivity, exploit new monetary opportunities and efficiencies, increase their competitive edge and provide customized advices for their customers increasing their satisfaction (Kshetri, 2016). As the years go by, we will be witnessing an explosion of this technology with more and more products to be connected through the internet. According to Parasol’s research (2017), in the beginning of 20’s more than 200M devices were attached with the web and after thirteen years this number has expanded to around 10 billion. The more impressive in this research is the prediction of the format that IoT could take, which is the blending of systems and technologies, Machine to Machine (M2M), Person to Machine (P2M) and People to People (P2P) and will set the ground for a new term, Internet of Everything.

3.2 IoT & Businesses

Information communication technologies and internet have facilitated efficiency gains in all sectors of economy. Specifically, businesses have gained momentum from the adoption of ICT and in parallel with their transformation from offline to online they tend to reinvent the term of “business”. Internet communication technologies exhibit significant benefits to businesses and most of them have captured the benefits of this adoption. However, as we are moving forward, companies tend to change from conventional utilization of ICT to more advanced technology like Internet of Things.

As stated in the research of Singh & Singh (2015), until 2020 more than 30 billion appliances will be connected to the web and will be empowered by sensors. Businesses will take advantage of the interconnected devices by opening new doors to its operations and exploiting all the valuable data that they offer. Thoroughly, IoT devices imply an expanded effectiveness and the advantages of this can be tightly linked to the business. The above authors refer that through this technology businesses can exploit the data that is produced from the devices and have valuable insights through the analytics which can lead to high consumer satisfaction and optimization of business strategy. Besides, the smart gadgets can boost the productivity by ordering on its own and in this way save time and use with best possible way the assets. IoT can also enhance the inventory network and the ordering system by integrating them and giving real time perceptibility. Finally, one of the main benefits of IoT is the enhancement of safety and security which can be attained through recognition systems and smart sensing.

According to Abazi (2016), the latter technology introduce us a new kind of data use through which organizations gather information and utilize them to examine, measure and finish up for a particular issue which have an impact on their business. There is a great connection between IoT and customers. The more the SME’s are associated with this technology, the more chances they have to get information about customers their customers and increase their gratification. However, Abazi (2016) states that the main thing that leads organizations to have a competitive edge is the change for innovation.

Not all the businesses have embraced this new technological trend, giving a head start to other companies that have affiliated it in its operation. Those companies that have

achieved to be innovative and adaptable to the new digital changes have gained more revenues in comparison with companies that have faded into technological obsolescence. Finally, according to Abazi (2016) IoT will influence different business areas while around 25% are as of now utilizing the Internet of Things innovations and have a great impact mainly on manufacturing sector. However, one of the principle critical focuses for an organization is to expand its capacities with regards to information for internet of things.

The great revolution in businesses will be made by the smart connected products. According to Porter and Heppelmann (2015) these products will introduce us to a new value chain which will be totally different from what we knew up until now. Thus, organizations will reclassify their industries and re-examine almost all the business procedures and the definition of the word competition. IoT will enable products to be connected to the internet but more importantly these products will introduce us to a new IT era which will lead to a great financial and industrial worth.

It goes without saying that businesses will increase their competitive advantage by using smart connected products. The benefits of this usage will be evident by the growing of products' capacities. In detail, having smart products in an enterprise, automatically facilitates to "monitor", "control", "optimize" and self-govern them. In other words, the usage of them becomes easier; you can acquire a tremendous quantity of useful data, improve item operation, control them remotely, decrease the number of workers required and take information of their condition continuously. As a conclusion, the capabilities of smart products offer an improved profitability and growth to enterprises. However, they exhibit additional challenges; financial challenges, for instance, high expenses for creating the software infrastructure and high costs regarding the addition of a new product's capacity or new industry participants leading in a significant change in the market's functionality.

Iansiti & Lakhani (2014), referring to the GE case, indicate that businesses can totally change their business model due to the development of Internet of Things and the whole digitalization. The digitized conversion can affect the business model in two ways: on the creation of value to the clients and on the way they make profit from that. The connectivity of the objects can transform the businesses in many ways. The adaptation of digital sensors to the enterprises' products, their association to a cloud

software platform, the allocation of capital to new software applications and the enhancement of their analytics capacities could result in an increase in the company's revenues due to their products increased efficiency. Moreover, this transformation can lead to high competitiveness which can be evident on transactions processes, on the analysis and the gathering of data as well as on the communication among people, products and activities

IoT not only reshaped the businesses but also the customer relationships and services. Weichselbaum(2015) supports that our communication with the technological appliances will be altered because they tend to be formed more as interconnected services than as products. Thus, this will lead businesses to a modification of the service model, applying a customer oriented service strategy and empowering with expertise service representatives. The IoT wave requires a service which will not only be oriented in the functionality of the products but also in the whole buying process from the purchase to the installation and the usage of the product. As a result businesses will gain a competitive advantage among their adversaries and they will earn the trust of the customers.

3.3 IoT & Retailer – Customer Relationship

In the quickly advancing retail scene, consumers and retailers seem to create a stronger bond than the one that used to have. Up to date technology innovations, e-commerce, new business models as well as data mining and analytics have changed the shopping procedure and settled the ground for a new retailing period which will be advancing day to day (Grewal et al.2017). In the new retailing prospect, consumers and retailers have both benefits and there is a great interaction between them. Specifically, through new technologies and mainly electronic commerce, store owners can elicit information from their customers and adopt a more targeted strategy.

All these technologies can assist customers to make more advised shopping decisions. As reported by Grewal (2017), electronic innovation can empower buyers to get more focused and helpful shopping offers, acquire speedier administration and finally settle on more informed choices. On the other hand, thanks to innovatively made efficiencies, retailers achieve suitable buyers at bring down expenses. As a

conclusion, both parties are simultaneously benefited which at last improve the organization's' benefit.

All these technological advances have as a goal to amplify the customer behaviour and increase the customer satisfaction. Adopting electronic commerce techniques and combining them with analytics, a retail store can accelerate its performance and strengthen the customer engagement. If a retailer integrates these technologies with the up to date rising powers, it can achieve a high grade of competitiveness. One of these powers is the Internet of Things. In a “smart world”, IoT has a leading role allowing customers and retailers coexist harmoniously behind a veil of automation and smartness. In order to be more specific, Grewal (2017) conforms to the latter concept, indicating the “smart homes” which are equipped with savvy machines that can perceive the quantity of stocks and request a new order when it’s below normal level.

3.4 IoT, Logistics & Supply Chain Management

The booming of technology had a great influence in many business activities. Two of the major systems that have been influenced by the new technological era are the Supply chain management and logistics. A new form of traditional logistics has the tendency of being shaped and various operations are being expanded in order to enhance the degree of effectiveness of the material stream and reduce dispersion costs in several enterprises. E-commerce has contributed to the extension of logistics advertise and the improvement of logistics advancements (Yu et al.2016). Many retail companies have changed their logistic system in order to balance the development of their system and the sharp increment of electronic commerce. GuoMei Company decided to enhance its logistic system by building new conveyance stores and adopting new propelled procedures that are connected with these stores like RFID, ERP systems and data administrative systems. There is a great connection between customer loyalty and logistics performance and with the advent of e-commerce this connection tends to be even greater enforcing the enterprises to change their shape and find new ways to service their customers. According to Yu (2016), although the volume of B2C online commerce orders is suppressed, the shipment can be somewhat unpredictable so the extension prerequisite for the part of logistics is substantially bigger and the last client can be characterized as dependably high desired of the

“logistic performance level”. In other words, customers consider logistic execution as an imperative factor of e-business, particularly the last mile circulation. Finally, logistic performance can be reinforced by the adoption of new advancements. These new innovations can help to decode the results of the trade-offs and lead to better customer service. For example, there are three innovations that can support e-business: Internet of things, Big data analytics and cloud computing. These advancements can redesign and change e-business logistics. Furthermore, the amount of information that can be acquired from these technologies can convey rich learning which could be utilized for supporting decision making for any kind of enterprise (Yu et al. 2016).

Ruan and Shi (2016) created a scenario in which e-commerce and IoT can be combined in order to achieve fruit freshness and high performance of supply chain. It goes without saying that in traditional fresh fruit retailing there are multiple intermediaries till the fruits are been sold to the end customers. Moreover, due to the entangled procedure the retailers have high expenses and fresh fruits cost a lot. However, in recent times e-commerce and IoT have reshaped the whole procedure giving in fruit retailing a new image. The authors’ scenario is proposing a new e-retailing type, named as “farm to table” commerce, in which the long customary inventory network from farm to end client is significantly abbreviated. Farmers need to just enter the product supply data on the e-commerce platform and then customers submit requests to the web based business. At long last, the farmers confirm the clients’ requests and convey the fruits to the suitable end customers.

Through this procedure, farmers alleviate their loss controlling the quantities of the fruits that are picking and it is less demanding to track the supply chain by decreasing the number of intermediaries. Finally this specific scenario is amplified with the IoT related technologies. Ruan and Shi (2016) propose some modules in which technologies facilitate the successful supply chain and delivery of the product. For instance, farm module gather condition information utilizing temperature sensors or soil sensors and cameras. Next to this, tagging RFID sensors and sensing subsystems are utilized to fruits and vehicles modules accordingly in order the operations to be completed with the highest degree of correctness.

3.5 IoT & E-commerce

Two of the most fundamental technologies of the 21st century are the Internet of Things and Electronic commerce. These technologies interact with each other with a purpose of boosting their perspectives. On the one hand, IoT interact with e-commerce by improving and optimizing its applications while on the other hand e-commerce assists IoT to develop new technological strands.

Without any doubt, E-commerce is one of most profitable industries in the world. The operation of the industry is increasing accordingly with the huge number of the online-shoppers. In order to respond to the high demands of online users, electronic shops must evolve some of its operations and see new technological evolution prospects. One of these prospects is the IoT technology which can be perfectly combined with electronic and mobile commerce, improve the level of their operations and at the same time, allow the users to complete basic needs. In accordance to Guo (2017), IoT, in combination with cloud computing, has turned into a promoter of the advancement of Web-commerce. These three technologies is linked in together, strengthen in the same time and they are critical variables influencing the world's scientific and mechanical novelty. Taking into consideration that e-commerce is constituted by data, coordination and capital stream, IoT can positively impact on them. Initially, concerning logistics and supply chain journey, the usage of RFID technology and the incorporation of logistics data in the web-business, enables businesses to read and share information of the packages, check in real time the position of the products and examine critically the supply chain procedure. In this way the logistics process is amplified and the analysis of the products is more accurate. As far as the customers are concerned, they can achieve high satisfaction through the briefing of their orders. In addition, with the integration of IoT in e-commerce, customers acquire more valuable information about the products, from the starting point to the completed item, and the quality of them. This information helps the customer to decide easier whether to buy a product. Finally, telecom operators and manufacturers provide online sellers new technological choices (“bank quick payment services, mobile payment services”) and they can augment their payment operation.

Yu & Zhang (2017) accord with Guo (2017) that the main problems that IoT technology could solve in E-commerce industry are the Distribution problem, the

“asymmetric information” problem and additionally the problem with the counterfeit online-shops and products. In detail, they indicate that an IoT “anti-counterfeit system” can contribute to the issue of the fake products by applying in each product when they are produced a unique identifier and an electronic signature on the tag ensuring the confidentiality. In this way, a high degree of authentication can be confirmed and the customers can validate the quality of the products. Moreover, the distribution process can be accelerated by the real time monitoring since the businesses can keep up abnormal situations. In conclusion, as it is already mentioned, asymmetric information can decrease the number of customers. So with the tags in every product consumers can have information from the merchant, not necessarily from the owner of the electronic shop, and they can be aware for product origin. Desai et al. (2017) proposed an IoT real time system which can be implemented on supermarkets and kitchens and monitor the monthly grocery consumption. Through this system, food corporations can gather and dissect data related to consumption behaviors geographically, financially and ethnically and improve their services. In addition, this system can assist online grocery stores to make automatic the shopping procedure by taking into account the consumption edges that have been settled and the physical grocery stores to prevent long queues. Finally, customers can utilize the data of the system in order to better administrate their monthly grocery expenses and the level of consumption.

In the case of supermarket, Ju & Li (2011), analyze how TESCO, a chain supermarket has incorporated the IoT technology with the E-commerce and create its virtual store in a Korean subway. The passengers-customers could pick the desirable products by scanning with their smart phones the 2D barcodes and taking all the information that might be useful for them like prices, expiration dates, date of production etc. After completing the picking they could pay through their phones and TESCO would delivered their orders on the home. As a result, this innovation brought an increase on the number of online purchases, raise the number of registered consumers and augment the customer satisfaction by time-saving. In other words, the IoT technology linked the online and offline shopping reaping the benefits both customers and TESCO.

Undoubtedly, online commerce has been on the rise the last several years. Yet, there is still a great difficulty in adopting all the marketing techniques that is used by

physical stores leading the online stores to sell their products in a lower price or create discounts on multiple products. Yamamoto et al. (2016), indicate that the enhancement of the e-commerce store with the IoT technologies and systems could affect the price factor on buyers' purchase process and as a result earn more profits by increasing the prices. Next to this, the authors propose an automatic IoT based online shopping system which suggests products at a lowered price and make recommendations for best product deals. The system is using the customers' gaze in order to acquire data for their preferences on products and automatically propose the most valuable for them or place out of view the less appealing. This is system in combination with past sales data, provide the online store owners with important insights for the users' buying decisions and preferences increasing the traffic on the web-site and making the customers take accurate recommendations.

3.6 IoT Challenges & Risks

It is taken for granted that IoT introduces countless opportunities for innovation through the usage of the smart devices. However, in a world where sensors and devices are connected to a network exchanging data, IoT promises to bring new challenges and risks. There are many references when it comes to IoT problems. Singh & Singh (2015), put the challenges into six categories: privacy, security, insurance, common standards, technical, social and legal. As far as the data is concerned, smart devices gather information from users' preferences and transmit data through the web. The information can be used by the producer for his own benefit but basic consumer privacy and security privileges can be trespassed. Also the vast amount of data and numerous smart devices require an infrastructure that can handle the volume of them which means high technical specifications. In the case of industries and society, the absence of common standards and the uncontrolled ownership of IoT devices pose great risks for humans and businesses. Finally, smart health devices and smart cars produce data that will lead insurance companies to reshape their strategies and introduce new pricing categories that will pose financial challenges.

The negative aspects of IoT are also confirmed by Hiroyuki et al. (2016) who refer that the main challenges of IoT is the same as these that the previous authors mentioned. Namely, in the IoT security, privacy and administration of numerous data

and devices are the main concerns that are looming. In addition to these threats, sensitive wireless networks are opened in cyber attacks which can provoke a challenge in the control of devices and reciprocation of data. Finally, the quick growth of Internet of Things and the other technologies that support it, create new risks related to the trustworthiness of the data and the scalability which impacts on the capabilities of the smart devices (Kushwaha et al.2015).

The hardware challenges perspective of IoT is analyzed by Hossain et al. (2015) on their research. Thoroughly, in the study is presented a scenario where a compromised smart device is utilized by an assailant and inevitably he accesses another smart appliance because of the interconnection of them. As far as the hardware is concerned, one of the risks is the “computational and energy constraint”. Most of the smart objects are powered by batteries and utilize low-energy CPUs which means that algorithms which need quick computation is impossible to act in such power levels. Furthermore, smart objects are produced with low memory capacity and this creates a limitation in the security algorithms. In conclusion, the vulnerable packaging of the IoT devices and the positioning of them in distant areas, allows attackers to have malicious behaviours, accessing in them and altering their functions.

As it is already stated, IoT will not only transform products but also the businesses. Fitts (2014), based on his 10 years experience, refers that many companies can not address the issues of IoT business models and he classifies the challenges in six categories: Product management, financial, operational, sales, human resources and engineering. The revolution of the new IoT technology wave requires the establishment of a whole new business model, re-establishing the business’ operational rules and reconsidering the target audience and inventively decides how to take care of their needs. Thoroughly, financial teams frequently experience difficulties in changing their traditional financial procedures, forecasting and planning to suit the new IoT models. Next to this, companies that adopt IoT technologies meet a lot of operational challenges because of the new operational prerequisites. Having new contract relationships, changes in guarantees, return policies, stock necessities and complying with new laws and regulations may all be held responsible for disfunctionality in the company environment. Moreover, challenges may occur on sales where the customer classification and the asset allotment may totally change. Finally, companies meet major challenges when it comes to engineering and human

resources because of the need to evolve new skills and infrastructure, this being a tough task due to the uncertainty of what capacities are required.

A concern for the challenges that may hinder IoT technology supports Haque (2015). According to Haque, what differentiates IoT from prior technologies and automatically set up challenges to people and companies is the “many-to-many” and “cross-domain” part of its network. Haque, also states that there is a great concern about privacy. Customers may use IoT products but if the data they produce is traceable from other companies, they may be vulnerable to advertising. Moreover, data access privileges are also one of the major concerns taking into consideration that the IoT data produced is far more susceptible than the data on the web.

Some people feel comfortable sharing their data with the public domain, as there are benefits that can be acquired from the companies such as discounts or offers. On the contrary, some others give a different meaning on the exploitation of the private data that is to be used for company purposes.

4. OVERVIEW OF LITERATURE REVIEW

The following tables give an overview of the potential impacts of IoT in businesses and E-commerce. Thoroughly, in the first table, in the first two columns, the main chapters of the literature review and the names of the authors per chapter are presented respectively. The beneficial aspects of IoT in businesses are introduced in the first row of the table. In general, regarding the matrix table 1, it is clear that customer satisfaction and business optimization are the most mentioned aspects and the ones that can majorly affect the development of businesses from the IoT point of view. In the matrix table 2 we exhibit the negative aspects of the usage of IoT. The challenges are referred only in one chapter of the literature and thus the table was presented separately. The major risks looming regarding the adoption of IoT are security, privacy and technical and hardware challenges.

Matrix table 1: Opportunities

Literature Category	Authors	Data Collection	Customer Satisfaction	Supply Chain Logistics	Business Optimization	Advanced E-Commerce Services	Financial Benefits	Competitive Advantage	Security Awareness
<i>IoT booming</i>	(Ksherti, 2017)	✓	✓	✓	✓		✓	✓	
<i>IoT & Business</i>	(Singh & Singh, 2015)	✓	✓	✓	✓				✓
	(Abazi, 2016)	✓	✓				✓	✓	
	(Porter & Heppelman, 2015)	✓	✓		✓				
	(Iansiti & Lakhani, 2014)	✓			✓		✓	✓	
	(Weichselbaum, 2015)		✓		✓			✓	
<i>IoT retailer customer relationship</i>	(Grewal, Roggeveen & Nordfalt, 2017)	✓	✓						
<i>IoT & SCLM</i>	(Yu et al., 2016)	✓		✓	✓				
	(Ruan & Shi, 2016)			✓	✓	✓			
	(Guo et al., 2017)		✓	✓	✓	✓			✓
<i>IoT & Ecommerce</i>	(Yu & Zhang, 2017)			✓					✓
	(Desai et al., 2017)	✓	✓		✓	✓			
	(Ju & Li (2011)		✓		✓	✓	✓		
	(Yamamoto, Yukiko, et al, 2016)	✓	✓			✓	✓		

Matrixtable2:Challenges

Literature Category	Authors	Security / Privacy	Financial	Skills / HR	Technical / HW	Business & Product Operation
<i>IoT Challenges & Risks</i>	(Singh & Singh, 2015)	✓	✓		✓	
	(Sato et al., 2016)	✓				
	(Kushwaha, Singh & Singh, 2015)	✓			✓	✓
	(Hossain, Fotouhi & Hasan, 2015)	✓			✓	
	(Fitts, 2014)		✓	✓		✓
	(Haque, 2015)	✓				

5. CASE STUDY ANALYSIS

5.1 IKEA DESCRIPTION

IKEA is known for ready-to-assemble furniture and a big range of home accessories. The company stands out also for its low product prices and its modernist designs. The core idea for the IKEA designers is to make life easier and more meaningful for many people. Based on this idea, the company tries every year to adjust its actions to the new digitalized world and offer to its customer's new purchase experiences.

The digital transformation journey began some years ago, when IKEA witnessed its customers to visit the company's website more than the physical store. According to Willers (2017), on 2015, the number of people who visited the website was twice as much as the number of people who visited the physical store. That observation led the company to focus on new e-commerce strategies, promoting their catalogue through their online store and smart phone. After that the company started working with apps, web design tools and other innovative concepts, so as to offer new innovative experiences and increase the customer engagement.

In order to revolutionize the customer experience and boost the usage of e-commerce, the company started making big scale investments on internet technologies. Some of the most characteristic technologies that have been used are the augmented reality and the Internet of Things. On 2017 a new mobile app, "IKEA place", launched on US using AR technology. The app offers a virtual experience measuring the room dimension and automatically place furniture. In the case of IoT, IKEA developed their own IoT smart home appliances like the wireless smart lighting which will be compatible to Google Home, Amazon Alexa, Apple Homekit and it will be controlled through voice or through a mobile application. Its presence in the connected smart home is looking to expand in the near future launching the smart kitchen which will display recipes, charge devices and sense the ingredients that you miss.

Except from the development of smart IoT products, IKEA tends to implement IoT services also in its businesses. One of the IoT inventions that have been adopted in

some stores is the Shoppermotion which monitors the customer flow by embedding sensors in baskets and providing useful insights on how customers behave and their shopping habits. In addition, another example of the IoT concept is the usage of Beacons inside the store. With the purpose of enhancing customer experience and adding value in specific store areas, IKEA Austria added Beacons to its store sending targeted messaging notifications to visitors that have installed the IKEA family app.

5.2 Interview

The implementation of innovative technologies on IKEA doesn't happen simultaneously in all the stores. Taking as a case the IKEA Thessaloniki (GR) and by making an in depth interview with the Sales Manager we aim to make an analysis on the technologies that are used in the store, the relation of the store with e-commerce and IoT concepts as well as the problems that have been faced because of the outdated technology and what are the possible opportunities that may occur from the usage of smart technologies. The interview took place on October 2017 and a supplementary questionnaire was answered on December 2017.

The interview was an open discussion. In the beginning, useful information was given from the sales manager according to the product life cycle and the supply chain of IKEA Greece. The discussion brought new insights about the ordering process. Before some years the ordering process of products was done manually. Now, the ERP system orders on its own having predetermined parameters (forecasting, sales space etc.) and the human intervention exists only by maintaining the parameters or changing them accordingly. Regarding the ERP system, automation can be also evident on cash system which subtracts the quantity of the products the moment that the payment is due. On the receiving and warehousing procedure, there is no automation on tracking and saving the quantity of pallets and products. The procedure for the warehousing is done manually through an ERP system (Navision) and regarding the transportation of pallets in the selves, scanner technology is being used which transfers automatically the data to the system. However, if a product is already inside the store, the relocating procedure is totally different. In this case, "internal transportation forms" are filled in and then the changes are manually updated on the system.

Concerning the online store of IKEA, there are many structural problems on that, causing disorientation to online visitors and burdening the navigation, as pointed out by the sales manager. In detail, he refers that the displayed stock availability is based only on the picking location of the product and not on the total stock that exists in the store. Moreover, the website is refreshed every hour using the data from the ERP system. In other words, the misinformation of the customers is the basic problem that may occur through the website and most of the times it may be deterrent for online shoppers.

The next subject that was discussed was the main problems of the Company and possible technological advancements may be applied with the purpose of solving these problems. Initially, the sales manager indicates that inventory accuracy is one of the most important things for IKEA Greece because it is tightly connected with the customer satisfaction and the ERP ordering system. Without an accurate stock, the automated ordering system cannot proceed to an order. Aim of the store is to know at anytime the exact number of stock that exists and in which picking location it is placed. With the usage of scanners, incorrect picking location and number of stock may be provided and therefore the inventory is inaccurately updated. So, it is crucial that the adopted technology will display the accurate number of stock and update the system accordingly without the human intervention.

Another complication is the *customer guidance*. Many visitors face difficulties in navigating inside the store and finding a specific department. It is common for the customers to lose their way and move towards the exit over passing some of the departments. Because of that, the store is thinking to apply beacons on the doors which will send messages on customers' mobiles and will inform them for the shorter route they can follow in order to find the department they are searching for. The sales manager also brought up the issue of *theft* and the *long queues*. The long queues are impinging on the inventory accuracy, on the customer satisfaction and on thefts. The store is planning to implement a queue buster solution (mobile POS) which will eliminate the long queues and will accelerate the cashiers' work. In the end of the discussion sales manager pointed out that they are looking forward to implementing new innovative technologies with the purpose of increasing the customer satisfaction and gain their loyalty.

5.3 Questionnaire

- Grade the importance of the opportunities mentioned below for IKEA Company, on a scale from 1 to 10:

Opportunities	1	2	3	4	5	6	7	8	9	10
Data Collection			✓							
Customer Satisfaction									✓	
Supply Chain Logistics									✓	
Business Optimisation							✓			
Advanced E-Commerce Services										✓
Financial Benefits									✓	
Competitive Advantage										✓
Security Awareness										✓

- Grade the importance of the challenges mentioned below for IKEA Company, on a scale from 1 to 10:

Challenges	1	2	3	4	5	6	7	8	9	10
Security and Privacy					✓					
Financial								✓		
Skills / HR								✓		
Technical / HW										✓
Business and Product Operation										✓

1 - Not at all Important
10 - Extremely Important

The purpose of this questionnaire was to obtain the Sales Manager's opinion about the importance of the opportunities and the challenges of IoT and E-commerce on the Company. The respondent was informed in the beginning that the collected information would be used only for the purposes of the study.

Two sets of questionnaires were designed, one for the opportunities and one for the challenges. The questions were set out in clear format and supplemented clarification was given for the purpose of avoiding potential errors. The questions asked the participant to rate the importance of the opportunities and challenges in IKEA Company with 1 being "not at all important" and 10 being "extremely important".

The first question that was asked was to tick the number of importance in regards to opportunities. There were some interesting responses to this question. A grade exceeding seven was given to seven out of eight of the opportunities listed, while six of the remaining ones were rated between nine and ten. In detail, the respondent stated that Advanced E-commerce services, Competitive Advantage and Security Awareness are extremely important opportunities for the company. Customer satisfaction, Supply

Chain Logistics and Financial Benefits are also of high importance for IKEA, having been graded with nine. Finally, Business Optimization is of moderately importance ranked with seven and Data Collection is before the average, graded with three.

The second question concerned the importance of the challenges for IKEA. The respondent rated the Technical/ HW, Business and Product Operation with ten as extremely important challenges. Likewise, with a grade of eight was ranked the Financial and Skill/HR risks and with a grade of five, neither important nor unimportant, the Security and Privacy challenges.

6. DISCUSSION & RESULTS

Internet of Things has a substantial effect on e-commerce and retail businesses as seen in the main body of this dissertation. The potential impacts arising in this research are presented in two matrix tables, separated in opportunities and challenges respectively. The literature review findings provide a big number of opportunities through the usage of IoT, in respect to e-commerce and retail businesses, with customer satisfaction and business optimization being the major ones. Data collection is also classified as one of the major opportunities. Based on the scientific article findings, data collection is fairly one of the major opportunities as it can detect new trends, provide new insights, speed up the decision making and improve the efficiency of the business operation and electronic commerce. The increasing number of data that can be collected, can optimize (e)-businesses and finally increase customer satisfaction. Therefore it can be assumed that the major opportunities can be interrelated. Moreover, business efficiency can be also observed from the product point of view, meaning that IoT can prevent failures and increase the performance of the assets. Finally, the whole digitization of IoT can accelerate the workflows, automate the procedures, improve the final product/services and as a result achieve loyal customers. In other words, the results of the literature review give as an overall that IoT can affect and improve many aspects of a retail business and an online shop. Every aspect that was investigated, which came as a result of the literature review, can offer added value and the affection of one can have an impact on others. However, the literature research work resulted also in some drawbacks that can be rising from the adoption of IoT technology. All these benefits come with risks with the biggest one

being the security and privacy. The growth in the number of devices and the ubiquity of these devices can generate big challenges and lead to privacy loss and security issues. In addition, retail businesses and online stores can be comforted with technical and hardware challenges which can lead them to a total technological transformation of previous legacy systems.

The literature cited the main opportunities and challenges that IoT can induce in electronic and retail businesses. Matrix tables presented the main aspects that IoT can affect. In order to validate these results and amplify the research, a qualitative research method was conducting through an unstructured interview and a questionnaire with the assistance of IKEA Company and more specifically with the sales manager of IKEA Thessaloniki. The interview findings indicate that IKEA Thessaloniki faces serious problems regarding the inventory accuracy, e-commerce structure, customer guidance, long queues and the transformation of products inside the store. The respondent admits that errors may occur because of the usage of legacy systems and he appears to be positive in terms of his willingness to adapt IoT and advanced technologies in IKEA operations in order to enhance the workflows and customer satisfaction.

The findings of the questionnaire revealed that the sales manager perspective comes in contrast to the results of the literature review. In detail, he perceives the data collection as an insignificant benefit that can gain from the usage of IoT as well as business optimization which is of moderate importance. However, the main commonality between the literature and the questionnaire is the benefit of customer satisfaction. Moreover, based on the questionnaire results, Sales manager wants to seize the benefits of the security awareness, the competitive advantage and the advanced e-commerce services that are extremely important for the store based on his responses. Finally, the grading of the challenges importance comes also in contrast to the literature results in some points. Security awareness, the most referenced in the literature review, is of slight importance for IKEA Thessaloniki whereas technical/HW, business and product optimization are the biggest risks for the adoption of IoT.

In the above findings of this research, we have seen how IoT enables E-commerce and retail business to optimize its operations and force them into a new rapid growth. Numerous benefits can be acquired through the usage of that and through the combination in e-businesses. However, as IoT emerges, various challenges may occur mainly in the field of security. The benefits of IoT can be tightly linked, meaning that enhancements in some departments (e.g supply chain) entail other opportunities for retail and electronic business like financial benefits, business optimization, security awareness etc. The results of the case study can also support the perception that IoT could have an impact on retail business (IKEA) but the importance of the benefits and challenges can take a different meaning in each business based on their structure, strategies and goals. The opportunities and risks are not commonly spread among peoples' and businesses' perception because of the unknown strands of IoT. Thus, the deviation between the questionnaire and literature results can be imputed to the above reasons. The convergence on the customer satisfaction benefit can be easily understood taking into consideration that IKEA Thessaloniki is operating in an extremely competitive landscape and so the primary way to bear up is by competing on consumer satisfaction. So, it is necessary before an electronic or retail business adopts IoT in its operation to have a meticulous understanding of all the aspects of this technology, test its usage on their operations, consider potential risks, take appropriate measures and accordingly customize it on their business model and strategies.

7. CONCLUSION

Internet of Things idea is in an infant stage of development but is on the brink of blowing up. The great evolution of this technology will be evident in the connection of electronic commerce and in the adaptation for retail industries which will take them in new heights. Literature review and case studies findings confirm that IoT can contribute to the evolution of e-commerce technology and the reshaping of basic business operations. The major opportunities facing e-commerce and retail business is the improvement of customer satisfaction and the optimization of business processes. However, the benefits of IoT can be also noticeable as far as the data collection and the supply chain are concerned. The positive aspects that IoT can offer are tightly connected and the improvement of one aspect entails the improvement of the others.

In addition, references that deal with businesses can be interpreted as references for e-businesses and e-retailing due to the fact that the operations of businesses are interrelated to e-commerce. Literature findings are also highlighting the drawbacks of IoT pointing out the great challenge of security and privacy. However, based on the case study findings, the importance of the benefits and risks may have different meaning for each company. As a consequence of all the above, Internet of Things creates new opportunities and new challenges. It is commonly known that every opportunity comes with a risk. E-businesses that will handle the risks will be empowered to establish new limits and open new roads to future commerce experiences.

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