The Internet of Everything

Sustainable Advantages and Synergies in Clustered Retail

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Abstract

Title: The Internet of Everything: Sustainable Competitive Advantage in Clustered Retail

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The Internet of Everything (IoE) is a concept introduced by Cisco as the succeeding phase of the Internet of Things (IoT), consisting in *creating a network connection of objects, people, processes and data* (Cisco 2013). The novelty in this concept is that instead of referring *simply to the network connection of physical objects*, the IoE allows for connected 'things' to *send higher-level information back to machines, computers, and people for further evaluation and decision making* (Cisco 2013).

This dissertation aims to analyze the IoE concept's strategic impact in clustered retails. In order to contextualize the concept and, later, perform the correct analysis of the subject, a review of the technologies at its core and Cisco's perspective of IoE's realization in retail is made. Furthermore, making up the core of sustainable strategic advantage analysis, a review is made regarding Resource-based View (RBV) model according to Barney's framework and Customer Relationship Management (CRM) through Payne and Frow's framework.

In the subsequent chapter, the model of analysis is explained, incorporating the proposition that a smartphone application is, at a first phase, the optimal presentation layer for consumers. Empirical data collection is then performed through a questionnaire intended to give answer to the dissertation's research question of sustainable competitive advantage. The results, collected from a population sample of 120 respondents, ascertained the importance of the smartphone app and its most appealing features.

The strategic applicability of IoE in clustered retail is, then, confirmed through the application of both RBV and CRM models, which verify the system's potential to generate sustained competitive advantage, confirming the dissertation's main objective.

Resumo

Título: A *Internet of Everything*: Vantagens Competitivas Sustentáveis em Retalho Conglomerado.

Autor: Gustavo Ramos de Carvalho

A *Internet of Everything* (IoE) – ou a Internet de Tudo - é um conceito introduzido pela Cisco como fase sucessora da *Internet of Things* (IoT) – ou a Internet das Coisas -, caracterizada por *criar uma rede de conectiva de objectos, pessoas, processos e informação* (Cisco 2013). A novidade introduzida por este conceito é de que, em vez de fazer referência apenas à rede de conexões de objectos físicos, o IoE permite à rede de 'coisas' o *envio de informação de qualidade superior de volta para máquinas, computadores, e pessoas para avaliações e decisões adicionais* (Cisco 2013).

O objectivo desta dissertação assenta na análise do impacto estratégico do conceito de IoE em retalho conglomerado. De modo a contextualizar o conceito e, mais tarde, proceder à correcta análise do tópico, uma revisão da tecnologia basilar e da perspectiva da Cisco em relação à implementação da IoE em retalho é realizada. Ademais, constituindo a origem da análise à vantagem estratégica sustentável, uma revisão é feita a ambos os modelo de Resource-base View (RBV), de acordo com enquadramento de Barney, e Customer Relationship Management (CRM) – ou Gestão de Relacionamento com o Cliente -, através do enquadramento de Payne e Frow.

No capítulo subsequente, o modelo de análise é explicado, incluindo a proposição que uma aplicação para *smartphone* seria, numa primeira fase, o canal de ligação e apresentação ao consumidor ideal. A recolha de dados empíricos é, de seguida, executada através de um questionário, pretendendo dar resposta dar resposta à pergunta central da dissertação relativa à vantagem competitiva sustentável. Os resultados, recolhidos de uma amostra populacional de 120 inquiridos, determinaram a importância da aplicação para smartphones e quais as suas características mais apelativas.

A aplicabilidade estratégica da IoE em retalho conglomerado é, assim, confirmada através da aplicação de ambos os modelos de RBV e CRM, que certificam o potencial do sistema em gerar vantagem competitiva sustentável, confirmando assim o objectivo principal da dissertação.

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Abreviations

App – Application (Mobile Device)

CPU – Central Processing Unit

CRM – Customer Relationship Management

DIM – Data in Motion

EPC – Electronic Product Code

Et al. – *Et alii*

GPS – Global Positioning System

IEEE – Institute of Electrical and Electronics Engineers

IT – Information Technology

IoE – Internet of Everything

IoT – Internet of Things

MTC – Machine-Type-Communication

M2M – Machine-to-Machine

M2P – Machine-to-People

NFC – Near Field Communication

ONS – Object Naming Service

P2P – People-to-People

RFID – Radio-Frequency Identification

RBV – Resource-Based View

TC – Tacit Knowledge

VAS – Value-at-Stake

WSN – Wireless Sensor Network

1 - INTRODUCTION

1.1 Background

The 1950's witnessed *the success and beginning of a new era for retailers and customers alike* (HBC 2014). The tendency towards the concentration of retail steered *towards bigger and better centres* that *would eventually lead to the development of huge malls that draw tourists as well as shoppers* (HBC 2014).

Compared to single stores, retail agglomerations augment the shopping experience for their customers in many different ways (Teller & Reutterer 2008). Since consumers undertake shopping not only for *purchasing or procuring products or services that satisfy emerging wants and needs but also to seek other values of shopping such as recreation, socialisation, information, self gratification, etc.* (Sheth, Mittal, and Newman 1999 cited in Teller et al. 2008). For such reasons *retailers seek out and locate next to other retailers in one place or in a nearby geographical area* (Berman and Evans 2007; Guy 2007; Ingene 1984 cited in Teller et al. 2008).

In recent years, *rising levels of consumer awareness, affluence and mobility have helped create a more discerning consumer*, […] and *so have social trends such as increasingly individualistic lifestyles and the growth of non-traditional households* (Reimers and Clulow 2004). Whilst maintaining the *essence of managed and controlled retail environment* (Kim et al. 2005), these factors help explain the petering of retail centre's emphasis on size, while other "shopping values", as named by Babin, Darden, and Griffin (1994) or Jones, Reynolds, and Arnold (2006), rose to play a more relevant part in consumer's decisions.

According to Darley (Darley 2010), with an *increasing proportion of the world's consumers spending more of their time interacting with and buying from the Internet*, […] *traditional models of consumer behavior may not reflect the new realities of a changing consumption environment*.

Nowadays, there is the need for traditional retails to offer a better shopping experience to consumers. The development of "smart environments", *a multi-user, multi-device, dynamic interaction environment that enhances a physical space by virtual services*, enables *the*

participants to interact with each other and other objects in a P2P way in the smart space (Wang et al. 2004). *Smart connectivity with existing networks and context-aware computation using network resources is an indispensable part of Internet of Things* (Gubbi et al. 2012) and a fundamental pillar for smart environments.

Just in 2011, the number of interconnected devices on the planet overtake the actual number of people. Currently there are 9 billion interconnected devices and it is expected to reach 24 billion devices by 2020 (Gubbi et al. 2013). The revenue potential that such a widespread of interconnectivity represents *amounts to $1.3 trillion revenue opportunities for mobile network operators alone spanning vertical segments such as health, automotive, utilities and consumer electronics* (Gubbi et al. 2013).

1.2 Aims and Scope

> *The Internet of Everything is the latest market transition that is allowing us to connect the 99% of the unconnected. That is driven by the Moore's Law and the continue reduction in cost of computing and sensors.*

<div align="right">Jim Grubb 2013[1]</div>

The emergence of the Internet and a more discerning consumer has created the need for traditional retail centres to provide a more convenient shopping environment (Reimers and Clulow 2004). As stated by Zheng (Zheng et al. 2011), t*he Internet has experienced a tremendous growth in the past three decades, evolving from a network of a few hundred hosts to a platform linking billions of "things" globally.*

With the technology breakthroughs witnessed in internet-related services in the first decade of the 21st century, leading to the rise of social media and user-oriented content, the Internet morphed from a static on-line platform provider to an interactive provider. *The Internet revolution led to the interconnection between people at an unprecedented scale and pace* (Gubbi et al. 2013).

As soon as the Internet was developed, there was a desire to connect more "things" to it)

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[1] Jim Grubb – Cisco's Chief Demonstration Officer

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(Dave Evans, 2012). The development of Wireless Sensor Networks and the *proliferation of these devices in a communicating–actuating network creates the Internet of Things (IoT), wherein sensors and actuators blend seamlessly with the environment around us, and the information is shared across platforms* (Gubbi et al. 2012). Internet of Everything, thus, has a strict relation with ambient intelligence, a concept which according to Miorandi (et al. 2012) *builds upon the ubiquitous computing concept, loosely defined as the embedding of computational devices into the environment* […] *providing therefore the distributed infrastructure necessary to enable the development of Ambient Intelligence applications*.

Nevertheless, according to Cisco (Cisco IBSG 2012), the Internet of Things is limited to *the networked connection of physical objects*. It is, therefore, a stepping-stone for the *network of networks where billions or even trillions of connections create unprecedented opportunities* (Dave Evans, 2012), which is the Internet of Everything

Introduced in 2012 by Cisco, the term "Internet of Everything", *brings together people (humans), process (manages the way people, data, and things work together), data (rich information), and things (inanimate objects and devices) to make networked connections more relevant and valuable than ever before—turning information into actions that create new capabilities, richer experiences, and unprecedented economic opportunity for businesses, individuals, and countries*[2].

The incorporation of people, process and data within the network connections allow for each of these factors to gain a more relevant role and influence in information harvest and process and the interactions with the physical world. *Langrehr speculated that* […] *stimuli acting in a natural retail/mall arena would have the positive impact of facilitating shopping and spending behaviour* (Kim et al. 2005). In light of society's need for permanent logon and, according to Wakefield and Baker (1998) findings of *consumers who rated the mall environment to be exciting tended to stay longer, have higher repatronage intentions, and were less likely to go outshopping*, there is a clear potential for the creation of more dynamic environments in agglomerated retail.

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[2] http://blogs.cisco.com/ioe/answering-the-two-most-asked-questions-about-the-internet-of-everything/

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From the perspective of mall management, a mall that can generate more traffic is one that can demand higher lease price from its store tenants because more mall traffic usually translates into more store traffic and sales (Chebat et. al 2010 cited in Yadav et al. 2012).

RQ: Can the Internet of Everything have the potential to generate sustainable competitive advantage for retail companies in a clustered environment?

1.3 Methodology

This dissertation aims to shine a light on the potential benefits to both companies operating in retail and consumers when using the Internet of Everything on centric-managed retail clusters.

The methodology is based on the research question this dissertation is investigating, with support from a survey conducted by Cisco to consumers in USA - Cisco Consulting Digital Shopping Behavior 2014 – as the main guideline for the topics of research. With Cisco's main findings of the survey acting as guidelines, the hypotheses are drawn considering the concrete case of centric-managed retail clusters.

Firstly, it is essential to understand if, as Cisco (Cisco IoE At-a-Glance 2013) claims, customers demand for *new types of interaction while shopping*. Cisco claims that the *shoppers of tomorrow* […] *will increasingly prefer a store that provides an Internet-like experience* as well as *speed, convenience, information access, and product assortment* (Cisco Consulting Digital Shopping Behavior 2014). Thus, regarding shoppers attitudes, *data usage and experience personalization* are one of Cisco's main factors of concern in the upper mentioned study.

Furthermore, the same paper reinforces the idea that the *use of personal digital devices throughout the shopping journey* is one of the main transitions to consider in retail. As such, shopping journeys are *digitally influenced* by the presence of personal devices (e.g.

smartphones) with Internet capabilities, having access to a *network that delivers abundant bandwidth and low latency* (Cisco Consulting Digital Shopping Behavior 2014).

Finally, the issue of data harvesting and treatment is addressed, with special concern with trust and transparency between consumers and retailers. In this topic, Cisco suggests that *shopper suspicion of retailers' use of data is a major barrier to realizing value* and, as such, it is essential that *information* is *captured and used in permissible way*, applied in *non-intrusively*, be *secure and safe*, and *create tangible value for shoppers* (Cisco Consulting Digital Shopping Behavior 2014). These factors imply that consumers ought to be an active module of the IoE system that not only receive but, more importantly, provide information to the entire system.

In order to assess the potential importance for consumers of incorporating IoE in clustered retail and, consequently, the potential value for retailers in *ways to increase profitability, improve customer engagement, and move ahead of the competition* (Cisco Consulting Digital Shopping Behavior 2014), the collection of the necessary empirical data is needed.

Throughout the validation of the hypothesis a complementary analysis of the IoE's implicit characteristics' strategic competitiveness is given in order to assess the potential competitive advantage of the implementation of such technology in the conglomerate retail. Such an analysis will focus on Barney's framework of the Resource-based view model complemented by the Dynamic Capabilities model.

1.4 Dissertation Structure

The current dissertation is divided into three main chapters, first the Literary Review followed by the Survey Analysis and finally the Conclusion.

In the following chapter, an overall review of the main topics concerning the topics presented in the dissertation is made. The main topics in analysis regard the Internet of Everything, which is the main topic in hand, and what is considered to be the pillar stone of such concept – the Internet of Things. In the same chapter a review of the literature regarding

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both Customer Relationship Management and Resource-based view is given as basilar frameworks to answer this dissertation's research question. In the former, Payne and Frow's framework is used to better understand the application of the IoE concept in a highly customer relation sector, while on the former, Barney's framework is chosen as direct linkage towards sustainable competitive advantage. In addition, the concept of Tacit Knowledge is also reviewed as a complementary means to understand the importance of information in data-centric IoE's system.

In the Survey Analysis chapter the main hypothesis considered to be the most influential in the application of IoE to clustered retail are identified. The validity and significance of such hypothesis will then be tested through a survey made on which the empirical results will help to pinpoint the main attractive and competitive factors that the IoE concept may present when applied to clustered retail.

Lastly, the Conclusion chapter will be used to systematize the results of the survey and the application to the models presented in the antecedent chapters.

2 – LITERATURE REVIEW

The aim of this chapter is to provide the necessary theoretical foundations to better comprehend the analysis enveloping the research question.

In the outset of this chapter, a review of the most relevant literature available is conducted, establishing the bridge between the existent Internet of Things and the Cisco's novel vision of the Internet of Everything. Framework and technology will have a primary role in giving sustenance to both concepts, whereas the introduction of the components of people and processes, according to Cisco's view, will reinforce the disparity between concepts.

On the second part of the chapter the theoretical outline is given, with the presentation of the strategic advantage perspective of companies and the customer-centric view of such companies. In the former, an overview of the Resource-based View will be presented, having Barney and Peteraf's frameworks as core, with the inclusion of the Dynamic Capabilities view as an extension of concept. In the later, a brief presentation of Customer Relationship Management, through Payne and Frow's framework, is given to further solidify the theoretical foundation of the dissertation.

2.1 Machine-to-Machine

Nowadays, machine-to-machine (M2M) communication is being considered as the most promising solution for revolutionizing the future intelligent pervasive applications

<div align="right">Kim and Youm 2013</div>

Machine-to-Machine communications are *born from original telemetry technology with the intrinsic features of automatic data transmissions and measurement from remote sources typically by cable or rádio* (Chen et al. 2012). These types of communication are described by Chang (Chang et al. 2011) as *a form of data transfer that lets machines communicate directly with one another with little or no human interaction or intervention*.

The same authors assert that given the widespread availability of wireless technologies and the declining prices of modules, the M2M industry is becoming more prominent. Furthermore, according to Weyrich (Weyrich et al. 2014), *networks can be both wired and wireless, but wireless M2M protocols are increasingly used because they're convenient to install, use, maintain, and enhance*.

It is *thanks to the capabilities of M2M architectures, devices and the network itself will be able to enrich the environment of application with additional data that may be useful for improving performance and saving costs* (White Paper: Next Generation Platform Innovation In M2M – cited in Castro et al. 2012), as well as *benefit the quality of life* (Chen et al. 2012). This view is supported by Castro (Castro et al. 2012), which further adds that M2M *solutions work as a huge collaborative and interoperable network for the transmission of the data gathered by the end-terminals, such as sensors and smart objects, to the backend, such as servers, where are running applications such as data processing solutions*.

In terms of wireless technologies for M2M communication, see Appendixes 1 and 2.

2.2 Internet of Things

When wireless is perfectly applied the whole earth will be converted into a huge brain, which in fact it is, all things being particles of a real and rhythmic whole […] and the instruments through which we shall be able to do this will be amazingly simple compared with our present telephone. A man will be able to carry one in his vest pocket.

Nikolas Tesla 1926

Internet of Things (IoT) is a concept *first coined by Kevin Ashton in 1999 in the context of supply chain management* (Gubbi et al. 2013) at a conference for P&G (Ashton 2009). Whilst in the last decade the *definition has been more inclusive covering wide range of applications like healthcare, utilities, transport […]* (Gubbi et al. 2013), the *concept of "Things" in IoT has been generalized to ordinary objects at present, and the interconnection technology is also extended to all networking technologies* (Ma 2011).

The European Research Cluster on the Internet of Things (Vermesan et al. 2012) defines

the IoT as the *global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on, existing and evolving, interoperable information and communication technologies*.

The developments the IoT underwent in the last decade were *fuelled by the prevalence of devices enabled by open wireless technology such as Bluetooth, radio frequency identification (RFID), Wi-Fi, and telephonic data services as well as embedded sensor and actuator nodes* (Gubbi et al. 2013), further explained in subsequent chapters.

As stated by Xia (Xia et al. 2012), ubiquity in the context of Internet is one of the main consequences of the IoT. Such outcome is explained by the integration of objects and their consequential interaction via embedded systems, which will lead to *highly distributed network of devices communicating with human beings as well as other devices*.

Ubiquity is not only a outcome but a fundamental pillar of the IoT, as *developments in ubiquitous computing and networking, with integral communication capability, provides the key technological foundation for an Internet of Things infrastructure and its integration within the existing and evolving Internet* (Vermesan et al. 2012).

2.2.1 Technologies

The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it.

Mark Weiser 1991

Currently, the related technologies about IoT have become the international focus, and they are widely considered as one of the most important infrastructures for promoting economy development and technology innovation (Ma et al. 2011).

The existence and expansion of the IoT was only possible by the *useful deployment of multiple technologies that covers the domain of hardware, software and extremely robust applications* (Bandyopadhya & Sen 2011). The concept evolved in a *wider sense, referring*

now to a ubiquitous object society combining RFID, sensor networks and pervasive computing technologies (Gama et al. 2011).

Gubbi (Gubbi et al. 2013) suggest a tripartite division of the elements in IOT into the following categories:

- **Hardware** – the physical objects that collect data from the environment and transfer it throughout devices (sensors, actuators and embedded communication hardware);
- **Middleware** – data aggregation, cloud computing (storage), event management and data processing (software tools);
- **Presentation** – bridge of contact between the users and the collected and processed data.

2.2.1.1 Hardware

The first layer of technology – hardware – *represent all different facets of the ubiquitous computing vision, where sensor-enabled devices become integrated in the environment and provide context-aware services to the users* (Marin-Perianu et al. 2008 – cited in Floerkemeir et al. 2008). *Under the architecture of IoT, M2M mainly concentrates machine-type-communication (MTC) that means no human intervention whilst devices are communicating end-to-end, and emphasizes the practical applications* (Chen et al. 2012).

Some of the most important technologies associated are: RFID, NFC, Bluetooth, GPS, Code Bar and Sensor networks (González et al. 2008). Nevertheless, Atzori (et al. 2010) proposed a more narrowed spectrum of technologies to be the most relevant ones in the context of hardware layer: RFID, Wireless Sensor Networks and RFID Sensor Networks.

In the first case, RFID systems *are composed of one or more reader(s) and several RFID tags […], characterized by a unique identifier and applied to objects* (Atzori et al. 2010). *RFID systems comprise tags that are attached to products, interrogators that read and write data on tags, and back-end systems that store and share data* (Ilic et al. 2008). According to Nagel, Roidl and Follert (2008), *in the past years, the development of the Radio Frequency Identification (RFID) technology has opened up the possibility to eliminate the central data warehouses in logistic systems*.

Sensor Networks consist of smart sensing nodes with embedded CPUs, low power radios

and sensors which are used to monitor environmental conditions such as temperature, pressure, humidity, vibration and energy consumption (Wei, Lee and Murray 2012 - cited in Piyare et al. 2013). After harvesting data, *sensor data is shared among sensor nodes and sent to a distributed or centralized system for analytics* (Gubbi et al. 2013). Moreover, Atzori (et al. 2010) considers that *most of commercial wireless sensor network solutions are based on the IEEE 802.15.4 standard, which defines the physical and MAC layers for low-power, low bit rate communications in wireless personal area networks (WPAN).*

Furness (cited in Vermesan et al. 2010) states that *objects* […] *may also be grouped or networked to fulfill particular application needs* […], considering that such *devices with additional functionality, in the form of sensory, location, global positioning and local communications capabilities, may be used to achieve network structures as well as single-device operation.*

Finally, according to Atzori (et al. 2012), *a smart object (e.g., a smartphone) may implement the functionality of the three layers so that the gateway is not needed, but for some communication facilities targeted to maintain the Internet connectivity of the object* […], *a gateway for ubiquitous network connectivity.*

Elkhodr (et al. 2012) corroborates such a view by stating that *mobile applications such as those which run on the iPhones or the Android enabled devices give mobile users the ability to access remote data anytime and anywhere, and to improve availability of services.* This fact acquires special significance due to the growth of the smartphone category on the mobile device market, presented in **Appendix 3**.

2.2.1.2 Middleware

According to Gama (et al. 2011), *the role of the middleware is to track not only RFID-tagged objects but also other objects that can provide relevant information.* Therefore, such a layer *acts as an interface between the hardware layer at the bottom and the application layer at the top* (Bandyopadhyay and Sen 2011).

M*iddleware is gaining more and more importance in the last years due to its major role*

in simplifying the development of new services and the integration of legacy technologies into new ones (Atzori et al. 2010). Bandyopadhyay and Sen (2011) accredit its importance to the role it has in *critical functions such as device management and information management and also* by taking *care of issues like data filtering, data aggregation, semantic analysis, access control, information discovery such as EPC (Electronic Product Code) information service and ONS (Object Naming Service)*.

Gubbi (et al. 2013) corroborates the importance of the different aspects of middleware in regards to the *ability to uniquely identify 'Things' […], persistent network functioning to channel the data traffic ubiquitously* and data storage and analytics.

Given the *creation of an unprecedented amount of data […] storage, ownership and expiry of data become critical issues* (Gubbi et al. 2013). The same authors believe that Cloud based solutions can become the *centralized infrastructure to support storage and analytics required*. The potential of Cloud computing is also recognized by Vermesan (et al. 2013) when stating that IoT's *transformation is concomitant with the emergence of cloud computing capabilities and the transition of the Internet towards IPv6 with an almost unlimited addressing capacity*.

2.3 Internet of Everything

As stated earlier, the main addition that IoE introduces in the IoT concept is the *combined network connection of people, process, data and things* (Cisco 2013). According to Cisco, this new concept has the advantage that *the information extracted from these networked connections creates new capabilities, richer experiences, and incredible economic opportunity*.

Moreover, Cisco claims that in *comparison, the "Internet of Things" (IoT) refers simply to the networked connection of physical objects*, thus not including the people and process factors. *IoT is a single technology transition, while IoE comprises many technology transitions*, having IoT at its core.

According to Dave Evans (Dave Evans – Cisco IBSG 2012), *rather than just reporting raw data, connected things will soon send higher-level information back to machines,*

computers, and people for further evaluation and decision making. Cisco estimates that by incorporating such changes, a *$14.4 trillion of value (net profit) will be "at stake" over the next decade, driven by "connecting the unconnected" (people-to-people, people-to-machines, machines-to-machines, etc.) via the Internet of Everything* (Cisco White Paper 2013). See **Appendix 1** and **2** for more information

It is, thus, vital to refer that even though *technology is an essential foundation for realizing IoE profits, it is not sufficient on its own* […], with the *quality of technology infrastructure and tools* accounting to *just 20 percent of the variation in value realized* in Cisco's Model (Cisco White Paper 2013).

2.3.1 Data and Processes

The importance of data management in IOT and, consequently, IoE is perceptible in the European Research Cluster Book on the Internet of Things (Vermesan et al. 2012), in which is asserted that it is *a crucial aspect in the Internet of Things. When considering a world of objects interconnected and constantly exchanging all types of information, the volume of the generated data and the processes involved in the handling of those data become critical.*

As such, Cisco (White Paper 2013) believes that data achieved an ubiquitous level in which it stands no longer as a relevant differentiator factor for companies' competitiveness. Only by unlocking *IoE data to help predict customer behavior, asset performance, and business outcomes using network-based and real-time streaming analytic* can companies gain the necessary competitive insight (Cisco IoE 2013).

According to Jim Grubb (Chief Demonstration Officer of Cisco), *most of the new data being generated today is real-time data that fits into a broad category called Data in Motion* (Appendix 4). *The real challenge for data-driven organizations is how to manage and extract value from this constant stream of information, and turn it to competitive advantage.*

Furthermore, Cisco (White Paper 2013) appoints complementary key process's components regarding information-management and measurement practices that are is the best fit in predicting changes in value realized. Regarding information-management, the

central aspect is *using data strategically to achieve company objectives* […], being that *it is not data itself, but how it is managed and used, that determines success in realizing IoE value* (Cisco White Paper 2013). Whereas, in the measurement practices the essential factor is *tracking progress towards company goals or targets* […], *with companies that measure performance gaining a larger share of IoE Value at Stake than competitors that are less "fact-based" in their decision-making processes.*

Moreover, and as mentioned earlier, Cloud Computing may prove a fundamental tool in IoT and, consequently, IoE frameworks. As such, cloud storage and management of data is also a concept of high relevance since *the key idea is that all edge devices and intranet of things will send their information periodically to an application platform located in the cloud* (Roman et al. 2013).

2.3.2 People and Social Networks

The last fundamental pillar of IoE is a bipartite perspective of people, comprising the internal factor of employee productivity and, on the other hand, the external factors of customer experience.

In terms of relations and management of employees, the main focus of IoE is simultaneously *enabling all employees to contribute and collaborate effectively* and *managing a company's workforce and developing needed talent*. Whereas the second factor is the incorporation of people according to a consumer-centered perspective, in which the driver is aimed at *satisfying customer demand for new ways of interaction* (Cisco White Paper 2013).

The consumer-centered perspective gains a more relevant meaning in retail, with the *second-largest Value at Stake[3] opportunity for retailers* coming *from P2P connections*, in which *retailers can provide on-demand sales advice, and scale expert sales staff, by*

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[3] Cisco defines Value at Stake as *the potential bottom-line value (higher revenues and lower costs) that can be created or will migrate among companies and industries based on their ability to harness the IoE* (Cisco 2013)

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providing video collaboration in their stores (Cisco White Paper 2013).

Furthermore, Vermesan (et al. 2013) predicted that *user engagement in IoT awareness could build on the Social Network paradigm, where the users interact with the real world entities of interest via the social network paradigm.* Such a notion would suggest that the *integration with social networks* could *be seen as another bundle of information streams* (Vermesan et al. 2013). This expectation is corroborated with the analyst firm Gartner in 2012 report "The Internet of Everything Innovation Will Transform Business" in which it is envisioned that *people themselves will become nodes on the Internet, with both static information and a constantly emitting activity system*[4].

2.4 Cisco's Vision of IoE in Retail

It is up to all of us to get involved to ensure that the Internet, as IoE unfolds, continues to be a powerful force for improving people's lives.

Jim Grubb (Chief Demonstration Officer of Cisco)

Having mentioned the different characteristics and technologies used in both IoT and IoE concepts, it is important to understand Cisco's vision of IoE in retail.

Regarding the technology applicability of IoE in the retail industry, Cisco believes that *companies should have a sense of urgency about aligning their strategies and practices to leverage IoE* since in retail environment *barriers to market entry are falling, customers are demanding new ways of interacting, and margins are compressing* (Cisco IoE At-a-Glance 2013).

The company structures the connections between components of the IoE system into

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[4] http://blogs.cisco.com/ioe/thanks-to-ioe-the-next-decade-looks-positively-nutty/

three categories: Machine-to-Machine (M2M), Machine-to-People (M2P) and People-to-People (P2P).

Type of connection	M2M	M2P	P2P
Share of VAS	21.5%	47.7%	30.8%
Top use cases	• Innovative payments • Supply-chain efficiency	• Connected marketing and advertising • Connected vending	• Next-gen workers • Virtual attendants
IoE enablers: current strengths	• Remote inventory tracking	• Viewing KPIs on information dashboards	• Unified communications
IoE enablers: largest opportunities	• Mobile payments • Remote customer monitoring	• Predictive analytics • Data visualization	• BYOD • Rich-media customer interactions

Table 1: IoE Strenghts and Opportunities (Cisco White Paper 2013)

The application of IoE in retail envisioned by Cisco aimed to drive business benefits in terms of a trifecta of factors - operational efficiency, customer service and profitability - is presented in the table above.

Machine-to-Machine

In spite of its importance as a component of IoE applied to retail, M2M connection is the factor with least Value at Stake with an estimated 21,5%. As stated earlier in the hardware section, the main purpose of M2M is to collect data, mainly through sensors, from the environment and specific parts components of the retail area that directly affect consumers. According to Cisco, the benefits of these connections are expressed in inventory visibility improvement, ordering processes automation, energy consumption optimization and a higher degree of flexibility regarding payment options.

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Machine-to-People

Machine-to-People connections are envisioned as the most significant aspect of IoE in retail, with an estimated Value at Stake of 47,7% on the industry. *By improving their M2P capacities with predictive analytics, retailers could realize more value from connected marketing and advertising, the second-largest area of IoE Value at Stake, by improving the chances that personalized offers and ads will resonate with customers* (Cisco White Paper 2013).

The company foretells that M2P connections will grant companies the possibility to acquire behavioral insight of consumers and offer personal Social/Local/Mobile content. Furthermore, omnichannel features are also included through *in-aisle interactive displays and digital signage to help shoppers explore products, driving upsell/cross-sell* (Cisco IoE At-a-Glance 2013).

People-to-People

Finally, P2P connection has a bipartite application of interactions between employees of the retail company and between employees and customers.

Similarly to M2P connection, P2P has an intrinsic strong customer relationship component depicted by social media, immersive video and the shopper's own smartphone. Such benefits of pioneering IoE into the relation between retailers and consumers are depicted by scenarios in which it is possible to *maximize upsell and cross-sell* and increase *conversion rates by answering critical questions while shoppers are in the store and considering a purchase*, and the possibility *shoppers can receive expert advice regardless of the size and location of the store* (Cisco White Paper 2013).

For more information see **Appendixes 5 and 6**.

2.5 Theoretical Strategy Frameworks

The purpose of the following section is to lay the theoretical portrayal of the existing literature on the Customer Relationship Management (CRM) and Resource-Based View (RBV) theories. The combination of both theories will comprise the corner stone of the strategic reasoning behind the Research Question.

The section will commence with a review of the Customer Relationship Management (CRM), mainly through Payne and Frow's conceptual framework, in which the processes to effective develop an effective CRM strategy are presented. is

To further enrich the strategic conceptualization of this dissertation, the introduction of the Resource-Based View (RBV) theory concept is made through Barney's framework. The full benefits of incorporating this view arise when combined with the concept of Tacit Knowledge. This combination of concepts will consolidate RBV's implicit VRIN concept, increasing its relevance to prove IoE's sustainable competitive advantage.

2.5.1 Customer Relationship Management

CRM attempts to provide a strategic bridge between information technology and marketing strategies aimed at building long-term relationships and profitability.

Rashi Glazer 1997 (cited in Payne & Frow 2005)

According to Payne and Frow (2005), the concept of Customer Relationship Management (CRM) *emerged in the information technology (IT) vendor community and practitioner community in the mid-1990s* […] and *is often used to describe technology-based customer solutions*.

Contrasting with Payne and Frow's emphasis on the essential role technology plays in CRM, Ricardo Chalmeta (Chalmeta 2005) gives a more comprehensive definition of customer relationship management: *a customer-focused business strategy that dynamically integrates sales, marketing and customer care service in order to create and add value for the company and its customers*.

Regardless of the width of the definition, CRM is expressed in the fact that *retail companies seek to maximize relationships with customers* […], with *organizational systems and processes, especially those related to data and information management, changing to respond to this shift toward ''customer-centric'' retailing* (Anderson et al. 2007).

This centric view of the consumer, with the *evolution and integration of marketing ideas and newly available data, technologies, and organizational forms, concentrates on establishing, developing, and maintaining successful long-term relationships with well-chosen customers* (Boulding et al. 2005; Morgan and Hunt 1994; Reinartz et al. 2004 – cited in Ernst et al. 2011).

In the following pages, Payne & Frow's conceptual framework for CRM application is presented.

2.5.1.1 Payne & Frow Framework

In 2005, Adrian Payne and Pennie Frow proposed a strategic conceptual framework that positioned CRM at a *strategic level by identifying the key cross-functional processes involved in the development of CRM strategy*.

In this article Payne and Frow identified five basilar processes that firms could use to *develop and deliver and effective CRM strategy*: Strategy Development Process, Value Creation Process, Multichannel Integration Process, information Management Process and Performance Assessment Process. See **Appendix 9** for more information.

Strategic Development Process

The strategic development process can be divided in two correlated areas of strategy: Business Strategy and Customer Strategy.

According to the authors, the first strategic area *can commence with* […] *an articulation of a company's vision, especially as it relates to CRM*. It takes into account the industry and

its competitive environment and *must be considered first to determine how the customer strategy should be developed and how it should be evolve over time*. The second strategic area to be defined involves *examining the existing and potential customer base and identifying which forms of segmentation are most appropriate*. In terms of the segmentation decision-making, *several authors emphasize the potential for shifting from a mass market to an individualized, or one-to-one, marketing environment*.

Value Creation Process

The process of value creation is a bilateral one, *which transforms the outputs of the strategy development process into programs that both extract and deliver value*. There is, thus, a duality of value factors that complement each other: the customer and organizational value.

The first factor is a *concept of the benefits that enhance the customer offer* (Levitt 1969; Lovelock 1995 – cited in Payne & Frow 2005). Payne and Frow (2005) defend that in order to *determine whether the value proposition is likely to result in a superior customer experience, a company should undertake a value assessment to quantify the relative importance that customers place on the various attributes of a product*.

The perspective of organizational received value is based on the customer value as an *outcome of the coproduction of value, the deployment of improved acquisition and retention strategies, and the utilization of effective channel management*. Intrinsic to this concept there are two elements fundamental for the organization: variation of potential customer profitability across segmentations and the comprehension of the economics behind customer acquisition and retention.

Multichannel Integration Process

The multichannel integration process focuses on:

• *Decisions about what the most appropriate combinations of channels to use are;*

• *How to ensure that the customer experiences highly positive interactions within those*

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channels;

- *And, when a customer interacts with more than one channel, how to create and present a single unified view of the customer.*

As seen in **Appendix 9**, the range of channels is organized in accordance to a scale of physical presence. Nevertheless, *today, many companies enter the market through a hybrid channel model* (Friedman and Furey 1999; Moriarty and Moran 1990 – cited in Payne and Frow 2005) *that involves multiple channels.*

Payne and Frow (2005) state that *once established a set of standards for each channel that defines an outstanding customer experience for that channel, the organization can then work to integrate the channels.*

Information Management Process

This component of CRM strategy is related to the collection, collation, and use of customer data […] to generate customer insight and appropriate marketing responses.

According to Greenberg (2001 – cited in Payne and Frow 2005):

[…] *the key material elements of the information management process are the data repository, which provides a corporate memory of customers; IT systems, which include the organization's computer hardware, software, and middleware; analysis tools; and front office and back office applications, which support the many activities involved in interfacing directly with customers and managing internal operations, administration, and supplier relationships.*

Performance Assessment Process

Finally, in the last component of the Payne and Frow's CRM strategy framework it is ensured that *the organization's strategic aims in terms of CRM are being delivered to an appropriate and acceptable standard and that a basis for future improvement is established.*

In this component, a macro and microanalysis is rendered through shareholders results and performance monitoring, respectively. In the first global perspective of performance, the *organization should consider how to build employee value, customer value, and shareholder value and how to reduce costs.* Whereas, in the more detailed analysis, s*tandards, metrics,*

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and key performance indicators for CRM should reflect the performance standards necessary across the five major processes to ensure that CRM activities are planned and practiced effectively and that a feedback loop exists to maximize performance improvement and organizational learning.

Companies recognize that customer relationships are the underlying tool for building customer value, and they are finally realizing that growing customer value is the key to increasing enterprise value (Rogers, 2005, p. 262 – cited in Anderson et al. 2007).

2.5.2 Resource-based View

The RBV intends to explain the conditions under which firms may achieve a sustained competitive advantage based on their bundles of resources and capabilities.

Barreto 2010

According to Porter (1991), the success of a firm in a given industry is attained through *a competitive position or series of competitive positions that lead to superior and sustainable financial performance* […] *relative to the world's best rivals* (Porter 1991).

In order for the company to achieve the desired sustained competitive advantage, it must introduce *strategies that exploit their internal strengths, through responding to environmental opportunities, while neutralizing external threats and avoiding internal weaknesses* (Barney 1991).

The conjugation of the duality of internal and external aspects is likewise perceptible and further elucidated in Porter's (1991) determinants of a firm's success:

1. The ability of *a company develop and implement an internally consistent set of goals and functional policies that collectively defined its position in the market;*
2. Internally consistent set of goals and policies aligns the firm's strengths and weaknesses with the external (industry) opportunities and threats;

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3. *The firm's strategy be centrally concerned with the creation and exploitation of its so-called 'distinctive competences'.*

Thus, i*nstead of solely within the firm, the true origin of competitive advantage may be the proximate or local environment in which a firm is base* (Porter 1991).

2.5.2.1 Barney's Competitive advantage

In 1991, Barney (1991) published an article revealing his resource-based view framework. According to such article, in order to extrapolate a firm's (sustainable) competitive advantage two assumptions were needed:

1. *Firms within an industry (or firms within a strategic group) may be heterogeneous with respect to the strategic resources they control;*
2. *Resources may not be perfectly mobile across firms, and thus heterogeneity can be long lasting.*

Having as foundations stones both the assumptions of heterogeneity and imperfect mobility of resources, Barney (1991) identified four intrinsic attributes of a firm's resource, mandatory for a sustained competitive advantage in such firm. For more information regarding the relationship of said attributes and sustained competitive advantage see Appendix 7.

Valuable

The resource must have two-edge features to be able to become a source of competitive advantage to the firm. In one instance, it must *enable a firm to conceive of or implement strategies that improve its efficiency and effectiveness*. Moreover, the resource must provide the firm with the ability to *exploit opportunities and/or neutralize threats in a firm's environment*.

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Rare

Only when a *firm's valuable resources are absolutely unique among a set of competing and potential competing firms, those resources* […] *may have the potential of generating a sustained competitive advantage.* Thus, if the uniqueness of valuable resources or a bundle of valuable resources *used to conceive of and implement strategies* in a firm is questionable, *then large number of firms will be able to conceive and implement the strategies in question.*

Imperfectly Imitable Resources

The term developed by Lippman and Rumelt (1982) and Barney (1986a; 1986b) is used to describe the *valuable and rare organizational resources* of one firm that are not possessed and cannot be obtain by other (rival) firms. The imitability of resources of a given firm is derived from one or a combination of three factors:

- Unique historical conditions – the firm's ability to *acquire and exploit some resources depends upon their place in time and space*;
- Causal ambiguity – *the link between resources controlled by a firm and a firm's sustained competitive advantage is not understood or understood only very imperfectly.* In this case, if a rival firm comprehends the correlation between the resources controlled by a firm and its competitive advantage, while others do not, *in the long run this information will be diffused* […] *eliminating imperfect imitability based on casual ambiguity;*
- Social complexity – there *may be very complex social phenomena, beyond the ability of firms to systematically manage and influence.*

Substitutability

In the last prerequisite of a resource to potentially provide sustainable competitive advantage is *that there must be no strategically equivalent valuable resources that are either not rare or imitable.* Meaning that *if two valuable firm resources* […] *are strategically equivalent when they each can be exploited separately to implement the same strategies*, competing firms can implement such strategies in different ways and using different resources.

2.5.3 Tacit Knowledge and Knowledge Management

For knowledge to provide sustainable competitive advantage, the skills and resources that underlie a firm's core competencies must be relatively widely transferable within the firm, but very difficult for other firms to copy or develop.

Lubit (2001)

In recent years, the vital importance of knowledge to business had been highlighted by such authors as Alvin Toffler, Peter Drucker, and James Quinn (Nonaka et al. 1996). According to Yang (Yang et al. 2010), *the organization that knows more about its customers, services, technologies, markets, and their linkages should perform better*.

Yang's assessment of the importance of knowledge in organizations is shared by Lubit (2010), who asserts that *because competitive advantage is increasingly found in knowing how to do things, rather than in having special access to resources and markets, knowledge and intellectual capital have become both the primary bases of core competencies and the key to superior performance*. Nevertheless the latter author cautions that in order for sustained competitive advantage to be provided, *one needs knowledge that is difficult for outsiders to copy as well as the ability to rapidly develop new knowledge*.

Nonaka (Nonaka et al. 1996) identified *two types of knowledge* that *are not totally separate but are mutually complementary entities of knowledge*. First, the explicit knowledge is depicted by *being uttered, formulated in sentences, and captured in drawings and writing* […], with a *universal character, supporting the capacity to act across contexts* (Nonaka and Krogh 2009). Second, the tacit knowledge is characterized by being *tied to the senses, tactile experiences, movement skills, intuition, unarticulated mental models, or implicit rules of thumb* […], *rooted in action, procedures, routines, commitment, ideals, values, and emotions* (Nonaka et al. 1996, 2000a, b – cited in Nonaka and Krogh 2009).

Because tacit knowledge is much harder for competitors to copy than explicit knowledge, the ability to capture and transfer tacit knowledge is the key to developing sustainable competitive advantage (Lubit 2010). Teece (et al. 2007) corroborates the aforementioned idea when stating that *the more tacit the firm's productive knowledge, the harder it is to replicate by the firm itself or its competitors* […], to the point where *imitation may well be impossible, absent the hiring away of key individuals and the transfers of key organization processes.*

Lubit (2010) envisioned a perspective of tacit knowledge through four categories: *a) hard to pin down skills— "know-how," (b) mental models, (c) ways of approaching problems, and (d) organizational routines*.

1. The first category tackles the skill component of tacit knowledge, that *cannot be fully explained in words* […] and only achieved by *repeatedly practice skills, receive feedback and get the feel for them*;

2. The second group is depicted by the people's mental models *drawn when trying to make sense of the situation, determining how we understand and analyze situations.* These *often unconscious abstractions* […] *help us to make sense of the masses of data we are faced with*.

3. The third category concerns *how people approach problems* […] and *underlying decision trees people use.* T*he decision tree one uses to address a problem will markedly affect the solution one selects*.

4. Finally, *much of the tacit knowledge of a firm is stored in its routines*, solidified *as standard operating procedures and roles are developed and enforced. The tacit knowledge embedded in routines*, such as decision-making procedures and advertising policy, *includes an intuitive grasp of what data to focus on and of the relative priority of competing demands*.

2.6 Chapter Conclusion

Throughout the chapter an overview of the most relevant literature was presented to lay the foundations for addressing the dissertation's Research Question and provide the necessary insight on the topic addressed.

In the first part of the chapter, a presentation of the main aspects of Internet of Things was presented; as such elements constitute the foundation for the Internet of Everything. A

bridge between both visions of IoT and IoE was established, with the exposure of the main novelties introduced by the latter framework.

In the second part of the chapter, the theoretical frameworks were presented as a means of establishing the foundations to answer the Research Question proposed by this academic dissertation. In the RBV theory, special emphasis was given to Barney's framework, while on the CRM theory Payne and Frow's perspective was presented. A notion of Tacit Knowledge was included to further strengthen and contextualize the RBV model into the current topics of this academic dissertation.

With both theoretical frameworks, a better understanding of how the IoE may influence the competitive sustainable advantage of companies operating in retail is expected.

3 – METHODOLOGY AND ANALYSIS

The literature analysed in the previous chapter provides ground for the investigation of the current dissertation's objective and underlying research question.

The chapter opens with the examination of the purpose of addressing the study of IoE in clustered retail and the resulting research objectives. The goal is to clearly explain the intentions which the study held in this dissertation hopes to realize and the research questions drawn from them. Given the specificity of the IoE benefits and their high correlation with consumer adoption and usage, a section regarding Cisco's opportunities and strategies for the technology is made. This section is structured to mention both the Cisco's vision of technology usage in retail and other possible traits that can be exploited in a clustered retail environment.

In the second segment of this chapter, the Model of Analysis is presented and explained. In this section, the Research Question is explained through the analysis of the IoE system's characteristics that contribute to sustainable competitive advantage in a retail environment. Subsequent, the presentation the topics this academic dissertation is attempting to answer are explained, structured according to four different areas of approach regarding data content and channels of IoE. An additional topic is introduced in order to explain the possibility of creating a mobile device (tablet or smartphone) application (app) as a presentation layer for the IoE system, bridging the consumers and the collected and processed data.

In the third part, the research hypotheses used in answering the research questions are presented and explained in detail, with the reasoning behind each hypothesis and its intended purpose demonstrated. Latter on, their plausibility tested through empirical data collected resorting to an online survey.

On the final part of the chapter, the questions compiling the questionnaire are presented with an individual explanation on their importance and rationale on the core hypotheses. Moreover, the reason behind measurements and their correspondent scale used in the concepts in question is also a point of clarification. Afterwards, the results of the survey are presented and analysed according to the hypotheses presented, which in turn are validated. The final section is, hence, dedicated to summarize the validity of each hypothesis according to the findings of the questionnaire and the reasoning behind it.

3.1 Purpose and Objectives of the model

The chosen research paradigm of this work is based on a theory-driven quantitative approach, in which the prepared interrogations act as means to answer the core research question of the dissertation. This work's goal is, thus, to understand whether it is advantageous to apply Cisco's IoE concept in clustered retail under single management by collecting the necessary empirical proof to do so.

According to Teller (2008), one of the major trends in European retailing has been the rising popularity of shopping malls in contrast with a decline of shopping streets. Given such a trend, the conglomerate retailers considered in this dissertation's analysis will be focus exclusively in shopping mall centres, rather than other forms of conglomerate retails.

Even though it is a simplification of the spectrum considered in clustered retail activity, the technical and managerial logistics of considering a (common) space that is physically open – outdoors - and possibly not under a single management may prove overly complicated and mitigate the potential benefits. As such, focussing exclusively on mall centres, limited spaces under a common management, there is a higher success rate when applying the concept of IoE and a stronger possibility of forming synergies with the individual retail brands when implementing the technology and data channels.

Furthermore, the possibility of creating and implementing a mobile device application (app) is regarded as the main piece for the first phase of IoE system's adoption and, thus, it is necessary to collect evidence regarding the features that attract consumers the most. This notion arouse from the idea that *data automatically generated from existing technology platforms measuring every shopper, every day provides an afordable way to acquire large amounts of data in a non-invasive manner* (Cisco 2014).

3.2 Model of Analysis

The challenge addressed by this academic dissertation is whether Cisco's concept of IoE has the potential to generate sustainable competitive advantage for retail companies in a clustered environment.

Cisco expects IoE technology in retail to bring *ways to increase profitability, improve customer engagement, and move ahead of the competition* (Cisco 2014). As presented through this section, customer engagement and relationship is one of the major assets of the IoE applied in retail and, as such, consumer engagement and propensity to purchase has a central role in the sustained competitive advantage. As stated by Rogers (Rogers, 2005, p. 262 – cited in Anderson et al. 2007) *growing customer value is the key to increasing enterprise value*.

Through the examination of the main goal of this dissertation and Cisco's research insights of the IoE in retail (Cisco 2014), underlying objectives, that stand an aid in answering the challenge proposed, arise.

Cisco (Cisco 2014) identified three major information technology transitions to consider from the retail perspective:

1. *Continued evolution of digital shopping, as is being realized in e-commerce and the use of personal digital devices throughout the shopping journey*;

2. *Data-centric retail technology innovation race;*

3. *Privacy concerns* […] in *the capture and analysis of many new forms of data that average shoppers generate through their daily activities*.

This academic dissertation aims to confirm such claims, while answering further topics regarding transformations that information technology, in the context of IoE, are instigating in retail. In the next sections, the objectives of this dissertation are presented and structured according to main areas of topics.

3.2.1 Information in Retail

At a first level, the objective is to understand what is the consumer's typical shopping process. Cisco believes that *consumers start the shopping process at home, and prefer to receive offers via email rather than in-store* and, as such, it is intended to understand whether the consumer examines, *a priori,* information regarding the products it intends to purchase or if the purchases are usually made according to one's impulse. The gathering of information in the shopping process also includes searching *for a product in the store and buying online* and the *use of devices (including tablets and smartphones) within* the *shopping journey*.

Furthermore, customization of offers is object of analysis, since in Cisco's survey *shoppers by a large margin were open to receiving personalized offers from retailers*. The willingness of having access to higher and more customized levels of information during the shopping process is, thus, a topic of research in this dissertation. In terms of customization of information, the collection of data is needed, comprising not only what Cisco labels as "transactional" information - created during the time spent shopping at the location – but also data harvested from the consumer's preferences of products and similar private information or behaviour.

Given these topics, in essence, the research is partially centred in <u>understanding the role information has on the consumers and the shopping process</u>.

3.2.2 Privacy in Retail

As Cisco stated, *data is the fuel that will drive retail innovation and value creation in the years ahead* (Cisco Consulting Digital Shopping Behavior 2014), an idea defended by Payne and Frow's framework, regarding information management processes. As such, at a second level, after assessing the weight of information, the aim is to understand how to capture and use, in permissible and non-intrusively ways, consumer information.

The issue of *trust and transparency* regarding consumer's data harvesting and treatment, since *shopper suspicion of retailers' use of data is a major barrier to realizing value*. Hence, the analysis is targeted in understanding the level of willingness to share private information and what incentives may drive consumers to share such data with retailers. According to Cisco, *despite shoppers' concerns about privacy, retailers can utilize two techniques for*

gaining more customer information that can be used to personalize offers where, when, and how shoppers want.

3.2.3 Devices in Retail

Having covered the content section of IoE in retail, this dissertation chances to tackle the channel section of IoE. The aim of this section of the investigation is, thus, to understand, at a first level, whether or not shoppers regularly use digital means in-store to *browse* or purchase products – what Cisco dubbed *Digital Mass category*. In this category, Cisco estimates that *in-store touch screens and mobile devices make up for 50% of shopping methods* (Cisco 2014) and, as such, the effort is placed in understanding the importance the devices (smartphone or tablet) have on the purchasing procedure.

Furthermore, given mobile platforms in retail, this dissertation aims to comprehend the interaction between consumers and retailers, with underlying attention to the upper mentioned privacy concerns and shoppers expectation of quick and accessible information. Cisco presented eight in-store concepts that utilize the IoE system in a conspicuous fashion, relying heavily on personal devices and smartphone (or tablet) applications.

Given the prominence of information to today's consumers, one of the objectives of this dissertation is to enquire the relevance that consumers assign to the speed, accessibility, and customization of information while shopping. Complementary to this objective, it also intended to comprehend if an application (app) for mobile devices is the best channel to connect shoppers to the IoE system.

3.2.4 Social Networks in Retail

Given that *the rapid growth in social media is beginning to have a significant impact on consumers' purchase behaviour* (Gupta et al. 2011), the research focuses in uncovering the relationship between consumers and social media, especially regarding the individual's predisposition to conscious or unconsciously give feedback and valuable information to retailers through social media. One of Cisco's chosen in-store concepts was an app that integrated popular social sites such as Facebook, Pinterest, and Twitter, *allowing select family, friends, and acquaintances to provide feedback or advice on purchases* (Cisco 2014).

Section	Concepts	Aim to understand
Information and Data	Consumer typical shopping process	Information regarding products is researched at home or during shopping
		Consumers tend to purchase more under informed decisions rather than impulsive drives
	Consumer desires	Consumers are willing/keen to have access to higher levels and more customized information
Privacy	Consumer's private data and preferences	Consumers are *a priori* not willing to share private data with companies
	Incentives for data sharing	Non-monetary incentives may prove sufficient to deter consumers to share information
Devices	Digital means	Digital means are commonly used in shopping journeys
	Product information in-store	Search of product information and alternatives may become significant in shopping journeys
		Mobile device application (app) may be the most effective channel to connect consumers to IoE
Social Media	Social media and information	Social media may prove an additional means to capture feedback from consumers

Table 1: Aspects of the dissertation objectives – Model of Analysis

3.2.5 IoE Features

Regarding new forms of interface in retail, Cisco believes that customer demand for new ways of interacting is the main business driver of IoE in Retail[5]. As explained earlier in the Literary Review chapter, Cisco's prospects for the integration of IoE is divided into M2M, M2P and P2P connections, each integrated to maximize the efficiency of store planning and operations, and improve the relationship with customers.

This dissertation centres itself on the idea that the link between IoE's benefits and the consumers is, at an early stage, mainly performed through a smartphone application. This

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[5] Based on Cisco's IoE Value Index survey of 7,501 IT and business leaders.

assumption is based on the idea that people must be an integrated and active part of IoE's system in order for it to function at full capacity and, as such, ought to be able to receive and contribute with data. As stated in earlier chapters, the smartphone may be a fundamental piece in connecting the person to the system through the use of its connectivity hardware (e.g. Wi-fi, Bluetooth or NFC).

Furthermore, given the application of technology to clustered retail, opposed to single store, the perspective of application has to withhold a global perspective of stores and common spaces. This perspective suggests a phased entry of IoE technology, first by incorporating the shopping mall stores and their products as parts of the system and, only then, advancing the IoE technology – presented in Appendixes 8 and 9 – to individual stores.

For the upper mentioned reasons it is proposed a group of characteristics – partially inspired in Cisco's Consulting Digital Shopping Behavior 2014 survey - that are expected to incorporate the different aspects of IoE in the smartphone application, while attempting to captivate consumers' interest and preferences:

- *Mobile concierge* – guide through the mall space and products in the shopping carts;

- *Endless aisle* – at each store consult and reserve products available in-store an online;

- Customized information regarding new products, relevant offers and sales (price opportunities);

- Real-time store discounts through the app's product catalogue;

- Free internet access throughout the mall area;

- Product reservation through the app on any store in the mall;

- Loyalty points that can be converted to client points in a store you are registered.

3.3 Hypotheses Analysis

Based on the previous section's model of analysis, in particular table 1, a list of five hypotheses that will operate as a means to answer the concepts underlying the research question is presented.

H1: Consumers value quick, accessible, and custom information while shopping.

Given the rising awareness of the consumers, uncovering the main tendencies in shopping behaviour of consumers while assessing the importance and disruptive power that higher levels of information have on such behaviours is a topic of focus. Therefore, measuring the willingness of consumers to shift conducts when presented with the chance to gain access to higher levels of information and preferences' customization of on-going opportunities is extremely important.

This hypothesis is divided into 3 subsequent hypotheses:

- *H1.1 - Consumers tend to do the product research while shopping rather than, a priori, at home;*
- *H1.2 – Consumers tend to make more informed decisions while purchasing rather than impulsive ones;*
- *H1.3 – Consumers have an intrinsic desire for accessing more information while shopping.*

Regarding the first subsequent hypothesis, the aim is to prove that consumers still rely heavily on product information research while shopping, in contrast with *a priori* information research at home. This focus on the location and time of product research is justified by an intrinsic desire to have access to information while on a shopping journey, for reasons of convenience.

This upper mentioned desire of consumers to have access to information at convenient times and places is correlated with the second subsequent hypothesis. This hypothesis centres on discerning the consumer's predisposition to make informed rather than impulsive and unenlightened purchases.

Finally, regarding the last subsequent hypothesis, there is a desire for accessing deeper levels of information while shopping, which is intrinsically depicted in the aforementioned two subsequent hypotheses.

The core purpose is, therefore, confirm whether consumers have a tendency and desire to be more informed regarding the product's characteristics and possible alternatives while shopping.

H2: Consumers are willing to share "private" information and preferences if offered sufficient non-monetary incentives.

The second premise of this dissertation is extremely important as it contemplates one of today's most difficult issues in debate. The privacy of users' information and preferences in Internet and the use of such data by corporations and other entities is the cause of much debate in modern society. As stated before, given the importance of data to the IoE system, one major topic of debate is ascertain if non-monetary incentives, directly derived from IoE technology, can persuade consumers to said share private information.

It is from the collection, collation, and use of customer data that the topic of privacy arises. The boundaries of Internet and consumption data mining are yet to be clearly defined and society, as a whole, is becoming increasingly aware of the importance that on and offline privacy has on the lives of people. Therefore, there is a natural concern from consumers regarding their privacy when asked to share information with companies and as such, they are not willing to share private data.

This concern is the origin of the subsequent hypothesis *H2.1: Consumers tend to avoid sharing private information with companies.*

Given that customized content and rich-data would be one of the main characteristics and allures of the presentation platform, the analysis is aimed at understanding what characteristics are most valued by consumers and if such non-monetary incentives would prove sufficient to obtain the consumers' permission to access their information and preferences. The compelling opportunities that *Data in Motion* presents have the potential to equally benefit both retail companies and consumers alike and, as such, consumer's reaction

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to such advantages and the level of impact in terms of information sharing persuasion is a topic of focus.

Therefore, the second subsequent hypothesis *H2.2 IoE technology based incentives may persuade consumers to share private information.*

H3 – Smartphones can have an active role in today's shopping.

This hypothesis addresses device and channel usage in an IoE ambience, where ubiquitous and interconnected devices - regardless of being modules from the system or personal devices (e.g. smartphones or tablets) - are permanently harvesting and exchanging information.

It arises from Cisco's observations that mobile devices, especially smartphones, are having an increasing role in today's shopping. Therefore, these observations give origin to the subsequent hypothesis *H3.1 Consumers generally use smartphones in shopping.*

Furthermore, the type of in-store usage that consumers give to mobile device is a matter of relevance to the study as evidences drawn may uncover the features the consumers most value during shopping journeys. As such, the second subsequent hypothesis is drawn – *H3.2: Smartphone information related features are valuable in-store.*

It addresses directly this topic to find the importance and usage of smartphones in the shopping process and leads the topic for the following hypothesis.

H4: It is pertinent to develop a smartphone app for shopping.

The presentation platform used by the IoE to engage consumers would consist on a smartphone app that would take advantage of the rising level of smartphone usage by the consumers and the ease of connectivity of the smartphone. Analysing Cisco's in-store concepts, the conclusion was that the most popular targeted relevant offers for consumers, inventory and location-based information, consultation by experts, and *gamification*.

Moreover, in a smartphone app would prove most beneficial when comprising all the necessary information of individual retail brands within the clustered retail, instead of the individual and dispersed channels of each singular brand.

H5: Consumers are willing to comment the quality of service and relevant shopping experiences in social networks.

The second hypothesis aims to shine a light on the level of feedback of products and services given, advertently or inadvertently, by consumers in social media. Cisco considers social media to have the potential to become an important channel for new influx data through comments and feedbacks of consumers on the quality of products and services, and possible areas of improvement.

Therefore, the investigation concentrates in understanding whether feedback of consumers in the format of comments in social media as a significant expression and if it has the potential to, indeed, become an important aspect of the IoE system in retail. In the specific case of clustered retail, comments in social media regarding a particular store or a common space within the mall's property might be beneficial to improve the relationship between consumer and brand.

Concepts	Aim to understand	Hypotheses	Succeeding Hypotheses
Consumer typical shopping process	Information regarding products is researched at home or during shopping	H1: Consumers value quick, accessible, and custom information while shopping	H1.1 – Home vs Shopping
	Consumers tend to purchase more under informed decisions rather than impulsive drives		H1.2 - Informed vs Impulse
Consumer desires	Consumers are willing/keen to have access to higher levels and more customized information		H1.3 - Desire for info
Consumer's private data and preferences	Consumers are *a priori* not willing to share private data with companies	H2: Consumers are willing to share "private" information and preferences if offered sufficient non-monetary incentives.	H2.1 – Distrust in brands
Incentives for data sharing	Non-monetary incentives may prove sufficient to deter consumers to share information		H2.2 – Incentives are sufficient
Digital means	Digital means are commonly used in shopping journeys	H3 – Smartphones can have an active role in today's shopping	H3.1 – Smartphones active role
Product information in-store	Search of product information and alternatives can become significant in shopping journeys		H3.2 – Smartphone in-store features
	Mobile device application (app) may be the most effective channel to connect consumers to IoE	H4: It is pertinent to develop a smartphone app for shopping	
Social media and information	Social media may prove an additional means to capture feedback from consumers	H5: Consumers are willing to comment the quality of service and relevant shopping experiences in social networks	

Table 2: Hypotheses description according to the Model of Analysis

3.4 Questionnaire Analysis

The online questionnaire was structured according to the different aspects and particularities addressed by the five suggested hypothesis and divided into four parts. The empirical study took place during the month of December and collected answers of mainly Portuguese citizens.

The first part of the questionnaire concerns the details of the surveyed population regarding gender, age and nationality. Such information is crucial to identify and contextualize the main strands of the replies given to the questionnaire as well as differences and common aspects between the people surveyed.

In the second part of the questionnaire – labelled *Smartphone and Social Media* – the importance of the smartphone device as a central piece to the initial approach of IoE in clustered retail defended in this dissertation is addressed. The role of social media in the IoE concept is also approached, with direct tie with the fifth hypothesis.

The third part of the questionnaire – termed *Clustered Retail* - focuses on capturing the trends of consumer shopping behaviours and tendencies while choosing products. This section aims to order the consumers per categories regarding the frequency and purpose of shopping mall attendance and whether what resources and decisions are most common when choosing the products.

The last part of the questionnaire is organized mainly with the purpose of collecting information that can support hypothesis 4. Nevertheless, question 10 has a dual function of acting as an introduction to the smartphone application, necessary for the remaining questions, and mainly as a direct source of data to sustain hypothesis 2.

3.4.1 Questionnaire Design

The first part of the questionnaire is intended for capturing the details of the surveyed population, where no restrictions regarding place of residence or age were place. This fact is related with this academic dissertation's goal to incorporate different age segments of the population and to understand which age intervals demonstrate to have the highest potential of interest in the IoE technology and its benefits. See **Appendix 11** for more information

3.4.1.1 Questionnaire's Part II – Smartphone and Social Media

Q4. Do you own a smartphone?

As stated earlier, at a first stage, the strongest possibility to connect people to the IoE system in clustered retail is through smartphone devices. Given the central role that smartphones play in such scenario, it is vital to understand if there is, in fact, a widespread use of such devices in the enquired population.

Furthermore, this question will dictate the level of questioning done in this survey according to the answer provided. If the respondent answers negatively to this question, the questionnaire will not display question 9 to 14, as this enquiry cluster is only meaningful dependent on the consumer's ownership of a smartphone device.

Q5. Regarding posts on social media, have you ever commented shopping experiences you had? If yes, which topics you tend to comment the most?

- *Purchases made in a certain store*

- *Quality of the products services of a store*

- *Helpfulness and quality of treatment of a store's staff*

- *Positive or negative details in the ambience or space that caught your attention*

- *Special events held on a mall*

After weighing the share of smartphone device ownership by the enquired population, it is important to assess the connection with shopping experiences and social media content made by consumers. The second query of this part is designed to ascertain whether consumers have the predisposition to comment and share shopping experiences and details on social media. This question has a direct relation with the fifth hypothesis and, as mentioned earlier, aims to estimate the expression that posts regarding shopping experiences have in consumers' interaction with social media.

Furthermore, this question addresses the issue of whether there is any potential in treating such comments as indirect feedback and, consequently, as data used in improving efficiency and quality of services.

3.4.1.2 Questionnaire's Part III – Clustered Retail

Q6. How often do you go to shopping malls?

As stated and explained earlier, the type of clustered retail analysed by this questionnaire is shopping malls. As such, a frequency measurement of the enquired population's attendance to said shopping malls is introduced in order to give a more efficient and trustworthy treatment of the information collected. It is important to have empirical evidence that the population sample is, indeed, relevant for the study.

Q7. When going to a shopping mall, what are the most likely scenarios?
- *Go for a walk – no shopping purposes*
- *Window shopping – possibility of purchase without any specific item in mind*
- *Shopping for an item – without any specific brand*
- *Shopping for a product – with brand and model in mind*

This question addresses the consumer's intent when going to a shopping mall, classifying according to the level of importance the reasons to go to shopping malls in regard to purchases' objectives. This question acts as an introduction to the following question and an integrated part of the explanation of both **H1.1** and **H1.2**, which addresses behaviours behind the purchase decision and the value of information in terms of place and timing.

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Q8. When shopping for an item, which of the situation is most common?

- *Searched and selected the item at home through newsletters from brands*

- *Searched and selected the item at home through Internet reviews or magazines*

- *Search the item and compare alternatives in stores while shopping*

- *Search the item and compare alternatives in your smartphone while shopping*

The aim of this question is to assess the level of preparedness of consumers when shopping for a certain item. As mentioned earlier, it is important to understand if the need or desire to purchase a certain item drives consumer to research information and compare the product while shopping or at home. Information regarding the sources in which consumers base their decision is contemplated, ranging from direct channels from the brands to consumers (newsletters) to more generic and traditional means as magazines or more complete and diverse platforms as the Internet.

This subject of time and location for information research by consumers is the origin of subsequent **H1.1**. Furthermore, this question has an implicit element of impulsive purchases represented by the third option of in-store search and compare, which is the scenario where consumers are most prone to being influenced and make impulsive decisions. As such, this question's results ought to be used to strengthen **H1.2**.

Finally, the query is structured to unveil what means of choice do consumer use when research a product and as a means of supporting **H3**, whether the smartphone has, indeed, an active role in today's shopping. This claim is presented in the subsequent **H3.1**, aimed at ascertain if smartphones are, indeed, used in shopping journeys.

Q9. Do you use your smartphone in-store as an aid for shopping?

In regard to last question's implicit objective of confirming hypothesis 3, the aim of question 9 is assessing in a more direct manner the role of smartphone in shopping journeys, while serving as a bridge to the next query.

In case of negative answer to this question, the following query will not be shown.

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Q10. If yes, when shopping, what do you usually use your smartphone for? [Rate according to the level of usage, being 0 (Never) and 10 (Always)]

- *Make price comparisons*

- *Browse products*

- *Find product reviews*

- *Find product information*

- *Find sale or promotion opportunities*

- *Find product availability in-store*

- *Find the location of a store*

Serving as a more deepened approach to last question's objective, question 10 aims to understand what are the most useful in-store features and uses, according to the shoppers, the smartphone has. To achieve the desired objectives, a list of possible in-store uses of smartphone is granted for the interviewed to evaluate according to their preferences, thus revealing signs of inclination towards search.

This question has, thus, a dual agenda of assessing the consumer's desire to access to higher levels of information, contemplated in **H1.3**, and that such information is concerning products and consulted while in-store. Regarding the latter objective, understanding the significance of product research while in-store and the most alluring features of said information is the core at the **H3.2**.

Finally, this query serves to reinforce the previous question's objective of confirming **H3** and as basis for the mobile device (smartphone) application mentioned earlier in the IoE Features section.

The list of uses or features is taken from Google's *Mobile In-Store Research* (April 2013).

3.4.1.3 Questionnaire's Part IV – Shopping Mall Smartphone App

Q11. If a smartphone app of the shopping mall you usually attend be made available, would you download and use it?

As stated before, the pertinence of this question is linked to the necessity to introduce the possible existence of smartphone application in order to develop the following questions and, more importantly, as the main source of data to support the assumption present in **H4**.

The lack of initial information regarding the features of the smartphone application is intentional, as the purpose of the question is to understand whether there is an interest from the consumers in using mobile software for retail shopping. Furthermore, possible features will be introduced in question 13 to understand if the additional information provided has an impact in the appeal of the application.

Q12. Would you be willing to permit such app to access your preferences (of products, brands and items) from browser searches and other apps (e.g. Facebook) in order to further customize your shopping experience? [Rank according to level of willingness, being 0 (Utterly unwilling) to 10 (Certainly willing)]

This question is formulated in order to comprehend the sentiment of the enquired consumers regarding the contrast of online privacy and the possibility of accessing higher levels of information and customized content. The purpose is not to dwell on the possible legal and ethical aspects of online privacy but, rather, understand if consumers are willing to disclose information to have more efficient services and personalized information.

Thus, this question will allow assessing **H2.1** of whether consumers have a natural tendency to avoid trusting private information and preferences with companies.

Moreover, it is important to refer that this question's goal is additionally to be latter subject to comparison with question 14. The idea is to present the possibility of the smartphone application access preferences and personal information with no further information given to the people surveyed and, latter, compare the results with the data collected after the possible features of the software are presented. It is important to understand if certain non-monetary incentives are sufficient to convince consumers to provide access to personal information.

Q13. In a scale from 1 to 7, according to your preferences, rate each of the following smartphone app functionalities according to their attractiveness. (1 – Unappealing; 7 – Extremely appealing)

- *Free Internet access throughout the mall area*

- *Mobile concierge – guide through the mall space and products in sold in the stores*

- *Endless aisle – at each store consult and reserve products available in-store an online*

- *Customized information regarding new products, relevant offers and sales (price opportunities)*

- *See product and store reviews from customers who purchased in the mall*

- *Real-time store discounts through the app's product catalogue*

- *Loyalty points that can be converted to client points in a store you are registered*

The purpose of this query is to understand the attractiveness of traits that may be incorporated in the smartphone and the perception of the inquired person regarding each feature's value. This question is also incorporated in the questionnaire as a vital piece for collecting information that mainly support hypothesis 4, further explained subsequently.

In this academic dissertation, the presentation channel of the IoE system to the consumer was represented through smartphone application features. The entire bundle of features directly related to the possibilities withheld in the IoE system through the application channel, had a benchmark of free Internet. This benchmark was considered in order to test the relative importance of each feature with the allure of Internet access while in the shopping mall.

The features contemplated in this question are proposed according a mixture the shopping mall general space and ambience attributes and possible synergies between the shopping mall and each individual store. The valuation is determined according to a point system of 1 to 7 – being the lowest number the lowest level of appeal and the highest number the highest level of appeal.

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In terms of the presented features, embedding the smartphone app with an interactive map of the space and its stores and also the possibility of free Internet access all-around the shopping mall covers the general space. On the other hand, the other features of customized information regarding sales, product reservation and points represent the synergies between the general space and individual. The upper mentioned traits are only possible by the conjoint contribution and work of both parties – shopping mall management and individual store management – in keeping up-to-date information and, possibly, an integrated software system capable of reflecting real-time changes made by store management regarding price, sales and stock.

The results of this question will dictate and reinforce the pertinence of developing a smartphone app for the shopping mall, defended in **H4**, as the level of appeal of the traits presented to the interviewees will be reflected and compared with the basic function of Internet access throughout the mall.

Furthermore, given the possible characteristics of the app, the results may reveal signs of the consumer willingness to higher levels of information access and customization, corroborating **H1.3**.

Q14. Based on the functionalities presented in the last question, would you now be willing to permit such an app to access your preferences (of products, brands and items) from browser searches and other apps (e.g. Facebook) in order to further customize your shopping experience?

This question is structured, in accordance with question 12 and 13, to collect evidence that can sustain the fourth hypothesis. It was important to have question 12 as an introduction to the consumer of the possibility of having to disclose private information to the smartphone application without further details. Subsequently, question 13 presents the list of possible traits of the smartphone application in order for the consumer to assess them according to value.

Having been presented with the possible traits and weighed them according to value, consumers are confronted with the same interrogation as question 12, only with more information regarding the possible attributes of the smartphone application. Likewise

question 10, the contemplated features may give indications of the value of smartphone as a means to in-store search of information regarding products, envisioned in **H3.2**.

As such, the purpose of the last question is to register if there was an improvement in the consumer's disposition to share preferences and information by offering the non-monetary traits and incentives of the smartphone application mentioned earlier, substantiating the claim made in **H2.2**.

Furthermore, if only in a partial matter, it can provide evidence to support the intrinsic desire of consumers for deeper level of access to information while shopping, contemplated in **H1.3.**

3.4.2 Sample Size and Characteristics

The questionnaire was structured and distributed in both English and Portuguese versions and, as mentioned before, had no restrictions regarding the characteristics of the population. The questionnaire was answered by a population sample of 132 people, in which only 120 respondents successfully completed.

The overwhelming majority of the sample, 119 respondents, was of Portuguese origin and there was a significant discrepancy in terms of gender, with 74 interviewees being female (around 61.7%) while male provided only 46 answers (38.3%). In terms of age, the sample was specially concentrated in the interval between 19-29 years old, accounting for almost half the sample (46.7% of the total), with special relevance to the age interval of 25-29 – accounting for 32,5%.

3.4.3 Survey's Results

The following section holds the presentation of the survey results, based on the 120 valid responses. It is structured according with each question's outcomes, in which the both the results and the validity of the hypotheses in discussion are analysed.

Q4. Do you own a smartphone?

In terms of smartphone ownership, the majority of respondents disclosed having smartphones. From the total of 120 respondents, 93 declared to be smartphones owners – a value of 78.3% -, which corroborates the claim that smartphones are, indeed, becoming a

Smartphone ownership gains significant relevance for age intervals of 19-25 and 25-29, with 94.1% and 94.9% of respondents, respectively, owning a smartphone device.

Q5. Regarding posts on social media, have you ever commented shopping experiences you had? If yes, which topics you tend to comment the most?

In terms of retail-related social media posts, the vast majority of surveyed responded that never commented shopping experiences in social media. The extent of people who have yet to comment on social media reaches an average of 54.8% of total respondents. Overall, more than 76.1% of people surveyed answered they never or rarely commented shopping experiences on social media, 54.8% and 21.3% respectively.

Although topics related to quality of products or services were the ones that had higher contrast regarding frequency of comments on social media – with a 25% of enquiries admitting to comment "Sometimes" -, the differences are far too substantial to be considered relevant.

Therefore, considering the upper mentioned results, **H5 was not confirmed**, indicating that consumers are yet unwilling to share shopping experiences and suggestions on social media platforms.

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Q6. How often do you go to shopping malls?

Regarding shopping mall attendance, the respondents show a clear tendency to make regular visits to shopping malls, with 84.2% responded that they attend several times a month – "2-3 times per month" or more. These results help establish the relevance of the population sample at study as being appropriate to this survey's objectives.

Q7. When going to a shopping mall, what are the most likely scenarios?

In this question, the scenario considered to be the most frequent was "shopping for an item without any specific brand in mind", scoring 61.7% of preferences for both first and second likelihood – 34.2% for the main reason to go to shopping malls and 27.5% for the second. Regarding the upper mentioned consumers, having no brand in mind means that the likelihood of in-store influence regarding purchases is higher than the consumer who already decided the products characteristics and brand.

The second most relevant scenario considered by respondents, considering only the first two levels of importance, is "shopping for an item with a specific brand in mind", with 51.7% of inclinations – 19.2% as the main reason and 32.5% and for the second. Even though the first level of importance was relatively low, in comparison to the scenario of "no shopping purpose" – with 30.8% –, analysing the conjoint values of the first two levels, the results gain significant weight.

Concerning such results, there are indications that consumers tend to prefer searching the items before going shopping, but the brand of the product is preferably chosen during the shopping journey. This fact indicates that there is, in fact, a level of *a priori* research before going shopping but to some degree, the product is ultimately chosen while shopping. Furthermore, the fact those interviewees avoided the window-shopping concept – depicted in this academic dissertation as shopping with purchase intentions and no specific product or item in mind – as the first two options, indicates that consumers tend to prefer informed decisions, **partially supporting the claim made in H1.2**.

As such, even though there are indications that prior research of the product is made by consumers, the decision of product purchased is mostly made while shopping, **partially support to the claim made in H1.1**.

Q8. When shopping for an item, which of the situation is most common?

Concerning shopping journeys with purchase intent, the results showed that the majority of interviewees still prefer the traditional method of searching and comparing products while shopping. From a scale of 0 to 10, the choice of search and compare while shopping scored an average value of 7.24, being the preferred choice by a significant margin.

Both at home Internet reviews/magazines and newsletter information researches prior to the shopping journey scored an average of 4.54 and 4.42, respectively. Finally, scoring the lowest value – an average of 1.78 -, the role of smartphones in shopping journeys is almost insignificant in the enquired population sample.

Despite the low adherence to smartphone as an informative tool for shopping, the high value scored by traditional method of shopping and the significant margin in relation to other approaches is enough proof to **support H1.1**. As such, and in combination with the previous question, there is enough to claim that **H1.1 was confirmed**.

Furthermore, compared with other contemplated possibilities, the traditional choice of deciding while on the shopping journey is depicted by the least amount of information regarding the product and alternatives, and the higher likelihood of influence and, thus, impulsive purchase. The below-average score of all three more informed methods **disproves the reasoning of H1.2**. Therefore, concerning the results collected from the current and previous question, there is **not enough evidence to support H1.2**.

Furthermore, the results portrayed an almost insignificant use of smartphone devices in information procurement while on shopping journeys, in comparison to the other contemplated scenarios. This fact **refutes the logic behind H3.1**. Nevertheless, the following question's analysis will provide more evidence to support such claim.

Q9. Do you use your smartphone in-store as an aid for shopping?

In relation to last question, consumers were inquired in a more direct way regarding the role of smartphones in their shopping journeys. The results indicate that from a total of 93 interviewed with smartphone, only 24 people – 25.8% - acknowledged using a smartphone as

a tool to assist them while shopping.

The current level of popularity of smartphones as an in-store aid tool, in the considered sample, is not sufficient and, thus, combining with the results from the previous question, the subsequent hypothesis **H3.1 was not confirmed.**

Q10. If yes, when shopping, what do you usually use your smartphone for?

Despite the low level of interviewees using smartphone as an in-store aid, it is relevant to analyse the most used features by the aforementioned adopters. Using a scale of 0 to 10, the majority of contemplated features scored an above-average result, with exception for *Product Review* and *In-store Product Availability* – scoring an average of 3.96 and 3.71 points, respectively. Nonetheless, the feature most used by in-store smartphone users is *Price Comparison*, scoring an average of 6.48 points in 10, followed by *Browse Products* and *Store Location* both with 5.7 points.

Having most features scored above average, there are indications of the usefulness and popularity of certain aspects that can be integrated into the IoE system. Such popularity and results allows concluding that information research in-store has the potential to be widely adopted, **supporting the claim made in H3.2.**

On the other hand, given the above-average results of the majority of presented features, there is evidence that the interviewees who, in fact, use smartphone during shopping have a desire to acquire higher levels of information and a wider range of topics regarding products, reinforcing the idea defended in **H1.3**.

Q11. If a smartphone app of the shopping mall you usually attend be made available, would you download and use it?

When presented with the possibility of a having access to a shopping mall smartphone app, almost half the 93 interviewed – 44.1% of enquiries – admitted that they would *Possibly* download and use it. Furthermore, the number of interviewees that stated that the likelihood of using the app would be *Probable* or *Highly Probable* – with 17.2% and 14%, respectively

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-, was more significant than the ones who responded *Unlikely* or *Most Unlikely* – 11.8% and 12.9%, respectively.

Considering the aforementioned results and the inclination to admit downloading and using the application, there is enough evidence to **partially support H4**.

Q12. Would you be willing to permit such app to access your preferences (of products, brands and items) from browser searches and other apps (e.g. Facebook) in order to further customize your shopping experience?

Regarding privacy concerns of smartphone users, the level of willingness to permit a smartphone application (app) to access private information and preferences scored an average value of 3.13 – on a scale from 0 to 10. The low level attributed by consumers reflected both the lack of information regarding the app and the intrinsic privacy concerns regarding sharing information with companies. As such, the subsequent hypothesis **H2.1 was confirmed**.

Q13. In a scale from 1 to 7, according to your preferences, rate each of the following smartphone app functionalities according to their attractiveness.

In this question, the presentation layer of the IoE system is analysed according to the possible smartphone application features. The interviewees were presented with such features and, with no surprise, scored *Free Internet Access* as the most attractive feature with 6.44 points – 92% on the scale. The second most attractive feature rated by respondents was *Loyalty Points* gained by the smartphone with conversion to any store the consumer is registered, scoring 5.11 points, which can be interpreted as 73%.

Finally, the features of *Real-time Store Discounts, Mobile Concierge*, and *Customized Information* all scored approximately 5 points according to their attractiveness, which can be rendered to approximately 69.1%. Despite scoring the lowest value, *Endless Aisle* feature was still considered attractive to respondents, who rated it with 4.47 points – approximately 63.9%.

Furthermore, three separated multiple regression OLS analysis were conducted between the shopping journey intention options (presented in question 8), as independent variables, and the features *Customized Information*, *Loyalty Points*, and *Reviews*, as dependent variables. For more information see Appendix 15.

Regarding the OLS analysis made on these features, it was possible to conclude that, despite the relative low level of adjusted R-square, the variables of the options "search in newsletters" for the feature *Loyalty Points*, "search on magazines or internet reviews" for *Review* feature, and "search and compare while shopping" for *Customized Information* – models 1, 2, and 3, respectively - showed the most relevance (with a *p-values* bellow 0,01) in explaining each feature.

It is notorious from the feature's value perceived by respondents and the table results of the OLS analysis, especially regarding the appeal felt by people who search and compare products while in-store to a feature with customized information, that there is an intrinsic desire of people to access information while in-store, **supporting H1.3**.

The overall high score of the in-store features – average of 71.57% - allows to conclude that it is, in fact, high levels of interest in accessing IoE system features while in-store and that it is pertinent to develop a smartphone application. As such, **H4 was confirmed**.

Furthermore, the high interest demonstrated by interviewees point towards the potential relevance of in-store usage of mobile devices while on shopping journeys, **confirming H3.2**.

Q14. Based on the functionalities presented in the last question, would you now be willing to permit such an app to access your preferences (of products, brands and items) from browser searches and other apps (e.g. Facebook) in order to further customize your shopping experience?

This question aims to measure the progress, having question 11 as benchmark, regarding the willingness of consumers to share private information and preferences. The surveyed placed the average level at 4.33 points in 10, a slight improvement compared to the previous value of 3.13 in question 11. Therefore, the exposition of the potential features of the smartphones application in question 12 has effectively influenced the respondents' level of willingness.

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Furthermore, given the multiple regression OLS analysis conducted in Appendix 15, between the smartphone app features, as independent variables, and this question's willingness to permit the app's access to information, it is possible to conclude that there is a relatively significant level of influence. The *Customized Information* feature was the most significant variable at play in this analysis, indicating, on one hand, that the desire of customized information and relevant offers by consumers is the main force of persuasion to share information with retailers and, on the other, that IoE's technology-based incentives, indeed, impacted the willingness of respondents to overcome distrust of information sharing.

Nevertheless, given the sustenance of the value slightly below the middle of the scale and the only minor improvement of willingness, it is concluded that **H2.2 is partially confirmed.**

Likewise, this evolution give sustenance to the idea defended throughout this dissertation that consumers seek higher levels and more customized information regarding products. This idea is intrinsic in the fact that consumers are more willing to share personal information in order to access such quality information and, as such, gives **partial sustenance to the claim made in H1.3.** Nonetheless, regarding the information collected throughout the questionnaire, there is sufficient evidence to consider that **H1.3 was confirmed**.

3.4.4 Survey's Conclusions

As stated earlier in the analysis model (section 3.2), this dissertation rests on the idea that the presentation layer for the IoE system in retail is based, at a first phase, on a mobile device application (app). This idea is grounded on the aforementioned global benefit perspective of the mall, in opposition to individual store's benefits and uses the rising importance of smartphone usage in the lives of today's consumers.

In the previous chapter, throughout the questionnaire the hypotheses considered in this academic dissertation were tested using either direct questions or a combination of questions that would permit the collection of the necessary proof to support said hypothesis. Under the evidences collected, it is subsequently presented the validation of the conclusions according to each core concepts.

3.4.4.1 Information and Data

The perceived value of information by consumers, while on shopping journeys, was the main topic of focus of **H1**: *Consumers value quick, accessible, and custom information while shopping*. This hypothesis was further divided into three subsequent hypotheses, each targeting particular aspects of consumer behaviours towards information.

Regarding the topic of consumer preference for time and place of product research, subject of **H1.1**, the qualitative information collected in both questions 7 and 8 allowed to conclude that there was sufficient evidence to support the claim that consumers prefer to collect information while on shopping journeys. The evidences collected indicated that consumers have a tendency to make, to some degree, *a priori* researches regarding products of interest, but the traditional method of physically browsing the products while in-store is prevailing.

Likewise, even though there is some degree of prior research before shopping journeys, there are no indications that clearly operate as support for the subject of **H1.2**, which addresses the consumer's tendency to make informed decisions rather than impulsive ones. The evidence collected point towards a complementary behaviour of research and impulsiveness, with some existing degree of prior research and the last decision impulsiveness at the purchase, typical of traditional shopping.

Finally, regarding the more comprehensive desire of consumers to access higher levels of information, throughout the entire questionnaire, especially in smartphones (possible) features and usages presented in question 10 and 13, confirmation arouse that support the claim made in **H1.3**.

Hence, in regard to the adequate proof was collected in the subsequent hypothesis to claim that **H1 was confirmed**.

3.4.4.2 Privacy

Another major concern of this academic dissertation was privacy concerns of consumers in regard to companies and IT systems. As stated throughout this dissertation, the IoE system is heavily based on data to operate and, as such, the role consumers have, as an integrated part of the system, was the topic of *H2: Consumers are willing to share "private" information and preferences if offered sufficient non-monetary incentives*.

Concerning the aversion of consumers in sharing private preferences with companies, topic of **H2.1**, there was sufficient support from question 12 to confirm that, with no specific information regarding possible benefits, respondents shunned the possibility of allowing the smartphone application to access such information. Nonetheless, when revealed the possible benefits (presented in question 13) that allowing the app to access private preferences, interviewees maintain an avoidance and defensive posture. The evidence collected from comparing question 14 to 12 suggested that there was, in fact, improvement in the willingness to share information but the evolution was not significant to fully confirm **H2.2**.

Therefore, given the evidence collected, there were only sufficient indications to conclude H2 was **partially confirmed H2**.

3.4.4.3 Devices

The role mobile devices have in todays shopping journeys and the potential it instils in the future of retail is considered in the sphere of study. As stated before, in this academic dissertation, the smartphone has a central role as a channel between the IoE system and the

consumer and, as such, it is the core subject of *H3: Smartphones can have an active role in today's shopping*.

First, it was necessary to understand the actual part of the smartphone in the lives of consumers when on a shopping journey, topic tackled by **H3.1**. The findings gathered from questions 8 and 9 allowed to conclude that the smartphone has a low degree of adoption and in-store usage to consumers in shopping journeys, contradicting the aforementioned subsequent hypothesis. Nevertheless, the high and wide range of usage for consumers who admitted using the smartphone in shopping and the high scoring of the conceptual application's potential features, related with information searches, suggest an willingness of future adoption of the smartphone in in-store information research, **confirming H3.2**.

Consequently, the evidence is only sufficient to **partially confirm H3.**

Nevertheless, by introducing the possibility of a shopping mall app to respondents and its features, the results suggest that there is, indeed, willingness to download and use the app. Despite privacy concerns by consumers, the popularity of smartphone features considered in question 13, corroborated by the high scores in-store smartphones usage had on question 11, it is concluded that **H4 was confirmed**.

3.4.4.4 Social Media

Finally, Cisco envisioned the importance of social media as an indirect channel of consumer's feedback and information, a notion addressed by *H5: Consumers are willing to comment the quality of service and relevant shopping experiences in social networks.* Nevertheless, when enquired by the frequency in which comments regarding shopping related topics are made, respondents admitted to have little or no habit of posting such comments on social networks and, as such **H5 was not confirmed**.

See **Appendix 14** for more information.

3.5 Chapter Conclusions

This chapter was intended to define the main problematic of the study, routed on the aforementioned research question. The purpose of this dissertation was made clear and through it, the analysis model was drawn. A survey conducted by Cisco was used as a means to infer guidelines towards a more solid analysis model.

The concepts that emerged from the model were used to segment and create this dissertation's hypotheses, which, in turn, served as the source to the questionnaire's design. Subsequently, the questionnaire was presented and explained in relation to the intrinsic intentions and to the corresponding hypothesis or hypotheses. Being a theory-driven quantitative approach, the method of empirical data collection chosen was the questionnaire, directed to an unrestricted population sample of 120 respondents.

In the conclusions drawn from the empirical data collection hypotheses 1 and 4 were validated, hypotheses 2 and 3 were partially validated and hypothesis 5 was not validated.

4 – Strategic Applicability of IoE

The fourth chapter of the academic dissertation is aimed at the discussion of the questionnaire's findings and the applicability of the IoE technology in clustered retail according with the theory presented in the State of Art chapter. The analysis of the hypotheses' validity made in the preceding chapter allows developing a more robust analysis of the convergence and divergence of the findings of the study made so far and underlying theories presented earlier on.

In the first part of the chapter, a discussion of what particularities of the IoE system, implicit throughout the academic dissertation, have the most potential to generate benefits to both clustered retail and customers. This analysis will be performed having the Resource-based View at its core, in order to assess potential to contribute to the clustered retail's sustainable competitive advantage. The notion of Tacit Knowledge is inserted in the RBV's analysis of sustained competitive advantage as both a complement to the model, and an adaptation improvement to the dissertation's topic of data-centric technology.

The second part of the chapter will be dedicated to the strengths of the IoE system in clustered retail according to the Customer Relationship Management framework. Likewise the RBV model, the analysis of CRM will be based on the conclusions drawn from questionnaire results in the previous chapter.

Finally, the limitations of the IoE system regarding technology, privacy, and the specificities of clustered retail will be presented.

4.1 IoE Features in Clustered Retail

In the previous chapter the analysis focussed on the validation of the hypotheses devised from this academic dissertation's Research Question. Having validated part of the proposed hypotheses through empirical proof collected in the questionnaire, the emphasis will now be centred in analysing the most attractive features of the IoE system and their impact on the sustainable competitive advantage of clustered retails.

Sustained Competitive Advantage in Clustered Retail

As stated in the previous chapter, through the collection of empirical data, it was possible to prove that consumers, in a context of shopping journey, considered the access to information a significant characteristic. This indication was especially evident when presented with possible functionalities in format of a smartphone app.

4.1.1 App Attribute Analysis

Consumers were presented with a bundle of possible features to be integrated into a smartphone app and asked to rate according to the their perceived level of attractiveness.

The smartphone app had been introduced beforehand with no information regarding the possibilities or functionalities, and approximately half the sample admitted to possibly download and use it. Nonetheless, by presenting the possible features, it was possible to see the main aspects of information that consumers seek while on a shopping journey.

Features	Average Value	Percentage Value
Free Internet access throughout the mall area	6.44	92%
Mobile concierge – guide through the mall space and products in sold in the stores	5.01	71.57%
Endless aisle – at each store consult and reserve products available in-store an online	4.50	64.29%
Customized information regarding new products, relevant offers and sales (price opportunities)	5.00	71,43%
Real-time store discounts through the app's product catalogue	5.02	71,71%
Loyalty points that can be converted to client points in a store you are registered	5.11	73%
See product and store reviews from customers who purchased in the mall	3.99	57%

Table 3 – Average score of considered smartphone features

As seen in table 3, from a scale of 0 to 7, all the proposed features of the smartphone app present relatively high results. It is clear and with no surprise that free Internet access is the feature with the most appeal in the bundle, which might be related to the expectation of other internet-related activities unrelated to shopping. The aforementioned feature was included to serve as a benchmark to other functionalities and to compel the interviewee to put in perspective the importance of said functionalities.

As discussed earlier on the previous chapter, there are three functionalities that stand as information-intensive channels to consumers: *Endless Aisle*, *Customized Information*, and *Mobile Concierge*. The former is characterized by using the concept of omnichannel during shopping, in which consumers have the possibility to browse, while in-store, products from the online store, comparing features and prices even when the product is not in stock.

The second feature is less data integration demanding, regarding the shopping mall and its individual stores, but requires higher degree of data from the consumers. Given the feature is meant to be adaptable to each consumer's preferences, the access to the user's purchase and browsing history may be significant and, as such, private concerns gain special relevance. The functionality will operate based on new arrivals, price discounts and relevant offers to consumers, increasing the relative importance of information in the perception of the consumer.

Finally, the Loyalty Points feature was, disregarding the *Free Internet*, the most valued of the bundle. The fact that consumers value benefits that arise from loyalty indicates that either the attractiveness lies in the advantages gained without making much effort or changing their habits of shopping journey or in the control over to which store they prefer to allocate said points. Moreover, in light of the topic discussed in question 13 of section 3.4.3, the connection between the preference of researching products through brands' newsletters and this feature is undeniably relevant to competitive advantage of retail companies.

4.1.2 Application of the CRM Model

According to Jacoby & Chestnut (1978) and Wright & Sparks (1999), *in increasingly competitive markets, shoppers' loyalty is indeed the key factor in gaining market share and developing sustainable competitive advantage* (cited in Chebat et al. 2009). In order to gain

shoppers' loyalty a healthy and strong relation must be forged, through the adoption of a customer-centric business strategy must be adopted by the shopping mall.

Anderson (Anderson et al. 2007) stated that CRM *has emerged to allow retail companies to respond to shifting customer needs and wants using analytical tools* and, as such, there is an underlying importance of data collection. Payne and Frow (2005) proposed a framework to create and develop an effective CRM strategy, which obeyed five basilar processes, subsequently used to analyze the IoE system in clustered retail.

4.1.2.1 Strategic Development Process

The first process is aimed to develop the shopping mall's business strategy having the consumer as the centerpiece and taken into account the competitive surroundings. Given the focus and importance of customer experience in IoE's retail segment, there are high levels of compatibility between the IoE's system and CRM framework.

Regarding customer strategy, it is essential to analyze the current and potential customer base and the optimal method to segment them in order to optimize efficiency of the marketing channels. Being essentially data-driven and by considering the consumer as an integrated part of the system, diffusing and receiving information, the IoE is capable of collecting, directly and indirectly, information regarding the consumer's behaviors and preferences. By doing so, it is capable of better addressing and customizing the offers to the consumer's preferences, adjusting the marketing approach and channels used, and evolving alongside the consumer's changes in taste.

4.1.2.2 Value Creation Process

This process addresses a bipartite perspective of value, being on one hand, the value the company, in this case the shopping mall can provide the customer, and on the other, the value enjoyed by the mall.

In the value creation, as stated before, the IoE system is capable of providing a more immersive and content-rich shopping experience to the consumer. Convenience and higher levels of customization during shopping were proven, by the empirical data collected in the questionnaire, to be positive and appealing aspects of the IoE system, translating into value

creation in the perspective of the consumer. It is especially true for people who maintain the traditional approach of searching and comparing products while in-store, who regard the *Custom Information* feature as the most relevant – see discussion on question 13 of section 3.4.3.

On the other hand, as mentioned in Payne and Frow's framework, many authors view the customer as a *cocreator and coproducer* (Bendapudi and Leone 2003; Prahalad and Ramaswamy 2004; Vargo and Lusch 2004 – cited in Payne and Frow 2005), sharing IoE's view of the consumer as an integrated part of the system. The data collected from consumers will benefit the company in raising its operational efficiency and, possibly through strengthening of customer loyalty as a consequence of the value perceived by him.

Furthermore, from the perspective of shopping mall management, a mall that can generate more traffic is one that can demand higher lease price from its store tenants because more mall traffic usually translates into more store traffic and sales (Anderson et al. 2007).

4.1.2.2 Multichannel Integration Process

The envisioned implementation of the IoE system, in this academic dissertation, was mainly focussed, on a first phase, on a mobile device channel. Nevertheless, the smartphone application envisioned would implicitly have omnichannel characteristics – especially present on the *endless aisle* feature -, since the user had the option of browsing products in the online store, accessing in real-time discounts made in physical stores and reserve products in the physical store through the smartphone app.

The positive reviews given in the questionnaire regarding the smartphone app features and the desire to access more quantity and customized information are clear evidences of the positive interaction the consumers expect from said app. Even though it was proven that the smartphone is still not widely adopted by consumers as an in-store aid tool, the positive reviews and the willingness to download a possible smartphone application suggest that consumers aspire to have access to a unified view of the channels.

4.1.2.3 Information Management Process

The most important aspect of the IoE system is the collection and collation of data. Since *targeted advertising heavily relies on the use of valuable information that could lead to an accurate reconstruction of users' interests profile* (Malandrino et al. 2012), data repository, IT systems, analytical tools, and front and back office are also a key material elements in CRM. The IoE system has at its core the importance of data collection and management, with the importance of unlocking *IoE data to help predict customer behavior, asset performance, and business outcomes* (Cisco 2013). Decision based on said data will allow people within the network to make faster, more intelligent decisions, as well as control our environment more effectively.

As seen in CRM's analysis of the IoE system in clustered retail, it is possible to conclude that the IoE system concept presented follows a very customer-centric approach. The perspective of data harvest and management to create more meaningful shopping experiences is shared by CRM's theoretical framework and IoE's concept. Thus, it is only natural to conclude that according the concept of IoE system presented follows to a significant degree the CRM framework.

4.1.3 Application of the RBV Model

As explained in the State of Art, in order to achieve sustainable competitive advantage, companies have to formulate strategies by assessing the environment their operating in and utilize the existing or potential internal strengths to create substantial advantage in relation to competitors. Cisco believes that *competitive dynamics of the next decade will fundamentally be shaped by organizations' efforts to harness network effects through the new (and deeper) connections afforded by IoE* (Cisco 2013).

According to Barney's perspective of RBV model (Barney 1991), in order for sustainable competitive advantage to occur, the company's strengths, or 'distinctive competitive', must be analysed through four distinctive attributes: value, rare, imperfectly imitability, and non-substitutability. The aforementioned attributes must reflect the

company's position in the industry's environment since the *organization's strategic context helps to identify knowledge creation initiatives that strengthen its competitive position, support its mission, and create value* (Yang et al. 2010).

As demonstrated throughout this academic dissertation, Cisco's IoE framework is a data-intensive concept, in which knowledge plays a crucial goal in the efficiency and success of the system. According to Yang (Yang et al. 2010), the *theoretical background of private, or firm-specific, knowledge comes from the resource-based view (Barney, 1991)*, considered a *valuable, rare, inimitable and non-substitutable resource and a source of competitive advantage for organisations*.

4.1.3.1 Value

The value component of Barney's RBV, must enable the *firm to conceive of or implement strategies that improve its efficiency and effectiveness* and *exploit opportunities and/or neutralize threats in a firm's environment*.

As discussed earlier on, the Value-at-Stake for the retail industry is very significant, with Cisco claiming that in 2013 alone *companies failed to capture approximately 47 percent ($544 billion) of their potential Value at Stake* (Cisco 2013). The potential for profitability of the IoE system is poised on the improved operational efficiency and better customer service, which in term impacts customer influx, spending, and loyalty.

Empirical data collected through the survey suggested that respondents have a certain degree of predisposition towards the adoption of the IoE system. There are, however, high levels of reluctance and suspicion regarding information and preference sharing with retail companies. Nonetheless, given the significant score that the considered features of the smartphone app had, there are clear signs that consumers regard IoE with significant interest. This situation is corroborated by Yadav (Yadav et al. 2012) when stating that *shoppers tend to be more selective in making choices […] and patronize malls that are more attractive and have a wide variety of stores and merchandise matching their preferences*.

4.1.3.2 Rare

The following aspect of a firm's resources is *the* absolute uniqueness *among a set of competing and potential competing firms.*

Given the early stage of adoption of M2M communications in retail, especially clustered retail, and the fact that IoE is still considered a concept, the level of exclusivity of the IoE system and its components is undeniable high. Nevertheless, as M2M technology is improved and society becomes increasingly 'connected', the technological advantages derived from rareness will fade.

Moreover, the idea defended by this dissertation of conceiving a smartphone app for a shopping mall might not be novel. However, the situation is different when the integration of an app, with data-centric approach strategies at its core, takes different aspects of the consumer behaviour and preferences, and considers the individual stores as part of the whole cluster system. The resulting Tacit Knowledge of IoE system applied to clustered retail drive is derived from tracking *in-store customer behavior in order to optimize customer service and merchandising strategie*s (Cisco 2013).

The app's *Loyalty Points* feature is one example of an IoE's resource with rare characteristics, as it is based on Tacit Knowledge information between the consumer's point-generating activities and the consumer's preferences in choosing where to allocate such points. Furthermore, there were indications on the discussion in question 13 of section 3.4.3, which suggested that consumers who preferred searching products through the brands' newsletters showed more interest for the *Loyalty Points* feature. The aforementioned incentives and the possibility to integrate the system deeper in the consumer's habits are bound to generate switching costs to the consumer, discouraging the change of situation.

The conceptual smartphone app would reinforce Tacit Knowledge by being a more direct means of better tracking such behaviors, with special relevance to recording the preference history and in-store location.

4.1.3.3 Imperfect Imitable Resources

In terms of imperfectly imitability of resources, there are three factors to consider: the firm's ability to *acquire and exploit some resources depends upon their place in time and space*, the necessity for the *link between resources controlled by a firm and a firm's sustained competitive advantage* to not be *understood*, and the existence of *complex social phenomena*.

It is undeniable that it is possible to reproduce the IoE system applied to clustered retail and to employ the same technological principles to other locations and shopping malls, specially the regarding the smartphone application as first stage.

Nevertheless, *automating the creation and collection of shopper behaviour data in a natural retail environment produces more consistent, quantified, and accurate data* (Cisco 2014), unique due to the specificities of the bundle of individual retailers that compose clustered retail and the consumers who attend them. Hence, the existing Tacit Knowledge derived from the unique data collection is expected to be nearly impossible to reproduce in a accurate and efficiency way. *Architectural knowledge is organization-wide knowledge that is collectively held, tacit and private* […], with *no two organizations have the same architectural knowledge* (Matusik, 2002a, 2002b; Matusik & Hill, 1998 – cited in Yang et al. 2010)

Moreover, there is an important aspect of customer loyalty that plays a key role in terms of selecting a clustered retail to frequent. The importance given to customer loyalty is implicit in high score the feature of *Loyalty Points* of the conceptual smartphone app had, according to the questionnaire's results. Loyalty may play an important part when the consumer is already familiarized with the shopping mall's premises and stores, the IoE system, and the presentation layer – which in this case is the smartphone app.

4.1.3.4 Substitutability

By analysing the empirical data collected from the questionnaire, it was possible to identify the current low adoption of mobile devices as in-store aid tool. However, the features valued by respondents in both current usage and possible IoE's app usage indicates the smartphone's potential to become a regular means in shopping journeys. It is this potential that can represent both the greatest strength and weakness of the IoE's introductory phase considered in this academic dissertation.

Sustained Competitive Advantage in Clustered Retail

Although difficult to recreate using only the Internet, it is possible to access each brand's separate stream of information, providing similar content and recreating, to some degree, the benefits of the aforementioned concept. The differentiating factor in IoE's smartphone app, and the feature most difficult to substitute, would be unique bundle of retailers and products available to consumers, since it is extremely difficult for two clustered retailers to share the same design and store collection. Likewise, Tacit Knowledge plays an important role evident in the IoE's ability to record and transmit to both consumers and retailers alike unique real-time information, nearly impossible to recreate or substitute. The unique knowledge and insight gained by the clustered retail is developed by recording the consumers' behaviour patterns at different times in the specificities of the shopping mall space.

By analysing the components of Barney's perspective of RBV model, it is possible to conclude that the concept of mobile app, as a first step towards the full implementation of IoE system, shows potential to create sustainable competitive advantage. The expected value the concept would create to both consumers and companies operating in retail, and consequently the shopping mall management, has solid foundations and represent an enormous opportunity. Given the early stage of the technology implementation on single retail, it is easily assessed the rare characteristic of the IoE system in clustered retail, especially taking into consideration data-centric approaches for the shopping mall's strategies. Finally, despite the possible hindrances, both imperfect imitability and substitutability present solid ground to confirm Barney's perspective of sustained competitive advantage.

It is, thus, concluded that, according to Barney's perspective of the RBV model, the IoE concept presented demonstrates potential to create sustained competitive for companies operating in clustered retail, mainly through the data-centric benefits related with Tacit Knowledge.

Given the solid findings for both perspectives of sustained competitive advantage for the clustered retail, it is only natural to conclude that the Internet of Everything, indeed, has the potential to generate competitive advantage for companies operating in a clustered environment, confirming the academic dissertation's research question.

RQ: Can the Internet of Everything have the potential to generate sustainable competitive advantage for retail companies in a clustered environment?

4.2 IoE Challenges and Limitations

As mentioned in the State of Art chapter, the Internet of Everything is a concept introduced by Cisco as a subsequent stage the Internet of Things. Given the relatively initial phase of adoption of both concepts, especially Cisco's IoE, there are issues regarding the development and implementation.

4.3.1 Technology

As shown in **Appendixes 1 and 2**, there are several technologies that serve as a basis of M2M communications, yet there is yet to be established a homogeneous communication protocol between objects. This fact acts as hindrance to the implementation success of the concepts, as *many types of M2M devices, running various M2M applications with different characteristics and requirements, all need to be supported* and, as such, o*ptimizations are needed to avoid network congestion and system overload* (Chang et al. 2011).

Furthermore, regarding M2M communications, Chang (Chang et al. 2011) believes that battery enhancements and price reductions are also needed for mass-market acceptance. Technology improvements will continue to occur, however, it is necessary time for the mass-market to adopt M2M communications as basilar-stone for competitive advantage.

4.3.2 Security and Privacy

Topic of analysis throughout this dissertation, privacy is, indeed, a subject of high importance to the implementation of the IoE system. The dependence that IoE systems have of data – especially regarding customer information –, dictates that security and privacy must be ensured. *The heterogeneity and the resource limitations of IoT*, and consequently IoE, *technologies have to be taken into account* (Vermesan et al. 2012).

Furthermore, the suspicion that consumers have in sharing information, confirmed through this dissertation's empirical data, is an important point to be taken into account, as the personal right to privacy must be ensured. This is a delicate topic to the future of the IoE as *data deluge caused by* […] *entities creating information is a big threat to privacy* (Roman et al. 2013).

4.3.3 Clustered Retail

Regarding the main topic of this dissertation, the implementation of the IoE system in clustered retail – shopping mall – can be difficult and treacherous, as a combination of efforts is needed from both the shopping mall management and the individual retail stores. Such efforts are mainly linked with information collection and distribution between the different individual retailers and the mall management. Procedures and policies from each retail store's brand may oppose the sharing of client or store data to the mall's IoE system or adopt a free-rider posture, enjoying potential influx of customers without making any contribution.

Moreover, without a centralized system of data, IoE's idea of Data-in-Motion is compromised, as changes in each store may have a substantial delay before being transmitted to the system, meaning that information stopped being reported at "real-time".

4.4 Chapter Conclusions

During this chapter, the analysis of IoE system's sustainable competitive advantage when applied to clustered retail was made. The conceptual smartphone app features and their relative weights were presented to establish a origin point of analysis. Subsequently, the sustainable competitive advantage was tested according to, first, the RBV model and, then, the CRM framework.

The results collected from the questionnaire and the intrinsic strengths and benefits of the IoE technology when applied to retail allowed to conclude that, despite concerns regarding conceptual smartphone app substitutability, in the IoE system, there was significant evidence from both frameworks to support sustainable competitive advantage.

Following the confirmation of the dissertation's topic, a light incursion to the potential second phase of the IoE system was made. The objective was to give some insights on the features that can arise in the future of clustered retail.

Finally, after presenting the future possibilities of the IoE system in clustered retail, a section was created to list the main threats and limitations. In this chapter, the technological limitation was mentioned, as well as the privacy issues considered in this dissertation and confirmed by the empirical data.

5 – Conclusions

The topic of clustered retail addressed by this academic dissertation traced its origins to the rising importance of e- commerce as a virtual shopping platform and the rising awareness of today's consumer. The perspective of traditional retailers has changed in the past decades and the necessity to change in order to compete or incorporate the online commerce was evident.

As such it was proposed for single-managed clustered retail the implementation of Cisco's concept of the Internet of Everything, a technology and data-intensive concept that rely on environmental and people data collection and that could prove beneficial in terms of sustainable competitive advantage. Thus, this dissertation aimed to ascertain if such concept applied to clustered retail had the potential to create significant value to both consumers and retailers and, as such, the main topic and research question were presented:

RQ: Can the Internet of Everything have the potential to generate sustainable competitive advantage for retail companies in a clustered environment*?*

Throughout the State of Art chapter, the conceptual and technological foundations for the IoE technology were presented. Given the special relation of the concept with the Internet of Things, an analysis was structured to reflect the evolution of the IoT concept to the IoE. Subsequently, Cisco's vision of the IoE in Retail was presented to establish the foundations for this dissertation's idea of IoE system in clustered retail. Finally, the theoretical strategy frameworks were presented, with the RBV model according to Barney's perspective and the CRM framework. Both the frameworks would be used to ultimately prove the answer to the dissertation's research question.

After presenting the theoretical core of the topic in question, the model of analysis was structured to represent the most appropriate path in order to answer the research question. Based on the objectives of this dissertation and having as guidelines the findings of a survey conducted by Cisco in 2014, the hypotheses were designed. The adopted concept of IoE in clustered retail was, on a first phase, performed through a smartphone application capable of collecting and transmitting data from the consumers to the system while providing them with valuable shopping aid features. Subsequently, in order to validate the hypotheses drawn and

to collect the necessary empirical data to, ultimately, give answer to the research question, a questionnaire was designed.

From the questionnaire's results, it was possible to confirm the significant adoption of smartphones in the population's sample, with a 78.3% of respondents owning such a mobile device – question 4 of section 3.4.2. This was an important factor to be taken into account, since the envisioned concept was heavily dependent on the smartphone. Furthermore, there was evidence that pointed towards a mixed approach of purchase by consumers. On one hand, interviewees disclosed doing *a priori* research of products before deciding to purchase, whereas maintaining the traditional approach of ultimately making the decision while on the physical store, evident from the 72.4% of interviewees who prefer choosing and comparing products while shopping – question 8 of section 3.4.2.

Despite the high level of smartphone ownership, the results revealed that the smartphone is still a means of shopping aid that consumers have yet to adopt, depicted by only 25.5% of respondents who admitted to do so. Nevertheless, the interest showed on a possible shopping mall smartphone app is extremely significant, with 75.3% of smartphone owners admitting to possibly, probably or highly probably downloading and using the app. Furthermore, the possible features presented to respondents had high levels of interest and scoring, with and average rating of 77%. This indicates high levels of interest and expected values from consumers – questions 9 and 10 of sections 3.4.2 and 3.4.3.

Furthermore, the empirical data collected allowed the validation of the proposed hypotheses. First, the questionnaire enabled confirming the first hypothesis that consumers, indeed, value quick, accessible, and custom information while shopping, presented in sections 3.4.3 and 3.4.4. Furthermore, despite the validation of the privacy suspicion that consumer's feel towards retailers through the questionnaire, there were indications, in section 3.4.3, that consumers are willing to share private information and preferences if offered sufficient non-monetary incentives. Nevertheless, the data collected was not sufficient to validate hypothesis 2.

Additionally, despite the low level of smartphones adoption as an in-store aid tool, evidence was collected suggests that features related to this subject have significant attraction and willingness for future adoption of such behaviours – sections 3.4.3, 3.4.4, and 4.1. The data collected, however, was not sufficient to fully confirm hypothesis 3. Regarding a similar topic, there was, despite privacy concerns, enough evidence to support the pertinence of

developing a smartphone app for shopping. The value perceived by consumers of possibility of a shopping mall app and its features was considerable and, as such, hypothesis 4 was validated.

Finally, regarding the possibility of including social media platforms as a means to collect conscious and unconscious feedback from consumers through comments made, the results collected from the questionnaire's question 5, of section 3.4.2, were sufficient to determine the invalidity of hypothesis 5.

Through the questionnaire's results it was, likewise, possible to analyse the sustained competitive advantage of the considered IoE concept in clustered retail. The results clearly show that consumers have a high level of value expectancy towards the IoE-based smartphone application and its features, presented in section 4.1.1. The application by itself was not considered source of differentiation, however, with the expectation of Tacit Knowledge to arise from the different aspects and functionalities of the IoE system is what makes the concept truly unique and inimitable.

Furthermore, given the early stage of M2M technologies applied to retail, the IoE system was considered to have rare characteristics. Finally, given the fact that the IoE system is adapted to function accordingly to its surroundings and people, collecting an exchanging data in order to adapt in accordance with the behaviours and preferences of the people who are part of the system, it is extremely difficulty to reproduce or substitute the system or the Tacit Knowledge collected from it.

Viewing through the CRM framework, presented in section 4.1.2, it was possible to confirm the IoE's potential to create sustainable competitive advantage. The customer-centric view intrinsic to IoE technology, especially in this dissertation's contemplated concept, is one of the system's main strengths in creating value to both retailers and consumers. The importance of managing data to improve customer experience and optimizing the multichannel approach is also a characteristic that is consistent with the CRM framework

These aforementioned facts contribute to validate this academic dissertation's research question, indicating that the IoE system, indeed, <u>has the potential to create sustainable competitive advantage to the retail companies operating in the clustered retail</u>.

5.1 Future Research

Since this dissertation is based on a technology that has yet to mature, especially concerning the application to single-managed clustered retail, it would be interesting to extend future research to include the next integration steps between shopping mall's management and individual stores. The integration of IoE's technologies in each store, complementary to its presence in common spaces, and the relations between shopping mall's management and each store's brand practices would be an interesting topic of research.

Furthermore, given the many concerns regarding IoE's privacy, data security and the heterogeneity of the implicit technologies, it would be interesting to analyse the possible legal data and content limitations for the sake of privacy, even within the shopping mall or retailer's area.

APPENDIXES

Appendix 1 – Overview of Wireless Technologies (Weyrich et al. 2014)

	Use cases	Sector	Range	Through-put	Infrastructure needs	Efficiency	Chip size
LTE	Wireless communication for mobiles and data terminals	IT and communication	10 km	150 Mbit/s	Complex infrastructure from provider	High	Small
WLAN	Wider Internet access	Multiple sectors	100 m	600 Mbit/s	Router, access points	High	Medium
Bluetooth	Product interface	Consumer	100 m	706.25 kbits/s	No special infrastructure, point to point (p2p)	Low	Small
ZigBee	Device control	Consumer and industrial equipment	100 m	250 kbit/s	Access points	Low	Large
Wireless HART	Sensors and actuators	Process, industry	250 m	2 measurement	HART gateway to the fieldbus	High	Large
Industrial WLAN	Sensors and actuators	Process, industry	100 m	450 Mbits/s	Access points, gateways to the fieldbus	High	Large
EnOcean	Energy harvesting, smart homes	Building, automation	30 m	125 kB/s	Transceiver modules	Very low	Large
RFID	Non-contact identification and tracing	Many industries	6 m	100 kbit/s	Tags, scanner	Very low	Very small
NFC	Radio communication	Smartphones	10 cm	424 kbits/s	Smartphones, tags	Very low	Very small

	Integration effort	Cost	Scaling potential	Encoding	Market Readiness	URL
LTE	High	Low	Low	AES128	Mature for wide usage	www.3gpp.org/technologies/keywords-acronyms/98-lte
WLAN	Very high	Low	High	WPA2	Mature for wide usage	www.radio-electronics.com/info/wireless/wi-fi/ieee-802-11n.php
Bluetooth	Low	Low	High	AES128	Mature for wide usage	www.bluetooth.com/Pages/what-is-bluetooth-technology.aspx
ZigBee	High	High	High	AES128	Mature for wide usage	www.zigbee.org/About/AboutTechnology/Standards.aspx
Wireless HART	Low	High	Low	AES128	Niche markets	www.hartcomm.org/protocol/training/training_resources_wihart.html
Industrial WLAN	Very high	High	High	WPA2	Niche markets	https://a248.e.akamai.net/cache.automation.siemens.com/dnl/TM/TM0MTMzAAAA_90880063_HB/22681042_Aufbau_IWLAN_DOKU_V30_en.pdf
EnOcean	High	Low	Medium	ARC4 or AES	Certain sectors	www.enocean.com/fileadmin/redaktion/pdf/articles/perpetuum_radio_standards_en.pdf
RFID	Low	Low	Low	Not required	Mature for wide usage	www.rfid-journal.de/rfid-technik.html
NFC	Low	Low	Low	Not required	Upcoming	www.nfc24.info

Appendix 2

Vermesan and Friess (Vermesan and Friess 2013) defined the most common communication technologies proposed by standardisation bodies:

IEEE 802.15.4 has developed a low-cost, low-power consumption, low complexity, low to medium range communication standard at the link and the physical layers [122] for resource-constrained devices.

Bluetooth low energy (Bluetooth LE, [123]) is the ultra-low power version of the Bluetooth technology [124] that is up to 15 times more efficient than Bluetooth.

Ultra-Wide Bandwidth (UWB) Technology [125] is an emerging technology in the IoT domain that transmits signals across a much larger frequency range than conventional systems. UWB, in addition to its communication capabilities, it can allow for high precision ranging of devices in IoT applications.

RFID/NFC proposes a variety of standards to offer contactless solutions. Proximity cards can only be read from less than 10 cm and follows the ISO 14443 standard [126] and is also the basis of the NFC standard. RFID tags or vicinity tags dedicated to identification of objects have a reading distance which can reach 7 to 8 meters.
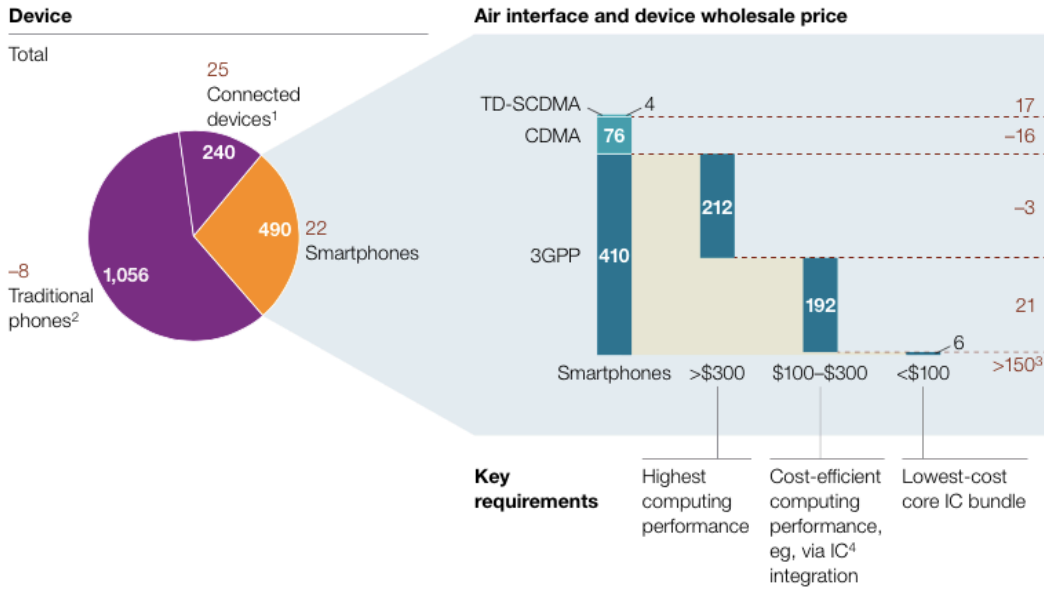
Appendix 3 – Growth and weight of mobile device market (McKinsey 2012)

Mobile-device market, million units, 2011

% Compound annual growth rate, 2011–15

Device

Total

25 Connected devices[1]

240

490 22 Smartphones

−8 Traditional phones[2]

1,056

Air interface and device wholesale price

TD-SCDMA 4 — 17
CDMA 76 — −16
212 — −3
3GPP 410
192 — 21
6 >150[3]

Smartphones >$300 $100–$300 <$100

Key requirements

| Highest computing performance | Cost-efficient computing performance, eg, via IC[4] integration | Lowest-cost core IC bundle |

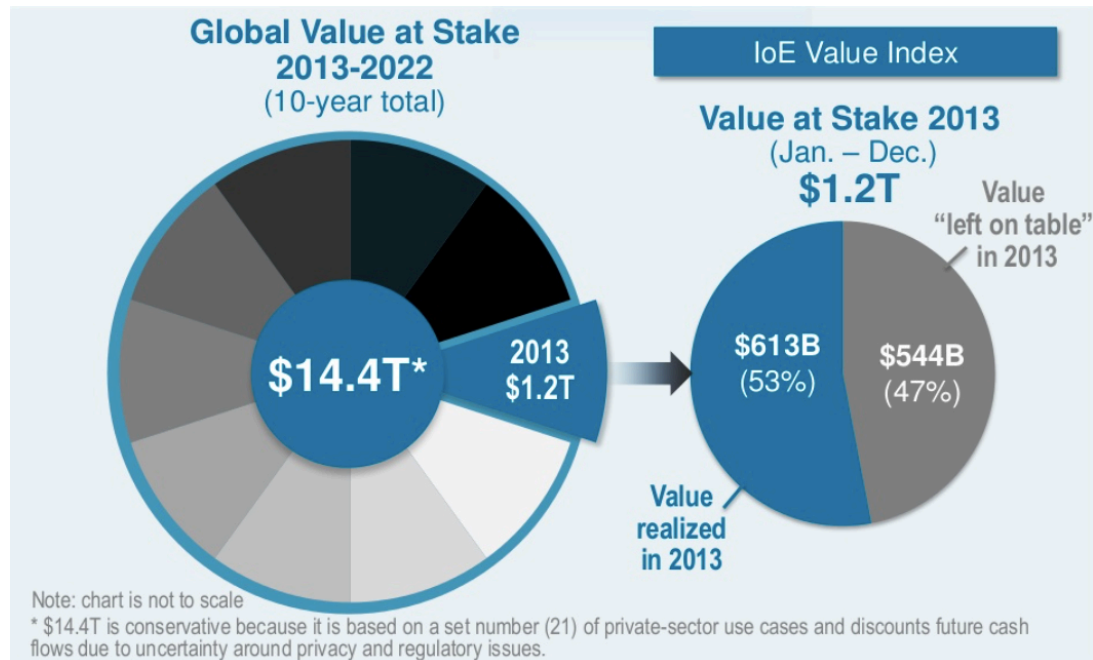[1] Including iPad, machine-to-machine communications, 3G/4G cards, dongles, and so on.
[2] Real-time operating system.
[3] ~220 million units by 2015.
[4] Integrated circuit.

Source: Strategy Analytics; McKinsey analysis

Appendix 4 – Value at Stake estimations for the next decade and for 2013 (Cisco White Paper 2013)

Appendix 5 – How IoE Value Realized is estimated (Cisco White Paper 2013)

The IoE Value Index incorporates both survey data and market indicators drawn from third parties.

The survey component of the Index is based on a respondent's capabilities in three areas: collaboration, analytics/"Big Data," and the Internet of Things (for example, sensors). These capabilities are representative of the core enablers of the 21 IoE use cases around the world. The survey asked business and IT leaders to provide perceptions of their companies' strengths and weaknesses across these capabilities in order to ascertain the level of progress their companies have made in each area.

The third-party data component of the Index is based on measures of transformational IT investment of a respondent's industry and the levels of innovation productivity and network quality within a respondent's country. By combining these indicators, we created a composite picture from both an industry and geographical perspective.

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Using both survey data and third-party market data enabled Cisco to base the Index upon both intra-firm capabilities (as assessed in the survey) and "hard" data on the business environment in which companies operate. Respondents were not asked about IoE per se, but rather about the types of capabilities their organizations possessed in collaboration, analytics/"Big Data," and the Internet of Things; the quality and quantity of information available to them; and their views on the overall connectedness of their business.

Appendix 6

With IoT, devices typically gather data and stream it over the Internet to a central source, where it is analyzed and processed. As the capabilities of things connected to the Internet continue to advance, they will become more intelligent by combining data into more useful information. Rather than just reporting raw data, connected things will soon send higher-level information back to machines, computers, and people for further evaluation and decision making. This transformation from data to information in IoE is important because it will allow us to make faster, more intelligent decisions, as well as control our environment more effectively.

Jim Grubb

Using Data in Motion streams from video, social, and mobile sources, retailers can create new ways to engage with customers, boost revenue, and deliver a richer, more interactive customer experience.

For example, video is already a significant source of Data in Motion. Using the intelligent network, retailers can tap the value hidden in this data to understand and interact with customers better and faster than ever before. Using high-definition video surveillance

cameras in combination with data analysis, they can gain insight into age, gender, emotional state, and socioeconomic indicators and employ facial recognition technologies.

The real power of Data in Motion lies in the capability to create tools and interactions that matter here and now, in real time.

Cisco Data-in-Motion

Appendix 7 - How IoE is driving value in Retail (Cisco White Paper 2013)

IoE in Action: Retail	
Machine-to-Machine (M2M)	• Improve payment flexibility and security with mobile electronic payments • Automatically have product orders placed when inventory falls below a certain level • Optimize energy usage within retail stores using environmental sensors (e.g., lighting, temperature) and smart energy technologies
Machine-to-People (M2P)	• Use mobile and video analytics to track customer behavior in store to optimize customer service and merchandising strategies • Customize offerings, marketing, and advertising messages by taking into account customer history, preferences, location, and budget • Use technologies such as in-aisle interactive displays and digital signage to help shoppers explore products, and drive up-sell / cross-sell
People-to-People (P2P)	• Use video collaboration to provide on-demand advice and to scale expert sales staff across multiple stores • Enable store managers, district managers, and executives at corporate headquarters to increase efficiency of store planning and operations using collaboration technologies • Provide training, product information, and interactive content to sales associates via their own mobile devices (i.e., BYOD)

Appendix 8 – IoE possibilities for Retail

New Connections	What They Mean
Machine-to-Machine	
· Shelf sensors · Parking-space sensors · IR motion sensors · Weight mats · Environment sensors · Door sensors · Mobile payment	· Inventory visibility · Automated ordering process · Flexible payment options · Energy optimization

| New Connections	What They Mean
Machine-to-People	
· Digital signage · Connected cameras and analytics · Wi-Fi badges · Gesture recognition · Point-of-sale · Kiosk	· Behavioral insight · Personal-Social/Local/Mobile content · Endless aisle omnichannel
People-to-People	
· Shopper mobile devices · Store associate mobile devices · Immersive video · Social media · Contact center · E-commerce site	· On-demand expert advice · Collaborative development · On-demand training

Appendix 9 – Relationship between the intrinsic attributes of the firm's resources and Sustainable Competitive Advantage (Barney 1991 – page 112)
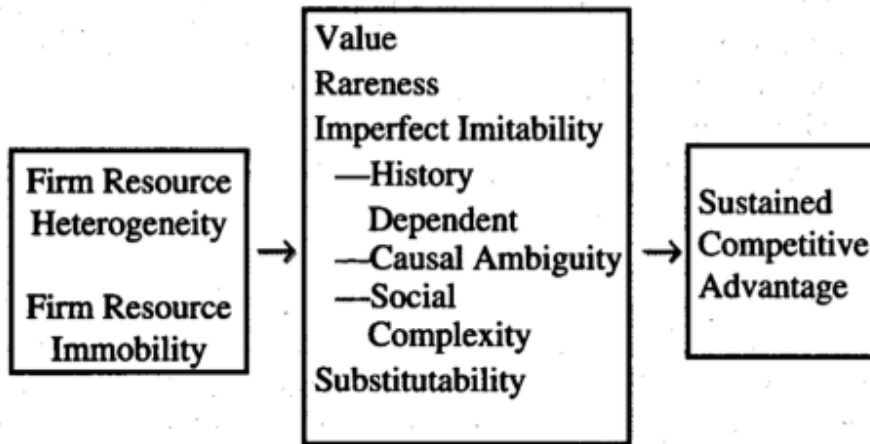
Appendix 10 – Payne and Frow (2005) Conceptual Framework
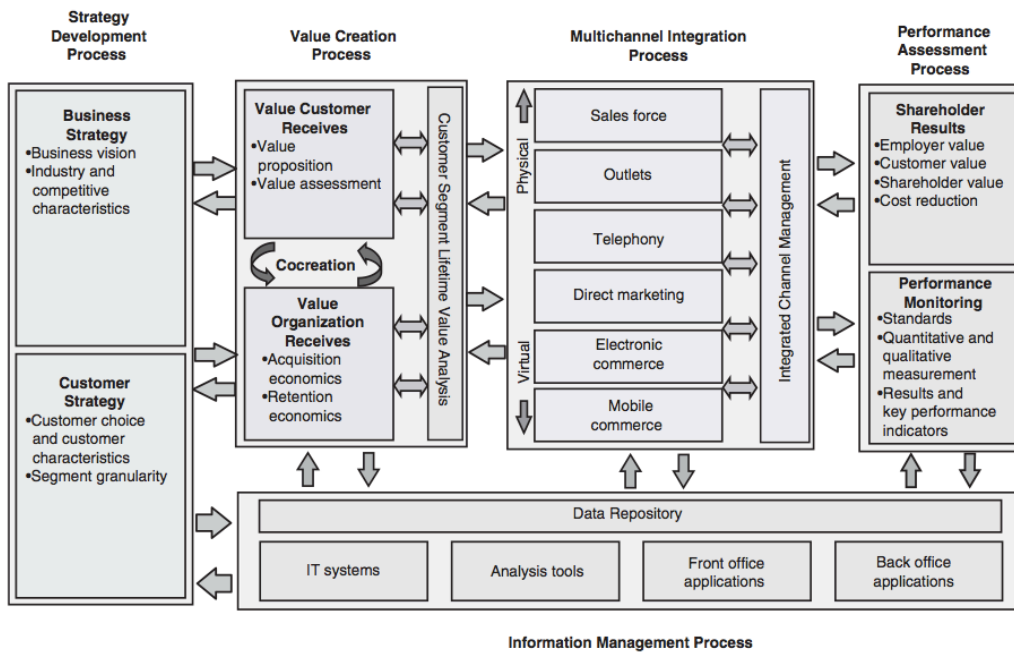
Appendix 11 – Pathway from concepts to questionnaire

Section	Concepts	Aim to understand	Hypotheses	Subsequent Hypotheses	Questions
	Consumer typical shopping process	Information regarding products is researched at home or during shopping		H1.1 – Home vs Shopping	Q8. When shopping for an item, which of the situation is most common?
		Consumers tend to purchase more under informed decisions rather than impulsive drives	H1: Consumers value quick, accessible, and custom information while shopping	H1.2 - Informed vs Impulse	Q8. When shopping for an item, which of the situation is most common?
Information and Data	Consumer desires	Consumers are willing/keen to have access to higher levels and more customized information		H1.3 - Desire for info	Q12. Would you be willing to permit such app to access your preferences (of products, brands and items) from browser searches and other apps (e.g. Facebook) in order to further customize your shopping experience? Q13. In a scale from 1 to 7, according to your preferences, rate each of the following smartphone app functionalities according to their attractiveness.
Privacy	Consumer's private data and preferences	Consumers are *a priori* not willing to share private data with companies	H2: Consumers are willing to share "private" information and preferences if offered sufficient non-monetary incentives.	H2.1 – Distrust in brands	Q12. Would you be willing to permit such app to access your preferences (of products, brands and items) from browser searches and other apps (e.g. Facebook) in order to further customize your shopping experience?
	Incentives for	Non-monetary incentives may prove sufficient to		H2.2 – Incentives	Q14. Based on the traits presented in the last question, would you now be willing to permit such

Internet of Everything

Sustained Competitive Advantage in Clustered Retail

Category	Concept	Statement	Hypothesis	Questions
	data sharing	deter consumers to share information	are sufficient	app to access your preferences (of products, brands and items) from browser searches and other apps (e.g. Facebook) in order to further customize your shopping experience
	Digital means	Digital means are commonly used in shopping journeys	H3.1 – Smartphones active role	Q9. Do you use your smartphone in-store as an aid for shopping? Q10. If yes, when shopping what do you usually use your smartphone for?
Devices	Product information in-store	Search of product information and alternatives can become significant in shopping journeys	H3 – Smartphones can have an active role in today's shopping / H3.2 – Smartphone in-store features	Q10. If yes, when shopping what do you usually use your smartphone for? Q13. In a scale from 1 to 7, according to your preferences, rate each of the following smartphone app functionalities according to their attractiveness.
		Mobile device application (app) may be the most effective channel to connect consumers to IoE	H4: It is pertinent to develop a smartphone app for shopping	Q11. If a smartphone app of the shopping mall you usually attend be made available, would you download and use it? Q13. In a scale from 1 to 7, according to your preferences, rate each of the following smartphone app functionalities according to their attractiveness.
Social Media	Social media and information	Social media may prove an additional means to capture feedback from consumers	H5: Consumers are willing to comment the quality of service and relevant shopping experiences in social networks	Q5. Regarding posts on social media, have you ever commented shopping experiences you had? If yes, which topics you tend to comment the most?

Appendix 12 – Questionnaire Structure

Part I – Sample Characteristics (page 1)

English ▾

. Gender

Female

Male

. Age

<18

19 - 24

25 - 29

30 - 34

35 - 39

>40

. Nationality

Part II - Smartphone and Social Media (page 2)

English ▾

. Do you own a smartphone?

Yes

No

. Regarding posts on social media, have you ever commented shopping experiences you had?
If yes, which topics you tend to comment the most?

	Never	Rarely	Sometimes	Frequently	Highly frequent	(Almost) Always
Purchases made in a certain store	○	○	○	○	○	○
Quality of the products services of a store	○	○	○	○	○	○
Helpfulness and quality of treatment of a store's staff	○	○	○	○	○	○
Positive of negative details in the ambience or space that caught your attention	○	○	○	○	○	○
Special events held on a mall	○	○	○	○	○	○

Part III - Clustered Retail (page 3)

English   ·

. How often do you go to shopping malls?

Never

Less than Once a Month

Once a Month

2-3 Times a Month

Once a Week

2-3 Times a Week

Daily

. When going to a mall, what are the most likely scenario?
(Order the scenarios from the most common (1) to the least common (4)

Go for a walk - no shopping purpose

Window shopping - without any specific item in mind

Shopping for an item - without any specific brand

Shopping for a product - with brand in mind

. When going shopping for an item, what do you usually do?
[Rate each scenario according to the probability of occuring, being 0 (Never) and 10 (Always)]
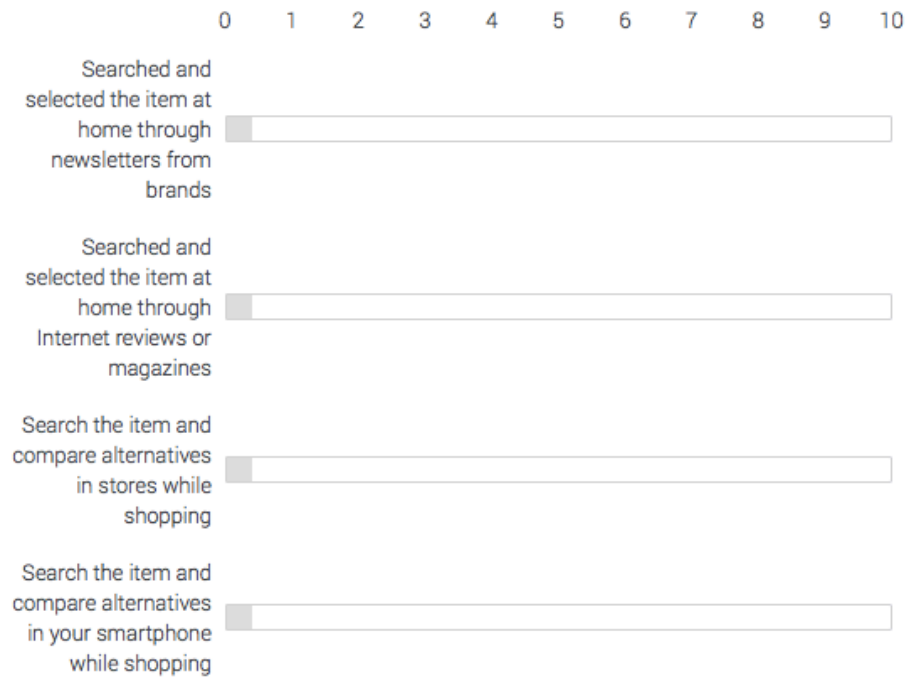
	0	1	2	3	4	5	6	7	8	9	10
Searched and selected the item at home through newsletters from brands											
Searched and selected the item at home through Internet reviews or magazines											
Search the item and compare alternatives in stores while shopping											
Search the item and compare alternatives in your smartphone while shopping											

(Page 4)

English ▾

. Do you use your smarphone in-store as an aid for shopping?

Yes
No

. If yes, when shopping, what do you usually use your smartphone for?
[Rate according to the level of usage, being 0 (Never) and 10 (Always)]

```
                                    0   1   2   3   4   5   6   7   8   9   10

Make price comparisons              ●───────────────────────────────────────
Browse products                     ●───────────────────────────────────────
Find product reviews                ●───────────────────────────────────────
Find product information            ●───────────────────────────────────────
Find sale or promotion              ●───────────────────────────────────────
  opportunities
Find product availability in-store  ●───────────────────────────────────────
Find the location of a store        ●───────────────────────────────────────
```

. If a smartphone app of the shopping mall(s) you usually attend be made available for smartphone (or other mobile devices), would you download and use it?

Most unlikely
Unlikely
Possibly
Probable
Highly probable

. Would you be willing to permit such app to access your preferences (of products, brands and items) from browser searches and other apps (e.g. Facebook) in order to further customize your shopping experience?
[Rank according to level of willingness , being 0 (Utterly unwilling) to 10 (Certainly willing)]

```
                     0   1   2   3   4   5   6   7   8   9   10
Level of willingness ●───────────────────────────────────────
```

90

Part IV - Shopping Mall Smartphone App (page 5)

English ⌄

. In a scale from 1 to 7, according to your preferences, rate each of the following smartphone app functionalities according to their attractiveness.
(1 – Unappealing; 7 – Extremely appealing)

Free Internet access throughout the mall area ☆☆☆☆☆☆☆

Mobile concierge – guide through the mall space and products in sold in the stores ☆☆☆☆☆☆☆

Endless aisle – at each store consult and reserve products available in-store an online ☆☆☆☆☆☆☆

Customized information regarding new products, relevant offers and sales (price opportunities) ☆☆☆☆☆☆☆

See product and store reviews from customers who purchased in the mall ☆☆☆☆☆☆☆

Real-time store discounts through the app's product catalogue ☆☆☆☆☆☆☆

Loyalty points that can be converted to client points in a store you are registered ☆☆☆☆☆☆☆

. Based on the functionalities presented in the last question, would you now be willing to permit such an app to access your preferences (of products, brands and items) from browser searches and other apps (e.g. Facebook) in order to further customize your shopping experience?
[Rank according to level of willingness , being 0 (Utterly unwilling) to 100 (Certainly willing)]

	0	1	2	3	4	5	6	7	8	9	10
Level of Willingness	●										

Appendix 13 – Questionnaire Results

Question 1
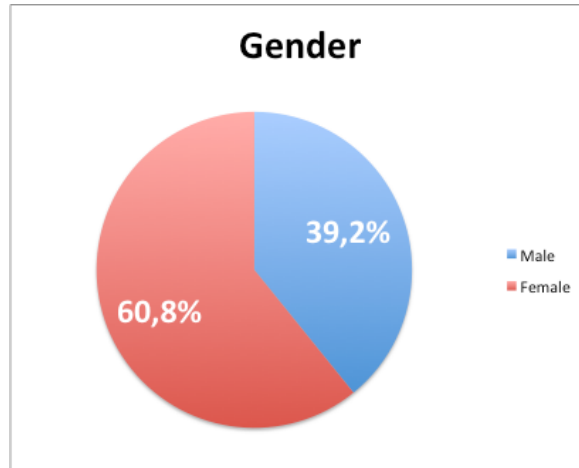
Question 2
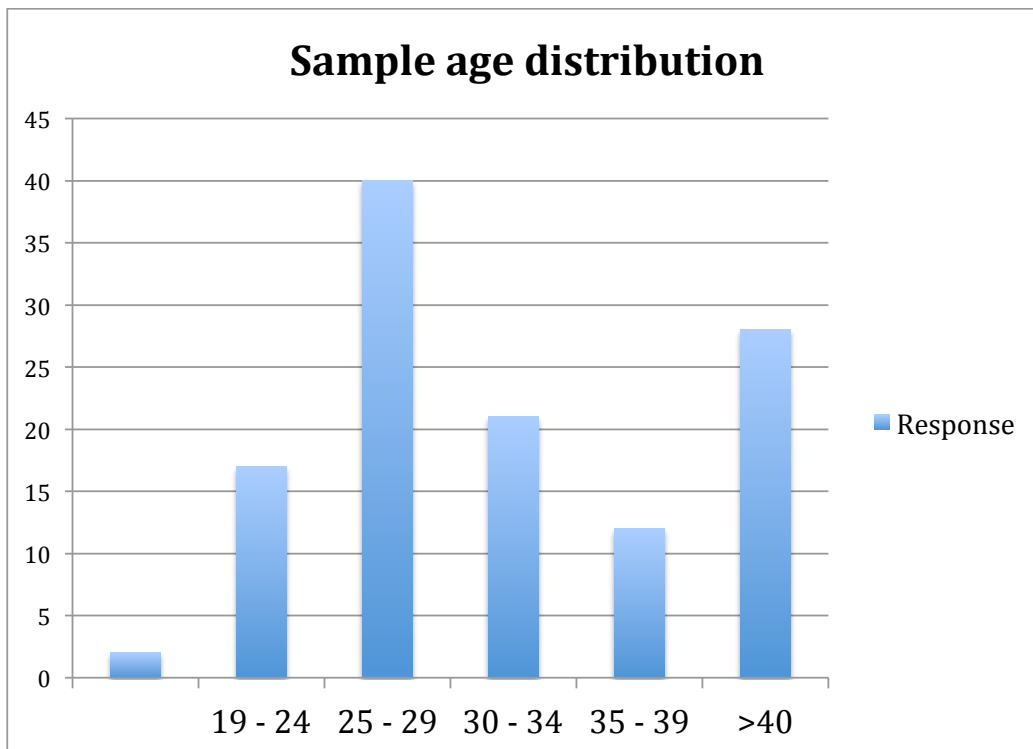
Question 4
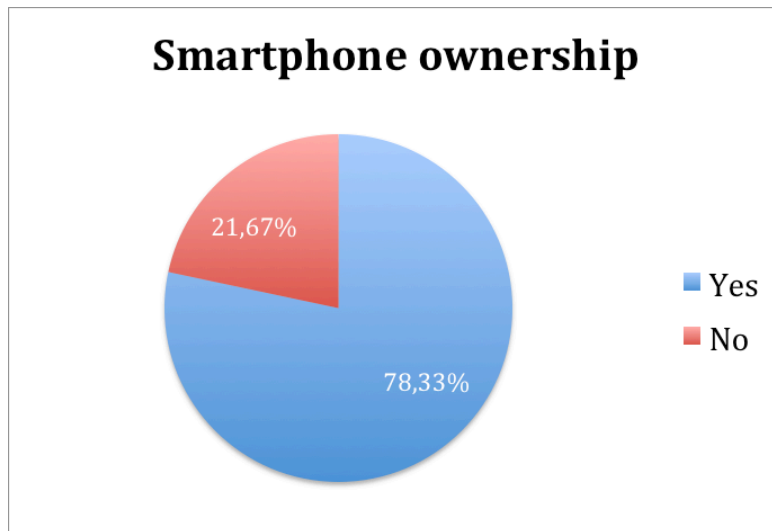
Question 5

Statistic	Purchases made in a certain store	Quality of the products services of a store	Helpfulness and quality of treatment of a store's staff	Positive of negative details in the ambience or space that caught your attention	Special events held on a mall
Min Value	1	1	1	1	1
Max Value	6	6	6	6	6
Mean	2.45	2.39	2.33	2.42	2.49
Variance	4.10	3.47	3.72	4.03	4.69
Standard Deviation	2.02	1.86	1.93	2.01	2.17
Total Responses	120	120	120	120	120

Sustained Competitive Advantage in Clustered Retail

Question 6

#	Answer	Response	%
1	Never	0	0%
2	Less than Once a Month	10	8%
3	Once a Month	8	7%
4	2-3 Times a Month	41	34%
5	Once a Week	47	39%
6	2-3 Times a Week	13	11%
7	Daily	1	1%
	Total	120	100%

Question 7

Question 8

Question 9
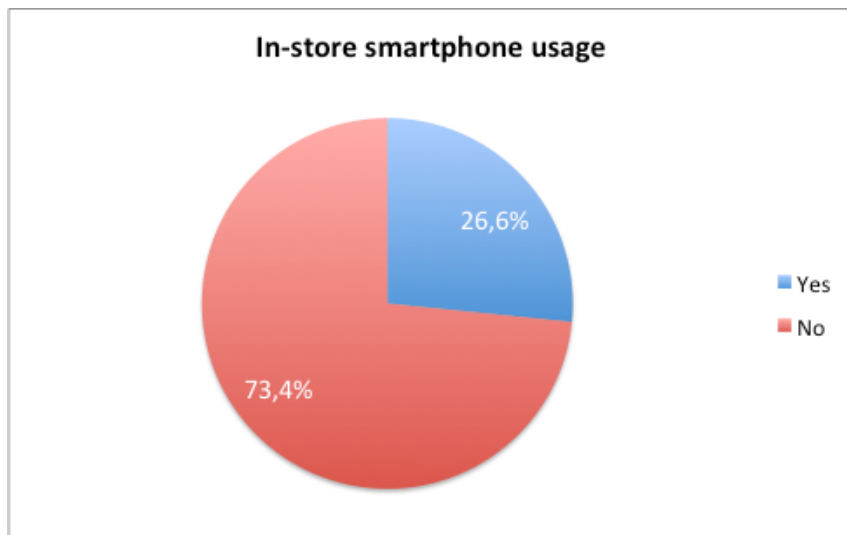
Question 10
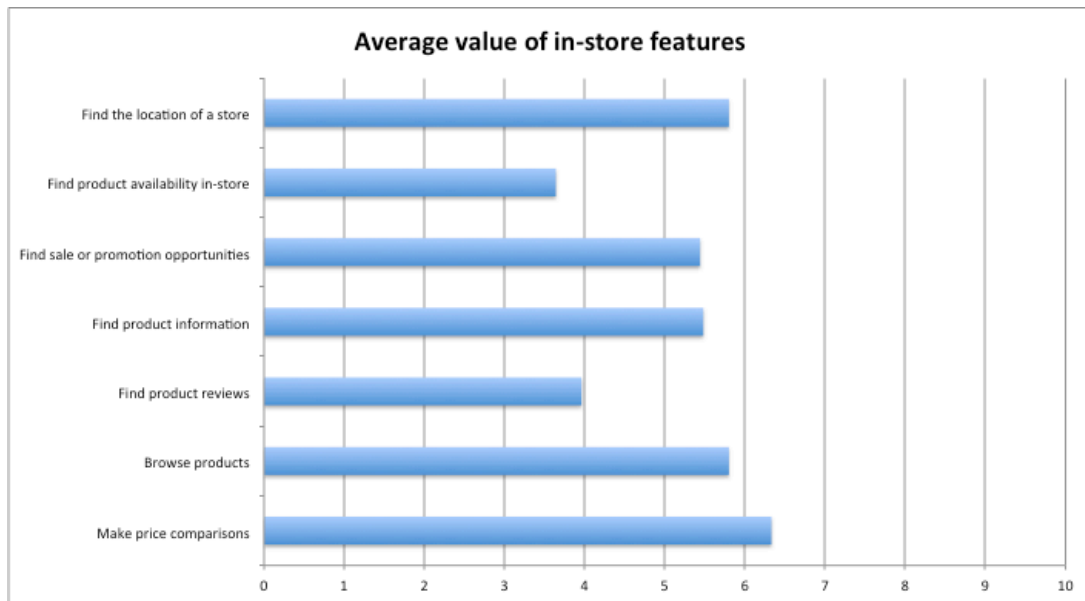
Question 11
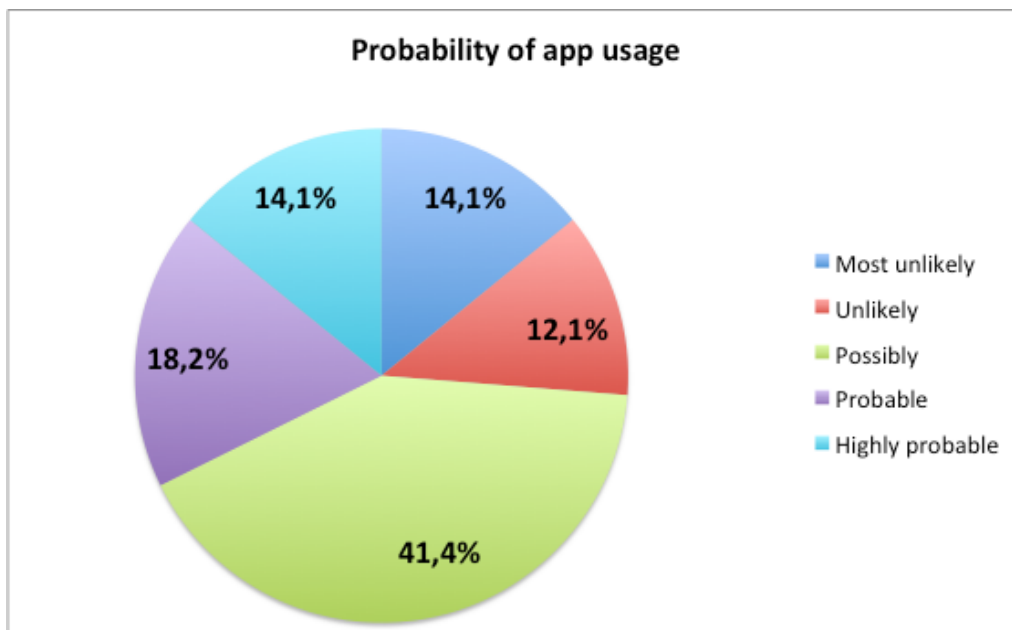
Question 12 – Willingness of private information sharing

Sustained Competitive Advantage in Clustered Retail

#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
1	Level of willingness	0.00	10.00	3.12	2.95	94

Question 13

Feature Rating

Question 14 - Willingness of private information sharing after presented with app features

#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
1	Level of Willingness	0.00	10.00	4.34	2.88	94

Appendix 14 – Hypotheses validation summary

Hypotheses	Succeeding Hypotheses	Subsequent Confirmation	Hypotheses Validation
H1: Consumers value quick, accessible, and custom information while shopping	H1.1 – Home vs Shopping	Confirmed	**Validated**
	H1.2 - Informed vs Impulse	Not confirmed	
	H1.3 - Desire for info	Confirmed	
H2: Consumers are willing to share "private" information and preferences if offered sufficient non-monetary incentives.	H2.1 – Distrust in brands	Confirmed	**Partially Validated**
	H2.2 – Incentives are sufficient	Not confirmed	
H3 – Smartphones can have an active role in today's shopping	H3.1 – Smartphones active role	Not confirmed	**Partially Validated**
	H3.2 – Smartphone in-store features	Confirmed	
H4: It is pertinent to develop a smartphone app for shopping	Confirmed		**Validated**
H5: Consumers are willing to comment the quality of service and relevant shopping experiences in social networks	Not confirmed		**Not Validated**

Appendix 15 – Models of Multiple Regression Analysis (OLS)

```
Model 1: OLS, using observations 1-132 (n = 99)
Missing or incomplete observations dropped: 33
Dependent variable: Willingness

                   coefficient   std. error   t-ratio   p-value
  ---------------------------------------------------------------
  const             -0.836427     1.44753      -0.5778   0.5648
  Free_Internet     -0.142390     0.225592     -0.6312   0.5295
  Concierge          0.330982     0.189949      1.742    0.0848   *
  Endless_aisle      0.0568440    0.203257      0.2797   0.7804
  Customized_info    0.417592     0.205468      2.032    0.0450   **
  Discounts          0.273270     0.188365      1.451    0.1503
  Loyalty_points     0.0310758    0.184878      0.1681   0.8669
  Reviews            0.115227     0.168384      0.6843   0.4955

Mean dependent var    4.222222   S.D. dependent var    2.905152
Sum squared resid     529.6001   S.E. of regression    2.412422
R-squared             0.359699   Adjusted R-squared    0.310445
F(7, 91)              7.302949   P-value(F)            6.12e-07
Log-likelihood       -223.4865   Akaike criterion      462.9731
Schwarz criterion     483.7340   Hannan-Quinn          471.3730

Excluding the constant, p-value was highest for variable 45 (Loyalty_points)
```

```
Model 2: OLS, using observations 1-132 (n = 99)
Missing or incomplete observations dropped: 33
Dependent variable: Loyalty_points

                    coefficient   std. error   t-ratio   p-value
  ---------------------------------------------------------------
  const              3.77276      0.685697      5.502    3.23e-07  ***
  Research_Newslet~  0.223445     0.0709097     3.151    0.0022    ***
  Reserch_Internet~ -0.0929945    0.0784402    -1.186    0.2388
  Research_Physica~  0.121145     0.0787667     1.538    0.1274
  Research_Smartph~ -0.0484108    0.0675432    -0.7167   0.4753

Mean dependent var    5.131313   S.D. dependent var    1.782262
Sum squared resid     271.7573   S.E. of regression    1.700305
R-squared             0.127004   Adjusted R-squared    0.089856
F(4, 94)              3.418810   P-value(F)            0.011769
Log-likelihood       -190.4595   Akaike criterion      390.9190
Schwarz criterion     403.8946   Hannan-Quinn          396.1690

Excluding the constant, p-value was highest for variable 29
(Research_Smartphone)
```

```
Model 3: OLS, using observations 1-132 (n = 99)
Missing or incomplete observations dropped: 33
Dependent variable: Reviews

                       coefficient   std. error   t-ratio   p-value
      -------------------------------------------------------------------
      const              2.73354      0.689550      3.964    0.0001   ***
      Research_Newslet~  -0.0186354   0.0713082    -0.2613   0.7944
      Reserch_Internet~   0.217001    0.0788810     2.751    0.0071   ***
      Research_Physica~   0.0155820   0.0792093     0.1967   0.8445
      Research_Smartph~   0.0597223   0.0679228     0.8793   0.3815

Mean dependent var    3.888889    S.D. dependent var    1.795055
Sum squared resid     274.8202    S.E. of regression    1.709859
R-squared             0.129704    Adjusted R-squared    0.092670
F(4, 94)              3.502298    P-value(F)            0.010360
Log-likelihood       -191.0143    Akaike criterion     392.0286
Schwarz criterion     405.0042    Hannan-Quinn         397.2785

Excluding the constant, p-value was highest for variable 28
(Research_PhysicalStore)




Model 4: OLS, using observations 1-132 (n = 99)
Missing or incomplete observations dropped: 33
Dependent variable: Customized_info

                       coefficient   std. error   t-ratio   p-value
      -------------------------------------------------------------------
      const              2.63563      0.678097      3.887    0.0002   ***
      Research_Newslet~   0.0139209   0.0701238     0.1985   0.8431
      Reserch_Internet~   0.122593    0.0775708     1.580    0.1174
      Research_Physica~   0.227819    0.0778937     2.925    0.0043   ***
      Research_Smartph~   0.0322705   0.0667946     0.4831   0.6301

Mean dependent var    4.969697    S.D. dependent var    1.758098
Sum squared resid     265.7665    S.E. of regression    1.681459
R-squared             0.122620    Adjusted R-squared    0.085284
F(4, 94)              3.284277    P-value(F)            0.014454
Log-likelihood       -189.3561    Akaike criterion     388.7122
Schwarz criterion     401.6878    Hannan-Quinn         393.9621

Excluding the constant, p-value was highest for variable 26
(Research_Newsletters)
```

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References

Anderson, J. L., Jolly, L. D. & Fairhurst, A. E. (2007). *Customer relationship management in retailing: A content analysis of retail trade journals*. Journal of Retailing and Consumer Services 14: 394–399

Atzori, L., Iera, A. & Morabito, G. (2010). *The Internet of Things: A survey*. Computer Networks 54 (2010): 2787–2805

Atzori, L., Iera, A., Morabito, G. & Nitti, M. (2012). *The Social Internet of Things (SIoT) – When social networks meet the Internet of Things: Concept, architecture and network characterization*. Computer Networks 56 (2012): 3594–3608

Bandyopadhyay, D. & Send, J. (2011). *Internet of Things: Applications and Challenges in Technology and Standardization*. Wireless Pers Commun (2011) 58: 49–69

Barney, J. (1991). *Firm Resources and Sustained Competitive Advantage*. Journal of Management, Vol. 17, No. 1: 99-120

Barreto, I. (2010). *Dynamic Capabilities: A review of past research and an agenda for the future*. Journal of Management 2010; 36: 256-280

Castro, M., Jara, A. J. & Skarmeta, A. F. (2012). *An analysis of M2M platforms: challenges and opportunities for the Internet of Things*. 2012 Sixth International Conference on Innovative Mobile and Internet Services in Ubiquitous Computing, 978-0-7695-4684-1/12: 757-762

Cisco (2014). *Beyond Big Data: How Next-Generation Shopper Analytics and the Internet of Everything Transform the Retail Business*. White Paper

Cisco (2013). *Catch and Keep' Digital Shoppers How To Deliver Retail Their Way*. Cisco Internet Business Solutions Group

Cisco (2014). *Digital Shopping Behavior in an 'Internet of Everything' World*. Research Insights

Cisco (2013). *Internet of Everything (IoE) At-a-Glance*

Cisco (2013). *The Internet of Everything (IoE): Cisco IoE Value Index Study* – Frequently Asked Questions

Cisco (2013). *Internet of Everything (IoE): Retail At-a-Glance*

Cisco (2013). *Internet of Everything (IoE) Value Index: How much Value Are Private-Sector Firms Capturing from IoE in 2013?* – White Paper

Chalmeta, R. (2005). *Methodology for Customer Relationship Management*. Journal of Systems and Software 79 (2006): 1015–1024

Chang, K., Soong, A., Tseng, M. & Xiang, Z. (2011). *Global Wireless Machine-to-Machine Standardization*. IEEE Internet Computing 1089-7801/11: 64-69

Chebat, J-C, Hedhli, K. E. & Sirgy, M. J. (2009). *How does shopper-based mall equity generate mall loyalty? A conceptual model and empirical evidence*. Journal of Retailing and Consumer Services 16: 50–60

Chen, M., Wan, J. & Li, F. (2012). *Machine-to-Machine Communications: Architectures, Standards and Applications*. KSII Transactions on Internet and Information Systems, Vol. 6, No. 2, Feb 2012

Darley, W. K. (2010). *The Interaction of Online Technology on the Consumer Shopping Experience. Guest Editorial: The Interaction Of Online Technology*. Psychology & Marketing, Vol. 27(2): 91–93 (February 2010)

Eisenhardt, K. M. & Martin, J. A. (2000) *Dynamic Capabilities: What are they?* Strategic Management Journal; Oct/Nov 2000; 21, 10/11: 1105-1121

Elkhodr, M., Shahrestani, S. & Cheung, H. (2012). *A review of mobile location privacy in the Internet of Things*. ICT and Knowledge Engineering (ICT & Knowledge Engineering), 2012 10th International Conference on , vol.266, no.272:21-23

Ernst, H., Hoyer, W. D., Krafft, M. & Krieger, K. (2011). *Customer relationship management and company performance—the mediating role of new product performance*. Journal of the Academic Marketing Science, 39: 290–306

Floerkemeire, C., Langheinrich, M., Fleisch, E., Friedemann, M. & Sarma, S. E. (2008). *The Internet of Things*. First International Conference, IOT 2008 Zurich, Switzerland, March 26-28, 2008 Proceedings

Gama, K., Touseau, L. & Donsez, D. (2011). *Combining heterogeneous service technologies for building an Internet of Things middleware*. Computer Communications 35 (2012): 405–417

Gubbi, K., Buyya, R., Marusic, S. & Palaniswami, M. (2013). *Internet of Things (IoT): A vision, architectural elements, and future directions*. Future Generation Computer Systems 29 (2013): 1645–1660

Kim, E-J. & Youm, S. (2013). *Machine-to-machine platform architecture for horizontal service integration*. URASIP Journal on Wireless Communications and Networking 2013: 79

Kim, I., Christiansen, T., Feinberg, R. & Choi, H (2005). *Mall Entertainment and Shopping Behaviors: A Graphical Modeling Approach*. Advances in Consumer Research Vol.32: 487-492

Lehtonen, M., Ostojic, D., Illic, A. & Michahelles, F. (2009). *Securing RFID systems by detecting tag cloning*. Pervasive Computing: Lecture Notes in Computer Science Volume 5538: 291-308

Lubit, R. (2001). Tacit Knowledge and Knowledge Management: The keys to sustainable competitive advantage. Organizational Dynamics, Vol. 29, No. 4: 164–178

Ma HD. (2011). *Internet of things: Objectives and scientific challenges*. Journal of Computer Science and Technology 26(6): 919–924

Miorandi, D., Sicari, S., Pellegrini, F. D. & Chlamtac, I. (2012). *Internet of things: Vision, applications and research challenges*. Ad Hoc Networks 10 (2012): 1497–1516

Nonaka, I. & Krogh, G. (2009). *Tacit knowledge and knowledge conversion: controversy and advancement in organizational knowledge creation theory*. Perspective, Organization Science 20(3): 635–652

Sustained Competitive Advantage in Clustered Retail

Nonaka, I., Umemoto, K. & Senoo, D. (1996). *From information processing to knowledge creation: a paradigm shift in business administration*. Technology in Society, Vol. 18, No. 2: 203-218

Nonaka, I., Reinmoeller, P. & Senoo, D. (1998). *Management Focus – The 'ART' of Knowledge: Systems to Capitalize on Market Knowledge*. European Management Journal Vol. 16, No. 6: 673–684

P-Y. Léo & J. Philippe (2002). *Retail Centres: Location and Consumer's Satisfaction*. The Service Industries Journal, 22(1): 122-146

Payne, A. & Frow, P. (2005). *A Strategic Framework for Customer Relationship Management*. Journal of Marketing, Vol. 69: 167–176

Porter, M. E. (1991). *Towards a Dynamic Theory of Strategy*. Strategic Management Journal, Vol. 12: 95-117

Reimers, V. & Clulow, V. (2004). *Retail concentration: a comparison of spatial convenience in shopping strips and shopping centres*. Journal of Retailing and Consumer Services 11 (2004): 207–221

Romeo, M., Codina, N., Yepes-Baldó, M., Pestana, J. V. & Guardia, J. (2013). *Data mining and mall users profile*. Universitas Psychologica, 12(1): 195-207

Teller, C., Reutterer, T. & Schnedlitz (2008). *Hedonic and utilitarian shopper types in evolved and created retail agglomerations*. The International Review of Retail, Distribution and Consumer Research, 18(3): 283-309

Teece, D. J., Pisano, G. & Shuen, A. (1997). *Dynamic Capabilities and Strategic Management.* Strategic Management Journal, Vol. 18, No. 7: 509-533

Teece, D. J. (2007). *Explicating Dynamic Capabilities: The nature and microfoundations of (sustainable) enterprise performance*. Strategic Management Journal, 28: 1319–1350

Vermesan, O., Friess, P., Guillemin, P., Sundmaeker, H., Eisenhauer, M., Moessner, K., Le Gall, F. & Cousin, P. (2013). *Internet of Things Strategic Research and Innovation Agenda*. Internet of Things: Converging Technologies for Smart Environments and Integrated

Ecosystems, River Publishers Series in Communication: 7-151

Vermesan, O., Friess, P., Woysch, G., Guillemin, P., Gusmeroli, S., Sundmaeker, H., Bassi, A., Eisenhauer, M. & Moessner, K. (2012). *Europe's IoT Strategic Agenda 2012*. Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems, River Publishers Series in Communication: 20-117

Wang, X., Dong, J.S., Chin, C.Y., Hettiarachchi, S.R., & Zhang, D. (2004). *Semantic Space: an infrastructure for smart spaces*. IEEE Pervasive Computing, 3(3):32-39

Weyrich, M., Schmidt, J. P. & Ebert, C. (2014). *Machine-to-Machine Communication*. IEEE Computer Society, Vol. 31, Issue No. 4: 19-23

Xia, F., Yang, L. T., Wang, L. & Vienel, A. (2012). *Internet of Things*. Editorial: International Journal of Communication Systems *Int. J. Commun. Syst.* 2012; **25**:1101–1102

Yadav, S., Siraj, S. & Arora, R. (2012). *Customer Patronage Behaviour in Shopping Mall: A review Analysis*. International Journal of Retailing & Rural Business Perspectives, Vol. 1, No. 2: 119-130 (October-December 2012)

Yang, C.-W., Fang, S.-C., & Lin, J. L. (2010). *Organizational knowledge creation strategies: A Conceptual framework*. International Journal of Information Management 30: 231–238

Zheng, J., Simplot-Ryl, D., Bisdikian, C. & Mouftah, H.T. (2011). *The Internet of Things. Guest Editorial*. Communications Magazine, IEEE, Vol. 49, Issue No. 11: 30-31

Online References

http://blogs.cisco.com/ioe/retail-and-consumer-experience/

http://blogs.cisco.com/retail

http://share.cisco.com/DiM/

http://share.cisco.com/IoESocialWhitepaper/#/

http://www.cisco.com/web/tomorrow-starts-here/retail/index.html

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http://www.cisco.com/web/about/ac79/innov/IoE.html#~tab~sm,acc~resource-center

http://www.hbcheritage.ca/hbcheritage/history/social/CustomerExperience/malldev

http://www.marcresearch.com/pdf/Mobile_InStore_Research_Study.pdf