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E-BUSINESS MANAGEMENT

SECURITY CONCERNS AND TRUST IN THE ADOPTION OF M-COMMERCE

Master Thesis

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INTRODUCTION

Nowadays, new technologies and communication channels are constantly emerge and lead to new ways of conducting businesses. Mostly, this situation influence businesses to restructure themselves by employing new tools in order to tailor to new markets or business trends. It is needless to say that, today, consumers easily embrace all these new technologies and channels than in previous decades. In a nutshell, both businesses and consumers can take a number of advantages such as having convenient, fast and safe transactions than they had in the past. It is well-known that millions of people use smartphones and tablets to surf the internet for entertainment, information, purchasing of products and the like. For this reason, year in year out, the use of hand-held devices to purchase services or products on the go is constantly increasing. This is a great opportunity for e-businesses to take this situation under serious consideration and provide e-consumers with associated services such as Mobile Commerce not only to meet consumers' needs but also to be more competitive by increasing the offered value, entering new markets and generating more revenues.

The topic of this master thesis will be of both theoretical and practical importance. Due to the in-depth examination of variables such as customer perception of risk and trust attitude in the adoption of mobile commerce, the author will generate new knowledge which will help not only future researcher to further investigate this context but also e-business to get an insight of how people react in mobile commerce security and trust factors. To begin with future researchers, they can combine the results of this study with other relevant factors in terms of risks and trust, namely, to further extend this study and keep up the academic discussion in this context. As for e-businesses, they can leverage this new knowledge in a practical way because they will understand all the associated factors affecting the intention to use m-commerce, that is to say, their services. This process would be of paramount importance to them as they will be able to better plan all future mobile activities, from design to content creation perspectives.

After having searched into research databases such as ebscohost.com and academic search engines such as Google Scholar, base-search.net and academia.edu the author found that a lot of researches examined the adoption of electronic commerce not only in a holistic way but also in specific areas by taking determinants such as the perception of risk and trust under consideration. Moreover, the author encountered researches in terms of mobile commerce, at this context, despite the fact that researchers examine the adoption of m-commerce in a holistic way, there was not any research to focus solely and in-depth on the determinants of trust and perceived risk.

After reviewing the literature in an effort to identify as many factors as possible that affect these two variables, they will be examined individually. To further clarify, there will be examination of factors in terms of risk such as privacy, mobile transactions, quality of product or service and mobile commerce legislation, as well as, factors in terms of trust such as institution-based, transparency, and characteristics of safety and security an online vendor offers. Last, but not least, factors associated with perceived usefulness and perceived ease of use such as availability, easy way of finding and understanding policies about current issues, will be examined, as well.

This topic is intrigued by lots of authors and works that contributed not only to electronic but also mobile commerce as well. Also, Davis F. examined e-commerce issues. Tsalgatidou examined the challenges and emerging issues of m-commerce in two different papers. Siau k. et al developed a framework for trust in mobile commerce. Shon et al, investigated the security perceptions for mobile payment systems. Moreover, Amoroso D.L. and Hunsinger D.S. investigated the consumer's acceptance of online purchasing. Challeppa and Pavlou investigated the consumer trust in e-commerce transactions (trust and risks). What is more, Clarke examined the person location as implications to risk and policy in new technologies. Culman explored the consumer attitude towards secondary use of information. Gururajan examined the new financial transaction security concerns in m-commerce. Joubert and Belle investigated the role of trust and risk in m-commerce adoption. Mahatanankoon P. et al, conducted a research on exploring consumer perception of mobile applications. Phelps J. et al, investigated the privacy concerns and consumer willingness to provide personal information. Last, Swaminatha T.M. and Ghosh A.K examined the software security and privacy risks in m-commerce communications.

In this thesis the object is twofold, that is to say, mobile commerce and security concerns (risks and trust).

When it comes to the novelty of the research, as the author mentioned before, there was a holistic research on mobile commerce adoption and this research aims to examine more in-depth two specific determinants such as perceived risk and customer trust. The novelty of this research is to perform an empirical study by testing the developed hypotheses of a proposed research model build by the author and based on TAM model.

As for the research problem, there is lack of knowledge on which determinants of trust affect negatively the perception of risk as well as which determinants of these two individual variables directly affect in a negative or positive way the intention to adopt mobile commerce.

In order to solve this problem, some research questions have been set. Initially, there will be examination on whether trust attitude reduces the perception of security risks to adopt mobile commerce. Secondly, it will be examined whether trust directly influence customers to adopt mobile commerce. Next, if security risks directly deter the intention to adopt mobile commerce. At last, another question is whether mobile customers are willing to adopt mobile commerce if they are provided with detailed and easy to understand policies capable to handle all security concerns. To solve this problem, a number of hypotheses were developed in order to validate or reject them and answer the research questions.

In the beginning, the purpose of this study is an empirical research as the author will put an effort to prove or disapprove the developed hypotheses. To delve into details, identified factors related to mobile commerce adoption in terms of security concerns (risk and trust) are going to be tested in order to validate or reject the stated hypotheses. Afterwards, the study slightly becomes explanatory, as there will be identification of whether and how much the examined factors in terms of risk and trust influence the intention to use mobile commerce as well as if and how much the trust factors affect the perception of risk.

There are four main objectives, first and foremost, the author aims to discover factors that might affect the adoption of m-commerce by collecting and analyzing existing information about security concerns and trust derived from academic literature in terms of both electronic and mobile commerce. This procedure takes part as these both fields are relevant between each other. Secondly, an additional objective is to review technology acceptance methods in order for the author to propose a relevant for this study model base on an existing and widespread method. Moreover, the identified factors to be examined and tested though the proposed model in order to keep an academic level of investigation. The last main objective is to analyze the data in order to indicate which factors negatively or positively affect the adoption of mobile commerce.

In order to achieve all the objectives mentioned above, the use of a variety of methods is essential. When it comes to theoretical collection methods, firstly, analogy is used to discover new phenomena in terms of risks and trust as electronic and mobile commerce have an abundance of similar characteristics. Moreover, generalization method is used to indicate principles of security concerns that are necessary not only to understand better this discipline but also to identify relations in m-commerce context. The last theoretical collection method is the modeling one which is used to show the relation between objects and variables (independent and dependent). As for the empirical collection methods, a survey instrument is conducted with the use of a quantitative approach. Therefore, after operationalizing the constructs, a questionnaire was prepared to gain an insight of

customer perception in terms of risk and trust in the adoption of mobile commerce. The questions associated with the research constructs employed Likert scales in order to get measurements later on. Moreover, the data of some scales were transformed to increase the accuracy of results. Next, the sample characteristics as well as it size were defined in order to perform a generalizable survey. After the survey was performed, a descriptive data analysis (univariate analysis) was used, measuring score means and standard deviation of the questions. At last, all the proposed hypotheses were validated according to the final results.

Keywords

Mobile Commerce, Security Concerns, Trust, Perceived Risk, Privacy, Mobile Transactions, M-commerce Legislation, Technology Acceptance Model, M-commerce Adoption

1. THE EVOLUTION OF M-COMMERCE

1.1 Businesses, ICT and the Internet

Throughout the past decades, there was a development in information and communication technologies that influenced businesses to change dramatically their environments. Nowadays, businesses have the opportunity to avail of the offered benefits as long as there is a will to change their function in order to not only provide more value to their customers and generate more revenues but also to gain a competitive advantage over their competitors in a specific industry. In other words, they take information and communication technologies under serious consideration and try to integrate them as much as possible into their business. However, it is well known that businesses differ from each other when it comes to the degree of ICT integration. To further clarify, some businesses have a systematic and integral use of ICT, also they have a great scale of external collaboration with other businesses, and the organization is oriented towards net economy and customer needs, while other businesses do not have systematic use of ICT, they have little external collaboration, the alignment of the business is partly towards net economy and they do not always trying to satisfy customer needs *[69, p.23]*.

The evolution of the Internet is going hand-in-hand with the development of ICT. It is well-known that the internet is the largest network of computers in existence today. The number of its users is becoming huge, namely, there is an increasing amount of connected computers that support peer-to-peer relationships. In terms of the market, this can provide a great opportunity for sellers to get connected with buyers and vice versa. The Internet is a two-way communication network in which sellers and buyers can not only communicate their messages but also a variety of transactions such as payments can successfully take part in it. Moreover, in this two-way communication system every party is given with the same level of reach at a low cost. The cost of using the internet is next to nothing comparing to other traditional media as sellers can reach buyers by developing an inexpensive website which provides all the associated and detailed information about a business such as conduct details and background, and its products or services. Also, one other cheap way to reach buyers is through online advertisement which is also proved to be more efficient and targeted compering to other traditional media such as TV, Radio, Newspaper and the like. On the other side, buyers can reach seller in a relatively low cost by conducting a simple search through search engines such as Google, Yahoo, Bing, AOL etc. Moreover, the internet saves time because all these parties mentioned before can reach each other in a small amount of time, for instance, buyers are able to find the product or services according to their needs in literally few seconds, while in

traditional media they had to spend ages to get relevant products or services and additional time to go at brick-and-mortar stores to buy them *[25, p. 5]*.

1.2 The commercial potential of the internet

The Internet reduces the gap between customers and retailers by offering a combined channel of marketing and distribution which is interactive. The word "Channel" is defined as a way in which a product from source flows to an end-user, for example, from retailer to consumer. Initially, the internet was a means of communicating information about the retail organization as well as its products and services. Next, this channel was used as a more proactive marketing tool, inviting consumers to interactively access the Website. Today, it is a means for businesses to sell their products or services on-line through transactions with the customers *[48, p. 955]*.

As I mentioned in the previous subchapter, the advantages offered by this new channel are accessibility, direct communications, cost and time saving, and the opening of new markets as businesses can enter to new markets that were previously incapable of. Consequently, the internet enables retailers to focus their marketing efforts on managing the customers more effectively. On the other side of the coin, this commercial potential has also some limitations such as technical problems. It is well-known that some websites have complex user interface and users might find it difficult to easily navigate in it. Moreover, user's connection speed and security concerns can set barriers to this retail channel *[71, p. 23]*.

Nowadays, it is very common that businesses aim at reaping all the benefits offered by the internet because they have increasingly started to apply technologies based on the World Wide Web and the like. This situation provides them with many opportunities and new challenges arising monthly and even daily. In other words, they are innovative by employing activities such as electronic commerce and the like.

1.3 E-commerce

Electronic commerce (e-commerce) can be defined as a procedure in which financial or none financial transactions can be accomplished between organizations and customers. In other words, technology offers electronic means to conduct commerce within-business, business-to-business, business-to-consumer, government-to-consumers and many more interactions. The common thing here is that organizations use the same infrastructure and all actions are conducted online. Electronic commerce can have a wide range of various perspectives. Initially, there can be an easier delivery of information, products, services or payments by electronic means. Also, there can be the application of technology towards business transactions and workflows. Cost reduction and

augmentation of service delivery speed can also be doable processes. Last, but not least, business can have an intermittent online presence (24/7) *[17, p.10]*.

It is worthwhile to mention that electronic commerce impacts not only marketing but also production and consumption. Information collected through web stores is used to customize products, to forecast future demand, and to formulate business strategies. Consumers not only order and pay for products online, but also search for product information, reveal their preferences, negotiate with sellers, exchange information about products and firms, and use products online by filtering, processing, and linking them with other computer programs *[24, p. 21]*.

1.4 E-business

After electronic commerce has been adopted by a multitude of businesses, there was a need of transformation of key business processes by the use of internet technologies. In 1997, IBM was the first company which use the term "E-Business" to promote its services *[17, p.13]*.

Electronic business (e-business) is any process that a business organization conducts over a computer-mediated network. Organizations which use e-business activities can be governmental, profit or nonprofit entities. These activities can be related to production, customers and internal management processes *[20, p.9]*.

First and foremost, there is the ability to acquire goods and services that are procured at the best possible cost to meet the needs of the purchaser when it comes to quality time and location. Stock can be replenished automatically as the stock is controlled by the computer so it is well known how many products have been bought and sold. E-business can employ electronic payment processes as well as having electronic links with suppliers. When it comes to customer-focused processes, they can employ digital marketing activities. Initially they can optimize the website content to rank higher in the search engines. Also, they can get reports about sales and viewership and according to them, to revamp content or to put more emphasis on some specific content in order for them to include the element of personalization, in which only associated products or services are shown to particular visitors according to their preferences. Online advertisement (CPC/CPM etc.) is also a new tool used by e-businesses to promote their messages to people meeting the criteria of the advertisement such as location, language and the like. Moreover, it is very common for e-businesses to use online PR, social media, email and mobile marketing not only to increase revenues but also to engage more consumers to e-business brand. Customer management and support is of paramount importance too. For this reason, e-businesses can employ eCRM activities to better support their consumers, that is to say, they can be able to easily access every client's purchase and

communication history and provide him with faster support. It is worth to say this process increase the value of the business. As for, the internal focused processes, normally e-businesses can provide their employees with automated services, training, ability to share information among them, have video conferencing and so on *[20, p.10]*.

In a nutshell, business can get a lot of benefits by reducing their operational costs such as shop assistances, store expenditures. Also the new way of marketing is cheaper comparing to traditional way of promotion and it can be more personalized, also business can keep track of returns of investment to recognize how effective an advertisement campaign was. What is more, information collected through the web stores is used to customize products, to forecast future demand and help business to give more emphasis in specific product lines and revamp their strategies. Internet can be used as an alternative marketing channel selling existing products online. Also, it can increase competition in the market because it lowers the cost of bringing together geographically distant buyers and sellers *[24, p. 22]*.

This venture can be of paramount importance not only for the business itself but also for its consumers too. In other words, more available choices for consumers are offered. This process lowers search for products and they can be lower transaction costs. Moreover, e-businesses remove location, so consumers can purchase products or services from their homes 24/7. In this way, they reduce time and do not spent money to go at a physical store. Also, they are offered with more alternative ways of communication with the business, such as email, web chat and so on *[17, p.344]*.

1.5 M-Commerce

1.5.1 Mobile commerce

Mobile Commerce (MCM) is the next generation of commerce and e-businesses from a variety of fields try to integrate it into their models. M-commerce is defined as any type of transaction of an economic value by using mobile telecommunications network and at least one mobile device. Transactions include buying or selling of goods / services, transferring ownership or rights, transferring money and the like. In other words, it is similar to e-commerce transactions performed by a customer using a hand-held device and a wireless internet connection *[103, p.26]*.

The mobile and electronic commerce business environments and activities have a lot in common. Since they involve much of the same functionality, that is to say, the use of the internet to conduct business they differ to each other when it comes to the mode of communication as well as the types of internet access devices *[28, p. 2]*.

Communication Mode - The main mode of conducting wired e-Commerce is through a wired connection to a Local Area Network (LAN) while that for m-Commerce is through a wireless network such as GSM, 3G, HSPA, Wi-Fi and the like.

Internet Access Devices - Wired e-Commerce is conducted mainly through desktop and laptop computers. M-Commerce, on the other hand, is conducted through a variety of wireless devices including cell phones, tablets, PDAs, and wireless-enabled laptops. Since most of these devices are more personal in nature than the usual desktop (i.e. they tend to be used by a single user who carries the device at most times), the potential for offering personalized products/services is higher.

A number of reasons have contributed to the increasing importance of Mobile Commerce. Initially, it is worth to say there were many advances in wireless network technology *[105, p.1]*. To further clarify, all major mobile handset manufacturing companies make smart phones and tablets which totally support wireless internet and web facilities that cover the personal, official and commercial benefits offered by the internet in order for consumers to get connected through the internet from many places and rip of the benefits. Moreover, network operators have contributed to build this new way of commerce by offering consumer information such as location and the like *[105, p.7]*. What is more, the miniature size of hand held devices permits everybody to carry them everywhere, so it can be a new channel of marketing for offering personalized and localized services. Also, the use of hand-held devices such as PDAs, mobile phones, tablets and the like is continuously increasing.

The Mobile commerce has some unique features that someone cannot find in the other forms of commercial transactions such as e-commerce. Below there is a short description of them *[70, p. 10]:*

Ubiquity – It is the ability to take advantage of mobile transactions independently of the user's current geographical location.

Immediacy – This feature is closely related with ubiquity and renders the mobile user capable of using the associated services immediately and anytime. This feature particularly attractive to mobile commerce as the demand for a fast reaction is constantly increasing.

Localization - Positioning technologies, such as the Global Positioning System (GPS), allow companies to offer goods and services to the user specific to his current location. Location based services can be, thus, offered to meet consumers' needs and wishes for localized content and services.

Instant connectivity – Nowadays, mobile devices are constantly "online" thanks to the development of various mobile telecommunication technologies such as 3G, HSPA and 4G. This feature brings convenience to the mobile user reducing time consumption when it comes to mobile commerce activities.

Pro-active functionality - M-Commerce opens, by the virtue of its ability to be immediate, local and personal, new avenues for push-marketing, such as content- and product offers. Services like "Opt-in advertising" can be offered, so that a user may choose the products, services and companies, which he wants to be kept informed about.

Simple authentication procedure: Mobile telecommunication devices function with an electronic chip called Subscriber Identity Module (SIM). The SIM is registered with the network operator and the owner is thus unambiguously identifiable. The clear identification of the user in combination with an individual Personal Identification Number (PIN) makes any further time-consuming, complicated and potentially inefficient authentication process redundant.

Nowadays, modern consumers are willing to pay for goods and services by using their mobile devices. However, there are a small number of applications and mobile websites available through the internet. So the potential of m-commerce is enormous, as this way of online purchasing can be very convenient for the consumers and can provide a competitive advantage to the vendor organization. First and foremost, it can be an ideal channel not only for offering personalized and location-based services but also one-to-one marketing. Mobile devices also open new ways to mobile marketing such as mobile advertisement *[106, p. 485]*. Other characteristics of m-commerce beyond mobility and reachability can include flexibility, exceptional business market potential, greater efficiency and higher fruitfulness *[47, p.25]*.

Despite the fact that mobile commerce is getting a great deal of global attention, mobile consumers are coping with some difficulties to engage in this new type of commerce. There are some factors which dramatically affect the buying procedure such as trust, security, satisfaction, user interface, habit and many more. Thus, e-businesses should provide services which are demand-driven and customer-focused in order to achieve their ultimate goal *[59, p. 37]*.

1.5.2 Factors for the adoption of M-Commerce

As I mentioned in the previous paragraph there are some factors affecting the adoption of M-commerce such as trust, security, privacy, satisfaction, user interface, habit and many more. In this subchapter I will shortly provide you with the definitions of some associated factors:

Trust – The Oxford Dictionaries define it as a belief in the reliability, truth, or ability of someone or something *[104, p. 1]*. Also, trust is the confidence in the other's goodwill and can also be viewed as being a consensual ideology *[86, p. 118]*. It plays a crucial role in commercial relationships *[72, p. 110]*. Trust is a highly complex and multidimensional phenomenon *[61, p. 967]* that I will examine in-depth, in terms of m-commerce, throughout this thesis.

Security – It is the state of being free from danger or threat and is highly correlated with trust. The greater the trust, the more secure someone might feel *[92, p. 1]*. The author discusses this factor from different perspectives in the next chapter.

Privacy – According to Longman Dictionary, there are two definitions of the word "Privacy". It is the state of being able to be alone and not seen or heard by other people, or the state of being free from public attention *[84, p. 1]*. There are plenty of privacy elements that go hand-in-hand with the adoption of m-commerce and are going to be examined in the next chapter, as well.

Satisfaction – It is a pleasant feeling that someone gets when he receives something he wanted or when he has done something he was craving for. Other definitions such as the of achieving a need or wish as well as the way of dealing with a complaint or problem that makes the person who complained feel happy, can also considered to be correct *[89, p. 1]*. When it comes to M-commerce, it is determined that customer satisfaction is of paramount importance *[62, p.7]*. Good mobile website quality through a proper user interface described before (customization and interactivity) can create good experience, consequently customer satisfaction *[63, p. 16]*. Rapid customer support and responsiveness can also contribute to satisfaction *[35, p. 16]*. Last, but not least, good transaction experiences always satisfy consumers *[46, p. 290]*.

User interface – The procedure of designing an application or website according to consumer needs can be defined as User Interface. The role of efficient interaction is of paramount importance. Understanding usability problem and solving them according to what are the customer needs is vital for the adoption of m-commerce. When it comes to usability, relevant information (personalization), ease of input, navigation, readability on display, accuracy and quality of information and the ability of search are very important factors *[95, p.88]*. In other words,

customization and user friendly interface can also dramatically affect the buying process. On the other side of the coin, that Gamification seems to gain territory in e-businesses because m-consumers fancy playing with mobile data services. It goes without saying that these services should support interactive consumer experience and provide entertainment in order to be considered as a type of generating revenues *[32, p.65]*.

Other factors

There are also some other factors which can affect the adoption of m-commerce. First of all, some consumers might not have mobile devices capable to support such kind of services or they might be not enough literate on how to use new technologies to purchase products or services. Consequently, they render themselves incapable of using a mobile commerce service. Secondly, the lack of telecommunication infrastructure, such as incapability of the mobile portal to supply e-businesses with information relevant to the current location of the user as well as user's profile, past behavior and the like can play a dramatically important role. Moreover, in some countries telecommunication providers do not offer their users with enough amount of downloadable space in order to download digital products. Also, one factor can be the small capital investment of e-businesses towards mobile commerce *[73, p.33]*. In addition, there might be a great reliance on cash as a medium of paying instead of mobile payment systems, credit cards and the like. On the other side, consumers might be willing to use such kind of services but they have concerns about the small size of screens. To further clarify, they might feel more comfortable of purchasing product or services through desktops or laptops *[73, p.17]*. Lastly, the emergence of mobile viruses and worms might affect the sales factors as there's an increase number of criminals who seek to obtain important financial data and exchange information from consumers *[73, p.39]*.

2. SECURITY CONCERNS IN M-COMMERCE

It turns out that security aspects are very important when it comes to m-commerce adoption by m-customers. In this relatively new field, security has a number of different aspects which are closely related between each other. To further clarify, privacy is the security of private user information. Moreover, when there is an existence of good security in an e-business, then users trust it accordingly.

2.1 Security as a general notion

In this subchapter there will be a detailed explanation of the notion "Security" and its main categories. Afterwards, an indication of how people do perceive security from both objective and subjective aspects. Next, there will be a short explanation of the security perception factors. This general context about security will lay the groundwork for further investigation, this time, by delving more into m-commerce aspects.

The detailed examination of the current or potential security issues in this context will provide us with necessary information to better understand and probably handle them in time.

2.1.1 Definition and Categories

The definitions of the word "Security" vary. Oxford is providing us with four definitions mainly pointing that security is the state of being free from danger or threat. The three other explanations, such as "the state of feeling safe, stable, and free from fear or anxiety", "the safety of a state or organization against criminal activities such as terrorism, theft or espionage" and "procedures followed or measures taken to ensure that security of a state or organization" can define the word "Security" as well *[92, p. 1]*. Similarly, Collins dictionary gives us a relevant to the previous one definition, that is to say, Security may be considered as assured freedom from poverty or want, precautions taken to ensure against theft, espionage or a person or thing that secures or guarantees *[34, p. 1]*.

Scientists that are adept at the security field have opened a conversation examining the psychology of this notion. Security as a condition is the degree of resistance to, or protection from, harm. It applies to any vulnerable and valuable asset, such as a person, dwelling, community, nation, or organization *[91, p. 26]*. However, there are plenty of scientists insisting that "Security" is an undefined term *[100, p. 64]* as well as capricious in nature and application, practiced across many domains and with heterogeneous actors *[49, p. 99]*.

Indeed, from the above paragraphs, we can conclude that the categorization of security is tremendous in variety because in many fields there are weak points that people want to eliminate by finding a proper and applicable solution.

In an effort to provide security knowledge categories, Brooks performed a research indicating 13 knowledge categories such as Risk Management, IT & Computing, Physical, Technology, Investigations, Personal, Industrial, Fire & Life Safety, Law, Criminology, Safety, BCM and Faculty Management *[15, p. 225]*. Additionally, the Operations Security Professional's Association (OSPA) has suggested four main categories which of course are followed by sub-categories.

2.1.2 Perception of Security

In order to further examine the perception of security, it is of paramount importance to understand how the security works.

Security goes hand in hand with two basic elements, that is to say, reality and feeling of security. When it comes to the reality of security, it is mathematical based on the chances of different risks and how much effective are the actions someone can take in order to handle them. To take an example, someone can calculate how possible is for his car to be stolen in dangerous area. On the other side, the feeling of the security is based on someone's psychological reactions to both risk and counteraction measures. For example, someone might feel safer when he sees people taking their shoes off at the airport security control or he might consider this process not so important. In other words, emotional, social, cognitive and other human biases affect along with the psychology of decision-making affect the feeling of security *[91, p. 1]*. In a similar way, according to Wolfers, security refers to an absence of objective dangers as well as subjective fears or concerns *[116, p. 485]*.

From the previous paragraph, we conclude that the perception of security is highly correlated with a lot of factors which are examined by plenty of researchers and immerse existing literature. Brauch has examined four objective factors: Security threats, challenges, vulnerabilities and risks *[14, p. 22]*. On the other hand, as I mentioned before subjective factors are different for different people, the only action someone should take is to ask "Security for whom?, From what threats*?"[102, p. 2]*. The subjective factors are influenced by the society demands or urban planning and can be influenced or triggered by overconfidence, loss aversion, individual experience, temporal factors, capacity of remembering, level of information and knowledge, public discourse, stigmatization, cultural factors, orientation of values, confidence in institutions, ethical and moral status, familiarity, media attention, accident history, voluntariness and the like.

2.1.3 Security Factors

In order to further understand all these factors, I will provide a short description for each one of them below:

Threats - The Oxford Dictionary, give us two definitions of "threat" term. The first describes it as a statement of an intention to inflict pain, injury, damage or other hostile action on someone in retribution for something done or not done. For example, a family receives death threats because a member was participating in a dirty business. The second one, defines is as a person or thing likely to cause damage or danger. To take an example, Asian tsunamis pose a threat to Asian travel industry *[102, p. 1]*. As a scientific concept, threat is mostly used within the framework of national security which is divided into more subsections such as military threats, economic threats, and ecological threats and so on *[42, p. 2]*.

Challenges - According to Oxford Dictionary, the first definition of challenge is a call to someone to participate in a competitive situation or fight to decide who is superior in terms of ability or strength. The second one is referring to a call to prove or justify something. Similarly, the British dictionary describes it as something that needs great mental or physical effort in order to be done successfully and therefore tests a person's ability *[18, p. 1]*. The scientific notion of "Security Challenges" is used often used for security and global issues related to refugees, international crime, distant conflicts, contagions, crop failures, currency fluctuations and the like that states need to put effort in order to handle them *[44, p. 42]*.

Vulnerabilities - For British dictionaries, vulnerability is defined as the state of being accessible, assailable, defenseless, exposed, open to attack, sensitive, susceptible, unprotected or weak in danger *[114 p. 1]*. While Merriam Webster defines it a situation where the state or property is capable of being wounded or physically injured, open to criticism or attack, open to attack by armed forces and liable to increase penalties. It goes without saying that Vulnerability as a scientific concept is closely related with technological, social, economic and political processes *[8, p. 132]*.

Risks - According to Longman dictionary, risk is the possibility that something bad, unpleasant or dangerous may happen. It also can be the state of deciding to do something even though you know it may have bad consequences. Moreover, it can be a situation of causing a harm or danger to someone or something *[87, p. 1]*. From the scientific perspective, this term is being used in many disciplines including philosophy, political science, sociology, psychology, information technology, economics you name it. Scientists are using the term of "Risk estimates" in order to measure the probably of damages or harms in all these fields *[14, p. 42]*.

Overconfidence – It is a subjective bias of someone's judgment over a specific situation that is not based on its objective accuracy but the person's high confidence *[75, p. 258]*.

Loss aversion – An instance of this subjective factor is the tendency of people who prefer to avoid losses instead of taking the risk to acquire gains *[55, p. 346]*.

Individual experience – According to Bayesian, the risk perception is correlated to individual's experience when there is a need to make a decision. Individuals with great working experience in their profession tend to overestimate a potential risk *[107, p. 8]*.

Level of information and knowledge – It goes without saying that the level of information and knowledge renders an individual capable of estimating a potential risk and see it more objectively and accurately *[96, p. 717]*.

Temporal – It is considered to be a factor that refers to one's subjective experience of time. Temporal perception comprises subjective phenomena such as simultaneity, successiveness, temporal order, subjective present, temporal continuity and subjective duration *[82, p. 56]*. In other words, temporal factors affect how stimulus information is processed, stored and retrieved within an organism *[39, p. 363]*.

Capacity of remembering – When it comes to the subjective perception of individuals, the capacity of remembering is correlated with the level of knowledge and are important factors for analytic judgments and fluency of processing *[85, p. 100]*.

Public discourse – The level of public discourse is influencing subjectively influencing the decision making. For example, a local community opposed to the construction of a factory that probably is going to pollute the area *[13, p. 2]*.

Familiarity – As a subjective bias effect, it affects identification and recognition. Familiarization of an item or situation increased the resting activation or bias *[21, p. 274]*.

Orientation of values - Both decision heuristics and social value orientation play important roles in the subjective building of preferences *[93, p. 20]*.

These were the main objective and subjective factors related to the general notion of security. There are plenty of other factors such as voluntariness, cultural, confidence in institutions, accident history and the like. But for the purpose of this master thesis it is of paramount importance to determine how security is connected to electronic as well as mobile commerce and figure out the most important factors in these fields in order to proceed with a proper research investigation.

2.2 Security Risks and Trust in M-Commerce

2.2.1 Information Security

Electronic Business which that is commonly referred to as e-business, is the utilization of information and communication technology (ICT) in conduct business on the internet, not only buying and selling but also servicing customers and collaborating with business partner. Electronic business methods enable companies to link their internal and external data processing systems more efficiently and flexibly, to work more closely with suppliers and partners, and to better satisfy the needs and expectations of their customers. Trust is the key to the success of e-business and lack of trust is the significant problem on the way to e-business success. During every business transaction, the parties involved should feel trust with the people and the companies. It must be established and managed continuously in business transaction activities.

There are security services offering protection from security threats. Today, e-business applications are doing more than ever to increase efficiency and improve relationships with partners and customers by using them *[110, p. 151]*. There are eight principles of information security affecting e-business applications that the author will describes below *[23, p.170]:*

Confidentiality

In the context of information security, confidentiality means that information that should stay secret stays secret and only those persons authorized to access it may receive access. Unauthorized access to confidential information may have devastating consequences, not only in national security applications, but also in commerce and industry. To further clarify, in order for someone to proceed with an online transaction though the internet using his credit card number, the e-business whether it conducts electronic or mobile commerce has to protect this process. Main mechanisms of protection of confidentiality in information systems are cryptography and access controls. Examples of threats to confidentiality are malware, intruders, social engineering, insecure networks, and poorly administered systems.

Integrity

Integrity is concerned with the trustworthiness, origin, completeness, and correctness of information as well as the prevention of improper or unauthorized modification of information. Integrity in the information security context refers not only to integrity of information itself but also to the origin integrity, that is, integrity of the source of information. Integrity protection mechanisms may be grouped into two broad types: preventive mechanisms, such as access controls that prevent

unauthorized modification of information, and detective mechanisms, which are intended to detect unauthorized modifications when preventive mechanisms have failed.

Availability

Availability aims to ensure that information is readily accessible to authorized users. It goes without saying that is as important and as necessary a component of information security as confidentiality and integrity. In other words, the information must be available when it is needed. The systems should be highly available at all the times without service disruptions such as power and hardware failures. Also, there are attacks against availability which are known as denial of service (DoS) attacks. Therefore, e-businesses should continuously operate and have a disaster recovery planning to minimize potential losses.

Identification

Identification is the step by humans and computers when access to information is required. Identification name spaces can be local or global in scope. To illustrate this concept, let's refer to the familiar notation of Internet e-mail addresses: while many e-mail accounts named jack may exist around the world, an e-mail address jack@company.com unambiguously refers exactly to one such user in the company.com locality. In this case, access control will probably be enforced as well as accountability will be established between the two parties, whether are customers or partners

Authentication

Authentication, which happens just after identification and before authorization, verifies the authenticity of the identity declared at the identification stage. In other words, it is at the authentication stage that you prove that you are indeed the person or the system you claim to be.

Authorization

After declaring identity at the identification stage and proving it at the authentication stage, users are assigned a set of authorizations (also referred to as rights, privileges, or permissions) that define what they can do on the system. These authorizations are most commonly defined by the system's security policy and are set by the security or system administrator. These privileges may range from the extremes of "permit nothing" to "permit everything" and include anything in between.

Accountability

Accountability is another important principle of information security that refers to the possibility of tracing actions and events back in time to the users, systems, or processes that performed them, to

establish responsibility for actions or omissions. A system may not be considered secure if it does not provide accountability, because it would be impossible to ascertain who is responsible and what did or did not happen on the system without that safeguard. Accountability in the context of information systems is mainly provided by logs and the audit trail.

Functionality vs. Assurance

The most important and challenging issue of information security is the functionality versus assurance. To further clarify, a particular system may claim to implement a dozen smart security features, but this is very different from being able to say with a high degree of confidence that it indeed implements them, implements them correctly, and will not behave in an unexpected manner. Another way of looking at the functionality versus assurance issue is that functionality is about what a system can do and assurance is about what a system will not do.

Privacy

Privacy in the information security context usually refers to the expectation and rights of individuals to privacy of their personal information and adequate, secure handling of this information by its users. Personal information here usually refers to information that directly identifies a human being, such as a name, preferences and address. In many countries, privacy of personal information is protected by laws that impose requirements on organizations processing personal data and set penalties for noncompliance. The European Union (EU) in particular has strict personal data protection legislation in place, which limits how organizations may process personal information and what they can do with it. The U.S. Constitution also guarantees certain privacy rights, although the approach to privacy issues differs between the United States and Europe. For this reason, E-Businesses' information security policies should define how personal information is to be collected and processed

Non-repudiation

Non-repudiation in the information security context refers to one of the properties of cryptographic digital signatures that offer the possibility of proving whether a particular message has been digitally signed by the holder of a particular digital signature's private key. Non-repudiation is a somewhat controversial subject, partly because it is an important one in this day and age of electronic commerce, and because it does not provide an absolute guarantee: a digital signature owner, who may like to repudiate a transaction maliciously, may always claim that his or her digital signature key was stolen by someone and that someone actually signed the digital transaction in question, thus repudiating the transaction.

2.2.2 Trust Concerns

The purpose of this subchapter is to illustrate how trust is closely related with security and privacy in the online mobile commerce context *[110, p. 151]*. Trust is the confidence in the other's goodwill and can also be viewed as being a consensual ideology *[86, p. 118]*. It plays a crucial role in commercial relationships *[72, p. 110]*. Trust is a highly complex and multidimensional phenomenon *[61, p. 967]*.

Trust in mobile commerce adoption is influenced by a number of factors such as reliability of wireless services, usability of m-commerce website, usability of mobile device, information quality, privacy of customer information, security of mobile transaction, trustworthiness of product vendor, quality of product and effect of culture *[95, p. 87]*.

All the principles described in the previous subchapter are of paramount importance when it comes to providing customers with security as well as the feeling of trust. At this point, it is worthwhile to mention that Privacy and Security concerns with regard to m-commerce adoption will be examined in detail in order to define variables for the upcoming research.

Institution-Based Trust

An important element of trust is the institution-based trust. It is a person's feeling or belief that the environment in which he or she transacts has appropriate safeguards and protections *[108, p. 77]*. All the principles of information security such as confidentiality, integrity, availability, identification, authentication, authorization, accountability, functionality, assurance, privacy and non-repudiation, if they are properly followed there is a huge possibility of significantly affecting both trusting beliefs and trusting intentions *[108, p. 76]*. There are a number of studies indicating that institution-based trust can strongly influence trust in online environments *[108, p. 77]*. People look for characteristics of safety and security when determining of placing trust to the organization. Moreover, cues such as peer endorsement or recommendation agents can help into creating trust towards an institution.

System Quality

System quality attributes are relevant to the concept of trust because recent research suggests that technical aspects of IT artifacts affect users' willingness to trust. One can argue that because security risks are closely related to trust. Trust is, in fact, a tacit component of many Web site quality studies *[108, p. 78]*.

Ease of Use

Wang and Benbasat also found strong support for the relationship between trust and ease of use *[10, p. 75]*. The logic for this relationship is that in the absence of better information, people use available information such as appearance and the like. The ease of use increases the m-commerce engagement as well as the trust effect in this technology.

Lack of trust is a significant factor that deters the adoption of mobile commerce services. As it was previously mentioned, trust is important during situation that are perceived to be risky, and m-commerce as a relatively new field exposes mobile consumers to new vulnerabilities and risks *[54, p. 27]*.

2.2.3 Security Risks

Security in mobile commerce is affected by plenty of factors. Nowadays, the technology infrastructure in this context is relatively new rendering it vulnerable to attacks from hackers, malware and the like. Additionally, mobile commerce introduces security risks and privacy concerns to mobile users towards the organizations conducting m-commerce activities. What is more, loss or theft of a mobile device containing sensitive or confidential data can be accessed by unauthorized persons. Also, in the era of 3G and Wi-Fi there are still risks to conduct mobile commerce because many networks do not offer a great encryption level that meets confidentially requirements. Another kind of risk is during the m-commerce transaction where people may have concerns when it comes to mobile payments. Similarly with e-commerce, people cannot directly see and touch a product offered to buyers so when this product will be delivered it might not meet the purchasers' expectations. This situation affects the security of conducting a mobile commerce transaction. Last, but not least, people aware of an associate legislation regarding m-commerce can feel more secure in proceeding with mobile commerce transactions. To delve into more details, I give a description of these factors according to the academic discussion around them.

Privacy

According to Phelps J. et al, information privacy is an utmost security concern *[81, p. 37]*. However, Culnan found that concern over privacy might not affect consumers' attitudes toward secondary information use *[30, p. 360]*. It turns out that a proportion of consumers frequently is concerned about privacy in the m-commerce context, that is to say, information about location and personal details such as preferences, age, education level and the like. A great deal of literature has already been written about the potential privacy problems of location-based services. One of the

biggest concerns is the possibility to compile a very detailed picture of someone's movements if they are carrying a wireless device that communicates its location to network operators *[97, p. 187]*.

Context-aware computing describes applications, often implemented for mobile devices that adapt to environmental sensor information. As mobile telephony becomes increasingly common as a handheld computing platform, location-tracking of mobile phones enables location-based services to spread outside closed environments. Location-tracking of customers by mobile telephony providers via GSM, WLANs and GPS enabled services generates a need for addressing privacy issues in relation to the building of location based technologies and services. At this point, it is worthwhile to mention that there are two types of location-based services: location-tracking and position-aware *[26, p. 207]*.

Not only the mobile device locations are tracked but also users' preferences, so there is potential of high-proliferation and personalization of the available data accordingly *[68, p. 349]*. Normally, mobile devices automatically store information of their location in hidden files. Information about location can be determined by Wi-Fi, GPS antenna a hand-held device has, by mobile phone network which calculates the location or by the combination of the last two (a-GPS). This situation gives a huge opportunity to e-businesses to more personalize their offers in order to be more efficient and satisfy their customers *[73, p. 33]*. This situation of accurately identifying a user gives e-business the privilege of personalizing their messages to various customer segments. For instance, using demographic information collected by wireless service providers and information on the current location of mobile users, more targeted advertising can be done. The advertising messages can be customized based on information provided by consulting the user at an earlier stage or by the history of users' purchasing habits *[68, p. 349]*.

But on the other side of the coin, mobile users are increasingly getting aware of the situation and feel that e-businesses do not respect these privacy issues and take advantage of them in order to generate more revenues. We can conclude that credibility plays a critical role in the m-commerce context and obtaining customer trust by decreasing uncertainties is of paramount importance.

One way of building trust is for the e-businesses to provide users with privacy policy in order to inform them how and what they are going to use of the following elements: data user, data element, purpose of use, conditions and obligations. To further clarify, users should be able to decide when information about their location and use of location-based services is going to be released. Also, an explicit written contract indicating consent to use location information should be signed, rather than an operator simply declaring that this information is being collected. Moreover, if users' identities can remain anonymous, operators should be able to collect location information for statistical or

planning purposes. Additionally, e-businesses who have access to user location data should define if third party services are going to have access to users' data. Last, but not least, information that is stored must be accurate, and users should be protected from loss, misuse or unauthorized access, or alteration *[97, p. 187]*.

All these are crucial in giving a shape to a generalized privacy policy. However, as privacy policies differ from website to website, the concern for these policies also differs from individual to individual, depending on the user's level of education, the website content and type and other various factors, all adding a whole different perspective to this relationship.

On the other side of the coin, even though those users are aware of the privacy policy existence, they prefer not to read them because of their complexity rendering them difficult to understand. Moreover, plenty of individuals confuse security with privacy. For this reason, many academics suggested that a need for government regulation over current privacy issues should be created or improved *[5, p. 9]*. At this point, it is worthwhile to mention that the European Union introduced the data protection directive (95/46/EC) which regulates the processing of personal data within the European Union member states. This directive is an important component of privacy and human rights law. Its three main principles such as transparency, proportionality and legitimate purpose should be met, otherwise the personal data should not be used *[37, p. 39]*.

Mobile Transactions

Mobile payment is a process of payment transaction for obtaining a product or service by using mobile communication techniques in conjunction with mobile handheld devices *[83, p. 201]* such as mobile phones, PDAs or Tablets, for initiation *[64, p. 233]*. Another definition of mobile payment is the state of payment where a mobile device is used in order to initiate, activate or confirm it *[56, p. 44]*.

Mobile payment transaction involves a direct or indirect exchange of monetary values between parties. Taking these into consideration, mobile payment is regarded as the next big innovation that will enhance existing e-commerce and m-commerce efforts to unleash the potentials of mobile business *[56, p. 57]*. The payment has evolved from the physical exchange of notes and coins, to writing checks, and to transferring payment card details either in person or at distance, over the Mobile payment systems *[56, p.49]*. There are several mobile payment systems and approaches currently powered by different concepts and technologies such as Premium SMS Based Transactional Payments, Direct Mobile Billing, Mobile Web Payments, Near Field Communication,

QR code Payments, Cloud-Based Mobile Payments and a more. Below I describe the most prevalent ones:

Premium SMS Based Transactional Payments – They allow customers to send payment authorizations through text messages from their phone. Thus, the amount of the transaction is billed to the mobile account bill. Once a successful payment is posted, merchants can authorize the release of goods or service agreements. This payment process is instant and virtually accessible from anywhere *[56, p. 59]*.

Direct Mobile Billing – Unlike the SMS Based Transactional Payments, direct mobile billing enables customers to pay faster and easier for products or services. The amount is billed to the user's mobile phone billing account but this time with one-click payment process that can be embedded in a mobile application or in a URL *[12, p. 58]*.

Mobile Web Payments – Instead of using SMS or other traditional technologies for transmitting data this method used WAP enabled web pages or applications that run on it. Mobile web payments include models such as direct operator billing, credit card payments and online wallets such us Paypal, Amazon Payments, Google Wallet and the like *[40, p. 16]*.

Near Field Communication – This is a technology for contactless short-range communication. Based on the Radio Frequency Identification (RFID), it uses magnetic field induction to enable communication between electronic devices. The number of short-range applications for NFC technology is growing continuously, appearing in all areas of life. Especially the use in conjunction with mobile phones offers great opportunities *[79, p. 11]*.

Security issues in electronic payment process had a huge amount of discussion in the literature. Chari claims that mobile commerce differs from e-commerce solutions due to the differences in their technologies, so they create a number of new security exposures *[22, p. 281]*. To take an example, mobile devices might be stolen, lost or damaged. Another security concern is the trustworthiness and reputation the merchant has. It was demonstrated that people tend not to use their debit or credit card to proceed with transactions at a merchant with no good reputation *[19, p. 364]*. Hence, Friedman B. et al strongly suggest businesses to improve their security and privacy issues for successful m-commerce *[43, p. 39]*.

According to Shon and Swatman, factors affecting the security perception of mobile payment systems adoption are reliability, privacy, anonymity, trustworthiness, regulatory framework, regulation and consumer protection *[64, p. 10]*. Moreover, confidentiality as a feature seems to be the most important for mobile users and this category includes issues related to data protection, data

security and unauthorized access. Additionally, the same research indicated that encryption, transparency, traceability, anonymity, fraud protection policies, authentication and authorization are elements that affect the subjective security perception from a customer viewpoint.

In general, use and customer acceptance of mobile payment services, in cooperation apparent and technical levels of defense should be high. Privacy and financial loss are of paramount importance to the mobile customer *[111, p. 121]*.

Due to the default mode of protocols, mobile communication networks such as GSM, 3G, HSPA and WLANs are not so secured and make the mobile devices prone to corruption and insecurity. To further clarify, reliability of wireless services such as encryption of wireless transaction data, authentication, wireless coverage area, and wireless communication can dramatically affect trust and security perception in this context *[108, p.87]*. Consumer fears regarding the safety of the information exchanged over a wireless network increases with the degree of interaction and the sensitivity of the information exchanged. Applications that require less interaction and are less personal (e.g. weather notifications) present a lower security concern than those applications involving increased interaction and containing personal information (e.g. mobile banking) *[7, p. 134]*.

In other words, reliability of wireless services such as encryption of wireless transaction data, authentication, wireless coverage area, and wireless communication can provoke security issues when it comes to this context *[108, p. 88]*.

Besides the reliability of wireless services, one risk that can affect security in mobile devices is the hidden and unconscious computing i.e. viruses, malware etc. The personal data of a mobile user can be accessed if the platform or/and the software applications have security deficiencies. There are two sources of risk, one emerging from the platform or operating system and one from the software applications the mobile devices use.

When it comes to platform risks, the devices should use advanced and secure infrastructure for running mobile commerce applications. Today, the manufacturers have failed to provide any kind of features necessary to enable any kind of secure mobile computing. There are issues relevant to memory protection for processes, protected kernel rings, file access control, authentication of principals to resources, differentiated user and process privileges, and the like. As for the software application risks, assuming that an advanced operation system is build, it is possible to design and develop secure applications using good software engineering and assurance models. Software flaws can introduce many security holes that attackers or hackers are willing to exploit. All in all,

software and platform used by devices can be serious threats for the user security and privacy *[99, p. 54]*.

Intangibility of Products / Services

Besides the risks emerging from technological aspects such as attacks, data interception and generally all the deficiencies mentioned above, an emerging issue is the risk involving the intangible element of products and services offer by e-businesses to mobile customers *[45, p. 76]*.

According to the Oxford Dictionary of Current English, intangibility is (a) that which cannot be touched or seen, (b) that which is difficult to define or describe clearly, and (c) that which cannot be easily grasped mentally *[52]*. Research has shown that intangibility is positively correlated with perceived risk [*33, p. 188]*.

As the e-customers cannot directly see or touch the offered products or services in the electronic market, they may feel anxiety or uncertainty when they conduct online transactions with e-businesses. To take an example, a product or service delivered to consumer may not perform as it as was anticipated beforehand. What is more, online customers may suffer the risk of paying expenses such as shipping and handling when returning or exchanging a defective product or service. The perceived risk emerging from intangibility characteristic is divided to five types, that is to say, functional loss, financial loss, time loss, opportunity loss, and overall perceived risk with product/service *[76, p. 11]*.

Despite the fact that e-businesses tend to include return policy in their websites, the security perception concerning the risk mentioned above has generally been examined from the electronic transaction perspective which gives us the opportunity to investigate this element in mobile commerce context, as well.

Lack of M-Commerce Regulation

M-commerce is a rapidly developing area and the law may not be able to adapt as quickly as the technology does. However, there are already safeguards in place for consumers when it comes to online transactions. For example, suppliers have to make it clear to customers as to how new technology works and the implications for the customer. The governmental institutions play a fundamental role in establishing legislation and standards of services and they should constantly adapt it to the market development and new technologies in order to protect mobile consumers. In this content it will be examined whether the mobile costumers feel secure or not concerning this risk *[109, p. 11]*.

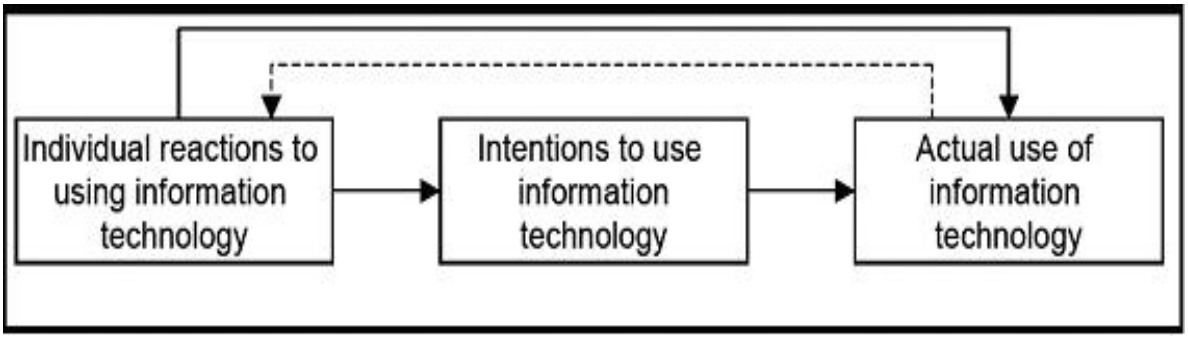
3. FRAMEWORK AND METHODOLOGY

3.1 Methods of assessing user acceptance

Assessing user acceptance is crucial for the success of new technologies such as mobile commerce. However, it is hard to predict in what matter a certain technology is going to be utilized by a potential user. It goes without saying that e-businesses providing m-commerce services need to know what user experiences and expects from a certain technology. To gain knowledge and understanding in what manner new technologies will prosper or fail into the market, plenty of researchers have created a number of models to measure potential user acceptance using a wide variety of determinants. In this subchapter, the author will make an overview of the existing models associated with the prediction of customer acceptance.

In the academic literature, many researchers have contributed on the evaluation user acceptance concerning information systems. All these models derived from the basic concept for user acceptance models which is illustrated in Figure 1. To delve into details, one individual is having a reaction to using an information technology; this fact will form the intentions to use that technology, which again leads to actual system use. In other words, the intention to use an information technology has a significant effect on using information technology *[121, p. 427]*.

Figure 1 The basic concepts underlying user acceptance models



Source: Venkatesh et al, title: User acceptance of information technology – Toward a unified view [112, p. 427]

In the following subchapters, a number of methods will be described along with their elements, determinants and processes. The six technology acceptance methods to be described are Innovation Diffusion Theory, Theory of Reasoned Action, Theory of Planned Behavior, Technology Acceptance Model, Extended Technology Acceptance Mode and a Unified Model. The purpose of

this procedure is to identify which model is to be totally or partially used in order to meet the requirements of this paper and hence proceed with the survey design.

3.1.1 Innovation Diffusion Theory (IDT)

One common theory used to identify the acceptance of technology concerning innovation academic discussion is the Innovation Diffusion Theory by E.M. Rogers (1995). According to him, innovation is "an idea, practice, or object that is perceived as new by an individual or another unit of adoption". Diffusion, on the other side of the coin, is "the process by which an innovation is communicated through certain channels over time among the members of a social system". Hence, the IDT theory argues that "potential users make decisions to adopt or reject an innovation based on beliefs that they form about the innovation" *[2, p. 90]*.

The Innovation Diffusion Theory consists of four different elements:

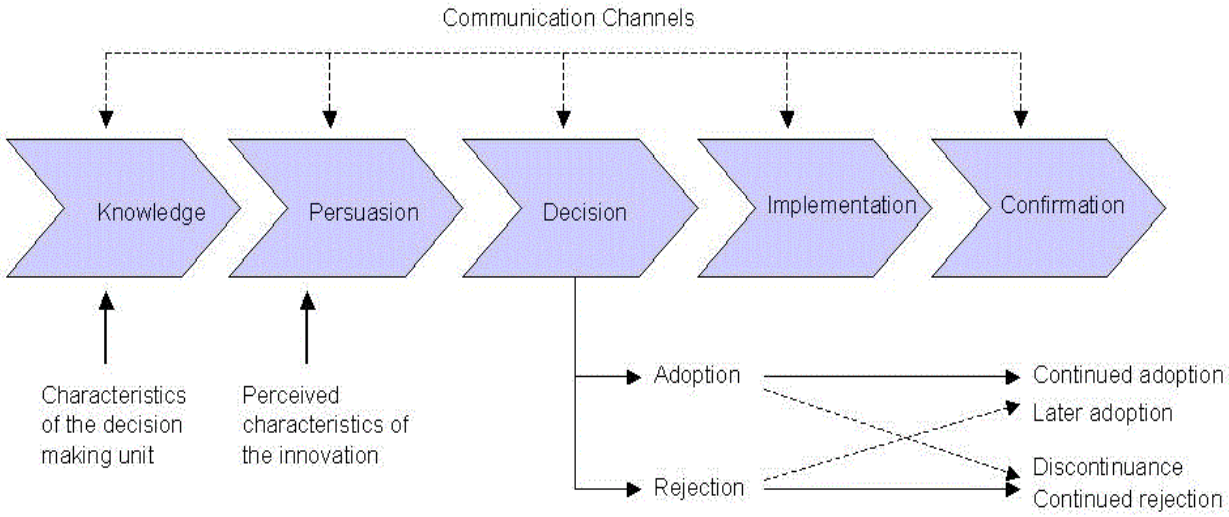
1. The Innovation
2. Communication Channels
3. Time, and
4. Social system

The main concept around this theory is assumption that if innovation process leads to a success, consequently that innovation is adopted. What is more, the essence of the IDT lies in the process of reduction of insecurity around the acceptance of an innovation. In this process there are five stages that a person passes through, that is to say, from the innovation awareness to its implementation. At this point the author gives a short description of the stages, followed by an illustration of the whole process in Figure 2.

1. Knowledge: The individual learns about the existence of the innovation and gains some understanding of how it functions and its functioning principles.
2. Persuasion: The individual forms a favorable or unfavorable attitude towards the innovation, based upon the perceived characteristics.
3. Decision: the choice for adopting or rejecting the innovation
4. Implementation: Implementing and using the innovation.

5. Confirmation: Determine the meaning and benefits of the innovation. Also, learn lessons through evaluation, improve the implementation, and consider other innovations *[88, p. 162]*.

Figure 2 Innovation Diffusion Process



Source: Everett M. Rogers, title: User diffusion of innovations, fourth edition [88, p. 163]

Innovation Diffusion Theory includes a set of attributes associated with technological innovations that influence adoption. According to Rogers there are five attributes and defines them as follows:

1. Relative advantage – "The degree to which an innovation is perceived to be better than the idea it supersedes."

2. Compatibility – "The degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters."

3. Complexity – "The degree to which an innovation is perceived as relatively difficult to understand and use."

4. Trialability – "The degree to which an innovation may be experimented with on a limited basis."

5. Observability – "The degree to which the results of an innovation are visible to others."

3.1.2 Theory of Reasoned Action (TRA)

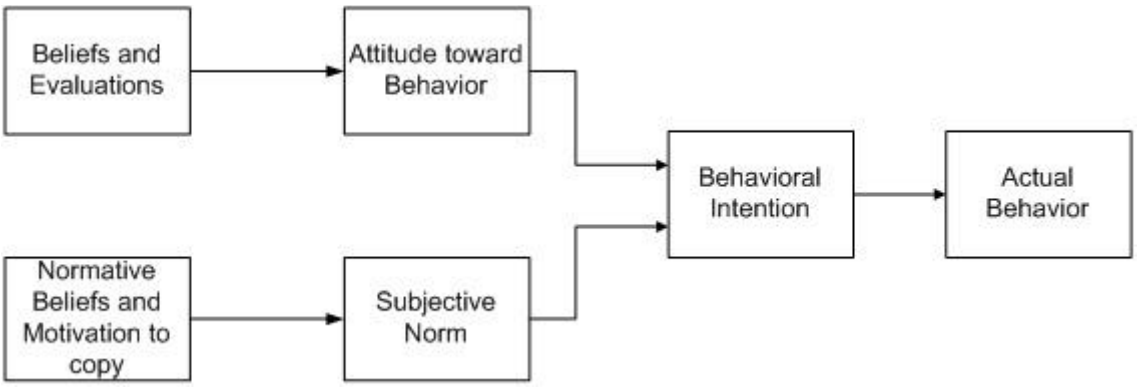
The Theory of Reasoned Action by Fishbein and Ajzen is a widely studied and influential method related to social psychology examining the human behavior. Specifically, this theory is concerned with the determinants of consciously intended behaviors. What is more, the theory of reasoned action is used various and different fields including the field of new technologies adoption.

The theory of reasoned action is based upon the presumption that people are rational in their decision making, and make consistent use of the information available to them. This supposes people will think about the consequences of their actions before deciding to do it, i.e. to adjust their behavior based upon reasoning. Fishbein and Ajzen describe how the components of the theory are basically constructed out of four different determinants. These components are:

1. Behavioral Intention (BI),
2. Attitude (A),
3. Subjective Norm (SN), and
4. Actual Behavior (AB)

The hypothesis emerging from TRA is that the individual's behavioral intention (BI) to perform a behavior is determined by the individual's attitude towards performing the behavior (A) and subjective norm (SN) which is the overall perception of what relevant others think the individual should or not do. Simply put, this model is composed of attitudinal, social influence and intention variables to predict individual's intention. A depiction of the process is illustrated on Figure 3.

Figure 3 Theory of Reasoned Action



Source: Fishbein & Ajzen, title: Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research [41, p. 16]

The importance of attitude and subjective norm to predict behavioral intention varies by behavioral domain. To further clarify, individuals who their personal-based influence is stronger than the social norm then attitude implications will be stronger. Contrarily, when individuals' behavior in which normative implications are strong, for example buying something that is important for others, then social norm will be the dominant predictor of behavioral intention.

The Theory of Reasoned Action also hypothesizes that BI is the only direct antecedent of actual behavior (AB). BI is expected to predict AB accurately if the three boundary conditions specified by Fishbein and Ajzen can be hold:

A. The degree to which the measure of intention and the behavioral criterion correspond with respect to their levels of specificity of action, target, context, and time frame.

B. The stability of intentions between time of measurement and performance of the behavior

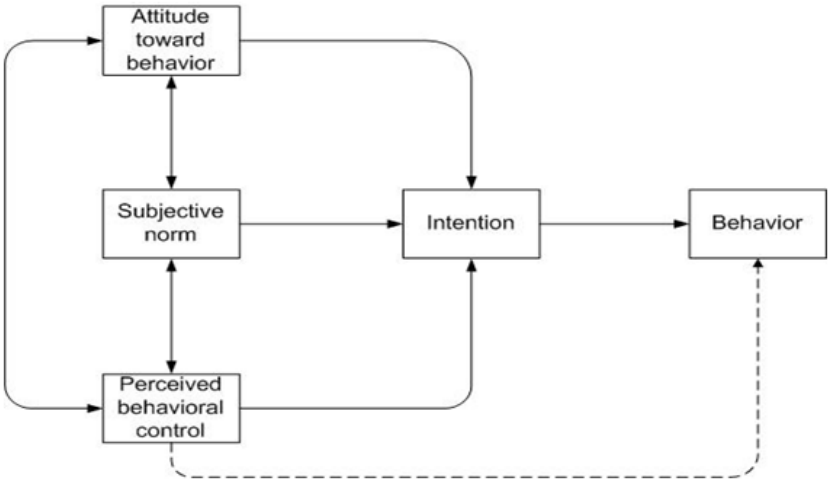
C. The degree to which carrying out the intention is under the volitional control of the individual (i.e., the individual can decide at will to perform or not to perform the behavior).

3.1.3 Theory of Planned Behavior (TPB)

The Theory of Planned Behavior by Azjen was an effort to improve the theory of reasoned action. The difference in TPB is that another construct was added to better explain behavioral intention. This new construct TPB included is perceived behavioral control (PBC) which renders it as one of the most predictive persuasion theories.

PBC has a direct connection with Intention to Use and Use behavior. It is also assumed to reject past experience as well as anticipated obstructions people might have against performing the behavior. In general TPB states that the more favorable the Attitude and Subjective Norm with respect to a behavior and the greater the Perceived Behavioral control, the stronger the intention will be to perform the behavior under consideration *[3 , p. 198]*. There is a depiction of TPB in the diagram below (Figure 4).

Figure 4 Theory of Planned Behavior



Source: Ajzen, title: Theory of Planned Behavior [3, p. 182]

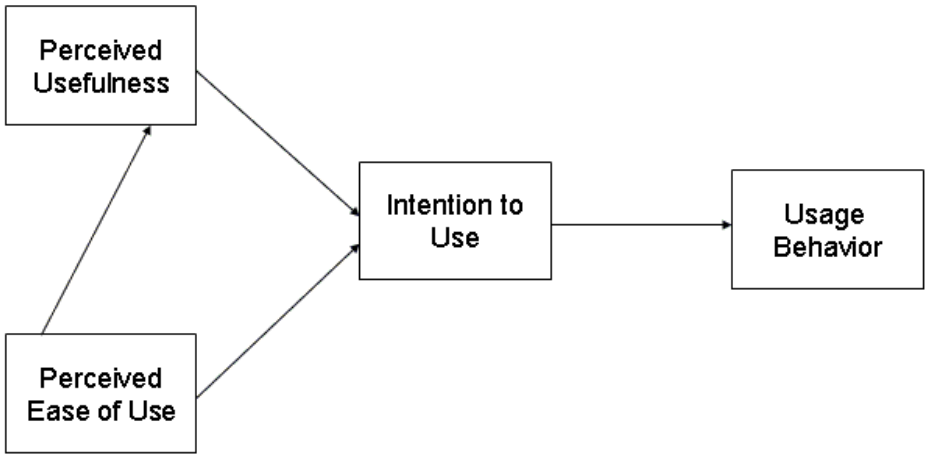
3.1.4 Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) was developed from TRA by Davis in 1989. This model used TRA as a theoretical basis for specifying the causal linkages between two key beliefs: perceived usefulness and perceived ease of use and users' attitudes, intentions and actual computer usage behavior. Behavioral intention is jointly determined by attitude and perceived usefulness. Attitude is determined by perceived usefulness (PU) and perceived ease of use (PEOU) which Davis proved to be fundamental and distinct constructs that are influential in decisions to use information technology. In other words, TAM replaces determinants of attitude of TRA by perceived ease of use.

The goal of TAM is to provide an explanation of the determinants of computer acceptance that is in general capable of explaining user behavior across a broad range of end-user computing technologies and user populations, while at the same time being both parsimonious and theoretically justified. But because it incorporates findings accumulated from over a decade of IS research, it may be especially well-suited for modeling computer acceptance *[31, p. 985]*. To further clarify it is used to predict if users are willing to use a certain information system and software *[60, p. 202]*.

Technology Acceptance Model is one of the most used models for user acceptance of information systems. Figure 5 illustrates TAM model, and how the underlying variables affect each other.

Figure 5 Technology Acceptance Model



Source: Davis et al, title: User acceptance of computer technology [31, p. 985]

From the above diagram, it obvious that TAM consists of four variables, that is to say, Perceived Usefulness, Perceived Ease of Use, Intention to Use and Usage Behavior. The first three are the primarily factors the author is going to explain below:

A. Perceived Usefulness (USE) - It refers to individuals' perception that a specific technology or computer application will help them perform their jobs better. Simply put, the application should result in a positive use-performance relationship.

B. Perceived Ease of Use (PEU) – It refers to "the degree to which a person believes that using a particular system would be free of effort". Simply put, it answers the question of whether an application is easily used for the intended purpose. Moreover, PEU can be seen as a predictor for USE.

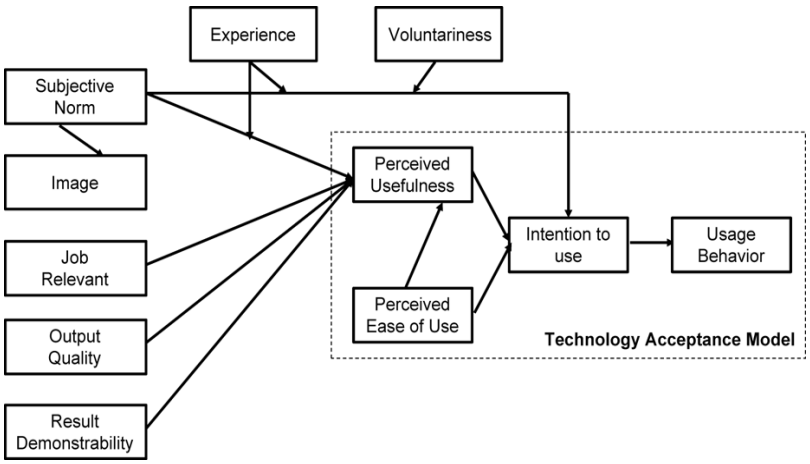
C. Intention to Use (I) – It refers to the intention of an individual to use a specific technology. It is worthwhile to mention that both constructs of usefulness and ease of use predict the attitudinal component of Intention to Use. Last, but not least, the Intention to perform a particular behavior has been shown to be an effective predictor of Usage Behavior *[31, p. 320]*.

3.1.5 Extended Technology Acceptance Model (TAM2)

The Extended Technology Acceptance Model was developed by Venkatesh and Davis, and it was first introduced in Management Science in 2000 on their research paper. The ultimate goal of TAM2 is to include additional key forces than the earlier presented variables such as Perceived Usefulness and Perceived Ease of Use. The purpose of these new variables is to explain perceived usefulness and usage intentions in terms of social influence and cognitive instruments processes, as well as, to understand how the effects of these determinants change with the increasing user experience over time with the target technology. Specifically, TAM2 includes social influence determinants such as Subjective Norm, Voluntariness, Image, and cognitive instrumental processes ones such as Job Relevance, Output Quality and Result Demonstrability *[113, p. 187]*.

An illustration of the Extended Technology Acceptance Model is depicted in Figure 6 below:

Figure 6 Extension of Technology Acceptance Model (TAM2)

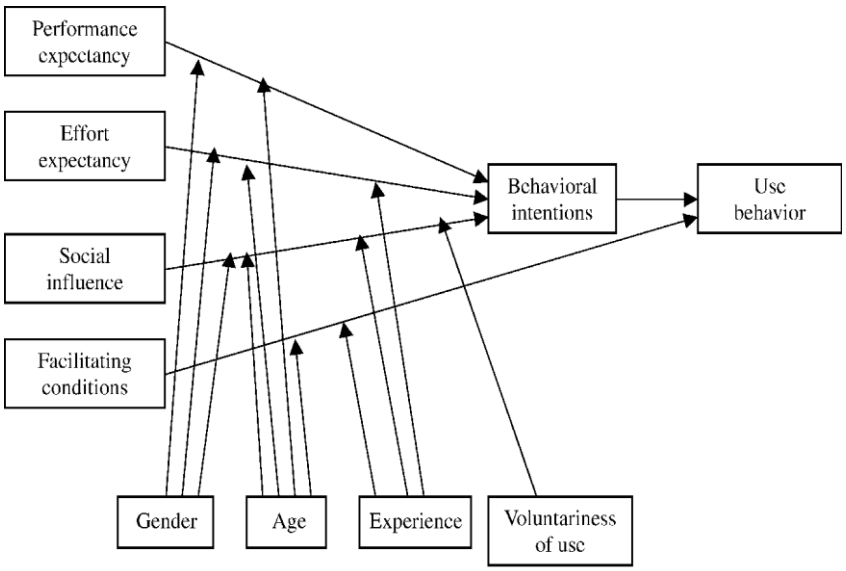


Source: Davis et al, title: A Theoretical Extension of the Technology Acceptance Model: [113, p. 188]

3.1.6 Unified Theory of Acceptance and Use of Technology (UTAUT)

The Unified Theory of Acceptance and Use of Technology (UTAUT) was developed by Venkatesh V. et al in 2003 *[12, p. 446]*. UTAUT is based on a review of eight other existing models in user acceptance literature. The ultimate goal of this effort was to create a unified model which combines elements of the existing models. On Figure 7 one can see the four determinants of the model such as Performance Expectancy, Effort Expectancy, Social Influence and Facilitating conditions, as well as, the four moderators of the model such as Gender, Age, Experience and Voluntariness of Use.

Figure 7 Unified Theory of Acceptance and Use of Technology



Source: Davis et al, title: User acceptance of information technology: Toward a unified view [113, p. 447]

All in all, UTAUT model provides a refined view of the determinants of intention and behavior evolve over time taking moderated factors into account. The key moderators such as age and gender which show the complex nature of the interactions observed had received little attention in the academic discussion around the content of technology acceptance. By emphasizing on moderators, several interesting issues can be investigated in future research.

3.2 Conceptual Framework and Research Model

The objective of this paper is to present an alternative framework and research model concerning the adoption of mobile commerce by customers. In this subchapter, after literature review was conducted, the author presents the emerging variables which lead to the proposed conceptual framework. Next, the hypotheses development takes part which leads to the proposed research method of this study.

3.2.1 Variables

After reviewing the literature, the author identified one dependent, one mediating and four independent variables. An independent variable signifies a "causal event that is under investigation" *[58, p. 3]*. Also it is connected to the dependent variable, which measures the outcome, by means of the hypotheses *[58, p. 2]*. A dependent variable is also called an outcome or response variable and represents the outcome of a treatment *[58, p. 3]*. Mediating variable is defined as a hypothetical concept that attempts to explain the relationship between the independent and dependent variables *[9, p. 1176]* .

To get into the details, the independent variables are Perceived Risk, Trust, Perceived Usefulness, and Perceived ease of Use. Moreover, the mediation variable is the intention to use mobile commerce and the dependent one is the adoption of m-commerce. Table 1 shows an overview of the variables.

Table 1 Independent, Mediation and Dependent Variables

Independent Variables	Mediation Variable	Dependent Variable
Perceived Risk	Intention to Use M-commerce	Adoption of M-commerce
Trust		
Perceived Usefulness		
Perceived Ease of Use		

Interestingly, each one of these independent variables is affected by an amount of factors. Table 2 gives an overview of these factors in relation with independent variables.

Table 2 Factors Related to Independent Variables

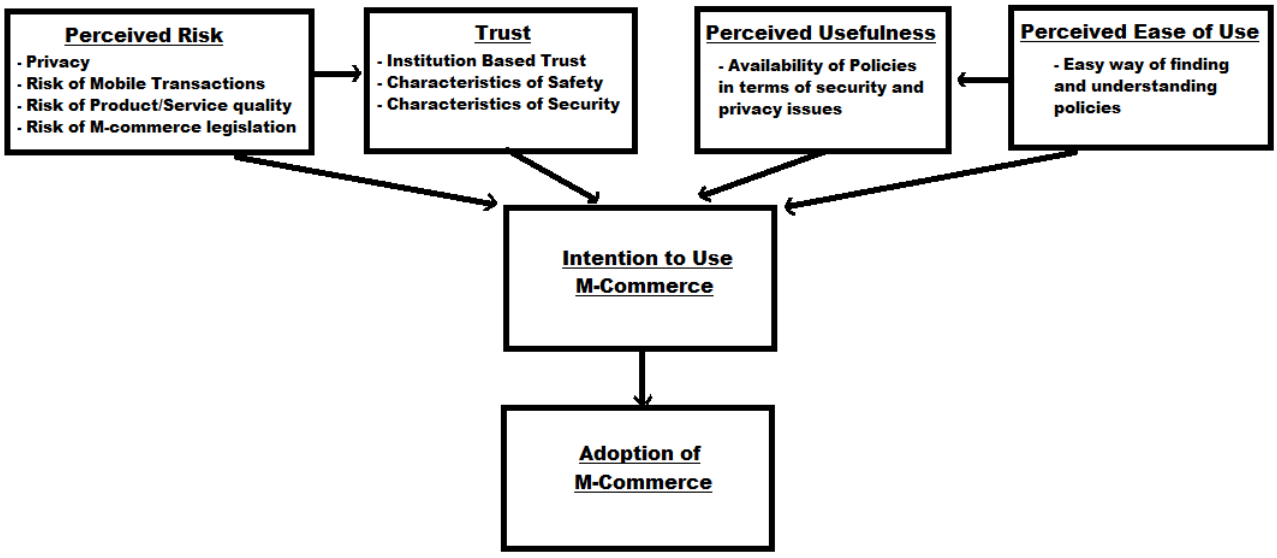
Category		Factor
Perceived Risk	Perceived privacy	• Mobile location data • Data about preferences, age and other personal details • Secondary use of the above customer's data
	Perceived risks of mobile transactions	• Unauthorized access (theft or loss of mobile device) • Mobile communication networks such as GSM, 3G, HSPA and WLANs are not so secured • Hidden and unconscious computing derived from mobile platform deficiencies • Hidden and unconscious computing derived from mobile application deficiencies.
	Perceived risk of product/service quality	• The quality of a delivered product/service might not be as it was anticipated
	Perceived risk of m-commerce legislation	• M-commerce legislation is in its infancy and might not solve some cases of dispute
Trust	Institution-Based trust (Trustworthiness of vendor)	• Clients do not use credit/debit cards if the vendor has bad reputation
	Characteristics of Safety	• Enticing promises, contracts and guarantees in case of dispute concerning the Product/service
	Characteristics of Security	• Actions such as availability, confidentiality, identification, authentication, authorization, accountability, assurance, non-repudiation, privacy • Transparency on how the data are going to be used

Perceived Usefulness	Availability of information that covers all the emerging security and privacy issues.	• Availability of Fraud Protection Policy • Availability of Privacy Policy • Availability of Return Policy
Perceived Ease of Use	Ease way of finding information about Security and Privacy Policies.	• Easy finding and understanding of Fraud • Easy finding and understanding of Privacy Policy • Easy finding and understanding of Return Policy

3.2.2 Proposed Conceptual Framework

By taking all variables and factors under consideration, the conceptual framework is proposed which is of paramount importance for the hypotheses development as well as to propose a research model. Figure 8 below depicts the conceptual framework of this study.

Figure 8 Conceptual Framework



3.2.3 Hypotheses Development

Technology Acceptance Model

The original Technology Acceptance Model (TAM) is consisted of Perceived Ease of Use (PEOU), Perceived Usefulness (PU), Behavioral Intention to Use (BI), and Actual System Use (AU). PU and PEOU are the two most important determinants for system use and both of them indirectly influence the adoption of M-commerce through the intention to use m-commerce.

PEOU refers to the degree to which an individual believes that using an information system would be free of physical and mental effort. There might be a user who believes that an application is useful, but she or he might find it difficult to use. Applied to m-commerce, perceived ease of getting information about policies is defined as the extent to which a consumer believes that getting information related to security policies from a seller using a mobile device would be free of effort. For this reason PEOU has been considered as an important determinant in adoption of information technologies such as m-commerce *[115, p. 175]*. PU is the extent to which someone believes that using an information system will enhance his or her performance *[31, p. 985]*. In this context, PU of getting policies is defined as the extent to which a consumer believes that a mobile device would enhance his or her effectiveness in getting information about policies. Perceived usefulness has been shown to shape positive attitudes in intention to use an IS *[101, p. 165]*. Moreover, in TAM, an individual's intention to use a system is proposed to be a precursor of actual usage, that is, adoption of m-commerce *[31, p. 985]*.

From this standpoint, it is reasonable to hypothesize a significant relationship between perceived ease of use, perceived usefulness, intention to use and adoption of m-commerce.

H1: Behavioral Intention to Use M-commerce has a direct positive effect on actual adoption of M-commerce

H2a: Perceived Ease of Use has a direct positive effect on Intention to Use M-Commerce

H2b: Perceived Ease of Use has a direct positive effect on Perceived Usefulness

H3: Perceived Usefulness has a direct positive effect on Intention to Use M-Commerce

Trust

Much research also indicated that TAM needed integration with additional variables such as Trust in order to improve its prediction of system use. According to Amoroso and Hunsinger, trust has been identified as significant as it influences online purchasing *[4, p. 39]*. Trust is an important element affecting consumer behavior and it determines the success of technologies adoption such as e-commerce and m-commerce *[51, p. 378]*. Trust is more crucial and complex in environment such as e-commerce and m-commerce than general and traditional commerce due to its uncertain environment. By comparing electronic with mobile commerce, one researcher, Lu, indicated that m-commerce is exposed to greater danger of insecurity so the importance of trust is relatively high in this context *[65, p. 216]*.

What is more, this construct is a salient belief that includes goodwill trust and credibility *[80, p. 70]*. Last, but not least, according to Jarvenpaa et al trust includes the antecedent of company's reputation *[53, p. 64]*. Based on these, the following hypothesis is proposed:

H4a: Trust has a direct positive effect on Intention to Use M-Commerce

As I mentioned previously, trust is also defined as the extent to which an individual believes that using m-commerce is secure and has no privacy threats. Therefore, it is obvious that there is a strong relation between trust and perceived risk. According to Pavlou, trust acts as an antecedent of perceived risk. Also, he indicates that trust in e-commerce or m-commerce can reduce a consumer's perception of risk about online transactions with a vendor *[80, p. 91]*. To further clarify, consumers in the web sphere are worried about risks concerning their personal information and monetary transactions *[66, p. 888]*, so for mobile commerce, it goes without saying that e-vendors need to increase trust and mitigate risks as well. Therefore, the following hypothesis is proposed:

H4b: Trust has a direct positive effect on Perceived Risk

Perceived Risk

Again there are plenty of studies supporting the integration of Perceived risk with TAM variables. In traditional commerce perceived risk was related to fraud and inappropriate product quality. Nowadays, perceived risk refers to certain types of financial, product performance, physical etc. when a client is proceeding with online transactions. Moreover, since intention to use mobile commerce for transactions involve a certain degree of uncertainty, perceived risk is a direct antecedent of behavioral intention to use m-commerce. A well-known researcher, Pavlou, includes perceived risk in the TAM model constructs *[80, p. 91]*. Therefore, the following hypothesis is proposed:

H5: Perceived Risk has a negative effect on Intention to Use M-Commerce

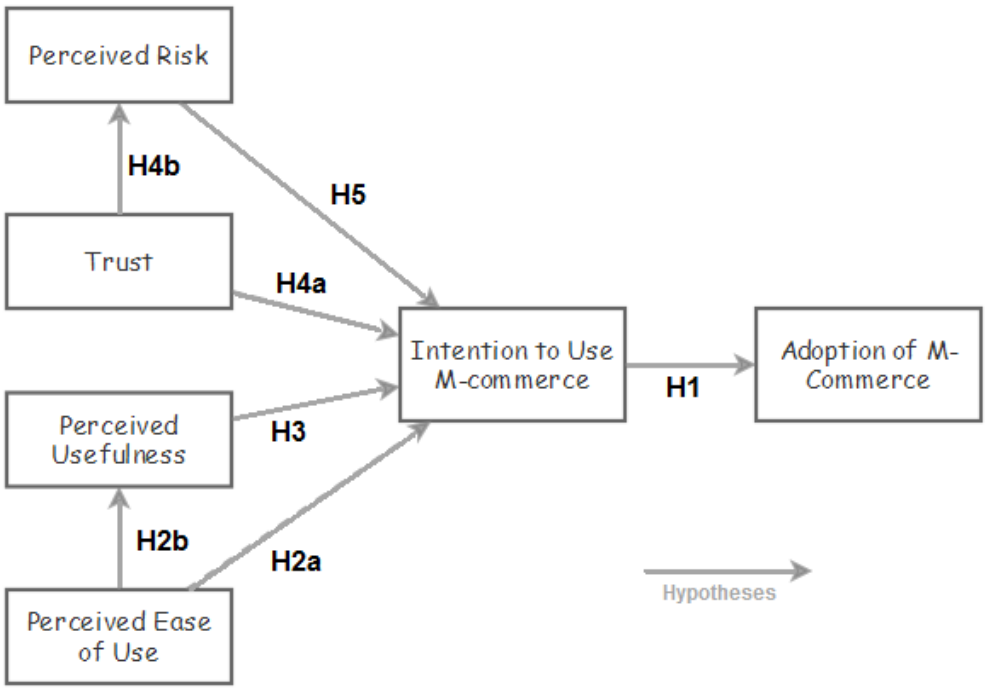
3.2.4 Proposed Research Model

To study the impact of security concerns and trust on the adoption of M-Commerce, a research model is needed to analyze the individual findings on factors that affect user acceptance and intention to start using M-Commerce. Afterwards, this model is going to be used to identify the implications of key user acceptance factors in order for e-businesses to improve their services (M-commerce) and researchers to investigate these factors in depth.

When it comes to this study, the Technology Acceptance Model was chosen as the base of the proposed framework as well as two additional constructs, that is to say, Perceived Risk and Trust. Since TPB examines the constructs of behavioral control and social norm, and TRA and TAM2 examine the subjective norm construct, they were rendered inappropriate models to examine this topic. Moreover, UTAUT was excluded due to the fact that is a complicate model for this context as well as it examines the construct of social influence.

The new proposed model is illustrated in Figure 9 Below:

Figure 9 Proposed Research Model



3.3 Research Methodology

To investigate the proposed research model as well as its hypotheses, a research plan is needed. In this plan, a research strategy will be created defining the research purpose and approach, the data collection method, sample selection, validity and data analysis method. Simply put, a proper methodology has to be relevant in the context to confirm or reject the proposed hypotheses.

3.3.1 Research Purpose

The purpose of this research is to verify what to be accomplished by conducting research work and how the accumulated outcomes of the research can be used. There are plenty kinds of research types such as descriptive, analytical, applied, fundamental, conceptual, empirical, exploratory and the like. Table 3 shows the main types of research along with their examinations *[78, p. 30]*.

In the beginning, this study is an empirical research as the author will put an effort to prove or disapprove the hypotheses mentioned previously. To delve into details, identified factors related to mobile commerce adoption are going to be tested in order to validate or reject the stated hypotheses. Afterwards, the study slightly becomes explanatory, as there will be identification of the most important factors that influence the adoption of mobile commerce.

3.3.2 Research Approach

There are two main research approaches to choose from when conducting research in social science: qualitative and quantitative method. Every single approach is divided to subcategories. For the purpose of this study a suitable approach should be chosen in order to define the data collection method. Bearing this in mind, a comparison between these two approaches was done to identify their strengths and weaknesses. Before this process, the definition of each approach is described on Table 4.

Table 3 Research Approaches

Research Approach	Description
Quantitative	It involves the generation of data in quantitative form which can be subjected to rigorous quantitative analysis in a formal and rigid fashion. An example of quantitative technique can be a questionnaire, document analysis etc.
Qualitative	It is concerned with subjective assessment of attitudes, opinions and behavior. Research in such a situation is a function of researcher's insights and impressions. Examples of qualitative techniques are interviews, questionnaires, observations etc.

There one major difference between qualitative and quantitative approach, namely, how a researcher uses collected statistics. The selection of the research approach depends heavily on the

research problem and data necessary to solve this problem. Quantitative approach tends to be more structured and formalized *[50, p. 13]*. It focuses on variables and its purpose is to test hypotheses that the research begin with *[6, p. 73]*. Also, there can be an examination of the relationships between and among variables to answer questions and hypothesis thought survey instrument or experiment *[29, p. 153]*. This approach put an effort to explain phenomena by providing results though with numbers [*67, p. 52]*. In other words, it describes, tests, and examines cause and effect relationships *[16, p. 56]* using a deductive process of knowledge attainment *[38, p. 131]*. Last, but not least, researchers using this approach gather data and then generalize the results.

On the other side of the coin, qualitative approach is the search for knowledge that is supposed to investigate, interpret, and understand the problem phenomenon by the means of an inside perspective *[77, p. 64]*. What is more, the characteristics of qualitative studies are that they are based largely on the researcher's own description, emotions, and reactions *[117, p. 112]*. Additionally, the purpose of it is to capture and discover the meaning of the research once the researcher becomes immersed in the data *[6, p. 73]*.

After comparing these two approaches, the author chose the quantitative approach for this thesis. Because the ultimate goal is to examine costumer's perception with regard to security concerns and trust on the intention to adopt mobile commerce by testing hypotheses and finally make generalization of the results.

3.3.3 Research Strategy

The next important step in writing a thesis is to define a research strategy. The design of this should be correlated to the research aims and questions. There is a need for the author to choose a proper and effective strategy to answer the research questions and then use proper data collection methods. But before choosing a quantitative data collection method there should be a careful examination of strengths and weaknesses of each strategy. According to Sukamolson, there are several kinds of quantitative research but there are four main types: descriptive, correlational, causal-comparative and experimental Research *[98, p. 4]*.

Initially, descriptive research strategy is named survey instrument, as well. The goal is to collect data to test hypotheses or answer the research questions. It is mostly used in business and management research to provide precise measurement of consumer response. Surveys are useful in describing the characteristics of a large population. For this reason, a researcher has the opportunity to generalize the results. On the other hand, surveys are not flexible, that is to say, they are constructed before their execution. As for the experimentation, the idea is to determine the effects

of various factors on a responsive variable in a controlled way or controlled conditions. For this research strategy there are some main weaknesses, that is to say, there is always a question whether the learned results will hold true in the real world, it is difficult to control influential factors and they are not appropriate for the examination of a unique population *[1, p. 110]*. When it comes to correlational strategy, this attempts to determine the extent of a relationship between two or more variables. Its strength is the high external validity, but the major disadvantage is the lack to establish a cause-effect relationship between variables *[98, p. 4]*. Last, but not least, the causal-comparative research strategy attempts to establish the cause-effect relationship among variables but the cause is not manipulated, such as gender. In other words, this research strategy involved two or more groups of individuals and one independent variable in order to make comparisons.

After comparing all the quantitative research strategies, the descriptive or survey instrument is chosen because the purpose of the research is to measure consumer response upon influential factors. Also, it is aimed to identify the cause-effect between variables from one group of individuals and then generalize the results.

3.3.4 Data Collection Method

Questionnaire

A questionnaire survey was used to test the cause-effect of variables as well as the proposed research model. The questionnaire was divided into five subsections. Initially, in the first subsection was included to gather general information about each respondent. To further clarify, the first 3 questions aim to gather information about respondent's age, ownership of internet-connected mobile device, and for which purposes a mobile device is used. The second subsection was included to gather information in terms of perceived risk, that is to say, mobile customer's perception in terms of privacy, mobile transactions, quality of product or service, and mobile commerce legislation risks. For this purpose, nine related questions were included. The ultimate goal of the third subsection is get an insight of mobile customer's trust in order to have an intention to use M-commerce. To gain knowledge about this construct, four questions were included. Moreover, the fourth subsection was included to gather information about perceived usefulness of the availability of privacy, fraud and return policies a vendor offers. For this purpose one question was included. As for, perceived ease of use, that is to say, the examination of the importance on how easy is the process of finding and comprehending such policies are according to mobile customer's perception, one question was included. Last, but not least, one question was included to examine whether the

intention to use m-commerce positively affects the adoption of m-commerce. Table 5 shows the relation between the created questions, variables and hypotheses.

Table 4 Survey questions in accordance with hypotheses and dependent variables

Variables	**Hypotheses**	**Question Number**
Perceived Risk	H5	Q4, Q5, Q6, Q7, Q8, Q9, Q10 Q11, Q12
Trust	H4a, H4b	Q13, Q14, Q15, Q16
Perceived Usefulness	H3	Q17
Perceived Ease of Use	H2a, H2b	Q18
Adoption of M-commerce	H1	Q19

In order to accurate measure the public perception, we included different types of questions. To further clarify, contingency, closed-ended, yes/no, multiple choice and scale questions were used.

Aiming to pretest the questionnaire before finalizing it, the author presented it to some students who suggested some minor modifications mostly associated with the improvement of clarity. Finally, seventeen questions were included in the questionnaire, from which fourteen are related to the constructs. The English and Greek version of the questionnaire can be found in Appendix A and B accordingly. The analysis of data is presented on chapter 4.

Mode of Survey Administration

There are several modes of survey administration such as paper/mail, telephone, electronic, face-to-face and mixed-mode. Each one of them has strengths and weaknesses. Simply put, the choice between modes of administration is affected by a number of factors such as cost, coverage to the sample, respondent's willingness to answer the questions accurately and the like. To begin with mail surveys, they are low cost and can target large population. Moreover, it is a good method to avoid potential researcher bias. On the other hand, people tend not to answer the questionnaires. To increase response rate the questionnaires should have few questions. One more weakness is the lack of guidance and explanation when the respondent does not understand a question. As for the phone survey, they are less expensive, quick and broad in scope with high response rates. But, people

might have difficulty in answering complex questions as well as there is no visual aid. When it comes to face-to-face survey, there are a lot of advantages, the respondents have visual aid, can get help when they do not understand a question, the response rate is very high and respondents can be motivated to answer. But, it cost more than the other modes and there is a possibility of research bias. One other mode is the online survey which is low cost and can have huge number of respondents from all over the globe. But, on the other side, people might not be honest and there is no clue how is answering under what conditions *[36, p. 355]*.

After having examined all the modes of survey administration, face-to-face one was chosen for a number of reasons. Initially, there should be visual aid as the questions are associated with very specific terms. Also, the researcher should be there to clarify some questions as people might find it difficult to understand. In spite of the high cost, the goal is to achieve high rate of response. All in all, face-to-face mode is the proper mode to perform an investigation on this context.

3.3.5 Sample

Sample Size

Before determining the sample size, there is a need to clarify which characteristics the respondents should meet in relation to this context, namely, the adoption of m-commerce. First of all, respondents should be of Greek Nationality. Secondly, due to the fact that mobile payments include the use of credit or debit cards, telecommunication contracts and the like, respondents must be above 18 years old. Moreover, it goes without saying, in order to use m-commerce, respondents must possess and use a mobile handheld device with connection to internet such as smartphone, tablet and the like. Finally, respondents were not selected based on gender, education and other personal details.

According to Hellenic Statistical Authority (EL.STAT), in 2011, the Greek population was approximately 10.815.197 people *[118]*. In addition, the same year about 26.4% of the Greek population, namely, 2.855.212 individuals were using internet through a handheld device such as tablet, smartphone and the like *[119, p. 2]*. Also, the Greek population below 18 years old was 1.889.916. To sum up, the population for this study is 965.296 people.

In order to determine the sample size, the author will use Cochran's formula (Figure 10_. In this formula "n" is the sample size, "Z" is value for the confidence level, "p" is the percentage picking a choice (0.5), expressed as decimal, "d" is the confidence interval (margin of error), expressed as decimal *[27, p. 277]*.

Figure 10 Cochran's formula to determine sample size

$$n = \frac{Z^2 p(1-p)}{d^2}$$

In this study, the confidence level is 95%, the confidence interval 11% and the population 965.296 people. The result of this equation is a minimal sample size of 79 respondents in order to have a strong enough sample.

Sampling Technique

There are two wide categories of sampling techniques such as probability and non-probability. Probability sampling is the ideal technique to be used when the researcher aims to generalize the results of the study, while non-probability sampling not the appropriate group of techniques to achieve this aim *[11, p. 69]*.

Probability sampling is a technique in which every unit in the population of this study has a chance of being selected in the sample, and this chance can be accurately determined. Probability sampling techniques include: Simple random, systematic, stratified, cluster, matched-paid and multistage sampling.

For the purpose of this topic cluster one was chosen because the population of this study is dispersed over a wide geographic region, that is to say, Greece. Simply put, it is not feasible to conduct a simple random sampling of the entire population. For this reason, the sample includes three clusters namely, Athens, Thessaloniki and Serres (about 50% of the total Greek population).

3.3.6 Operationalization

In order to accurately measure theoretical constructs of this study operationalization process is needed. Operationalization refers to the process of developing indicators or items for measuring these constructs. In this study there are two multidimensional constructs such as trust and perceived risk as well as three unidimensional constructs such as perceived usefulness, perceived ease of use, and adoption of m-commerce. In multidimensional constructs, each underlying dimension should be

measured separately and afterwards the scores should be combined to create an overall value for a specific multidimensional construct *[11, p. 44]*.

Table 5 Constructs along with indicators and attributes

Construct	Indicator	Attribute (Likert - 5 Scale)	Effect
Perceived Risk	Q4: Privacy Q5: Privacy	1. Very Unhappy 2. Unhappy 3. Neutral 4. Happy 5. Highly Satisfied	Low score indicates negative effect on intention to use mobile commerce
	Q6: Privacy	1. Definitely No 2. Probably No 3. Neutral 4. Probably Yes 5. Definitely Yes	High score indicates negative effect on intention to use m-commerce
	Q7: Mobile Payments Q8: Mobile Payments Q9: Mobile Payments Q10: Mobile Payments		
	Q11: Product/Quality		
	Q12: M-Commerce Legislation		
Trust	Q13: Institution-based Q14: Characteristics of Safety Q15: Characteristics of Security Q16: Characteristics of Security		High score indicates positive effect on intention to use mobile commerce
Perceived Usefulness	Q17: Availability of policies		
Perceived Ease of Use	Q18: Ease way of finding and understanding policies		
Adoption of M-commerce	Q19: Intention to Use m-commerce		High score indicates positive effect on actual adoption of m-commerce

The author measured the constructs through indicators using Likert Scale attributes. Likert is very popular ratings scale that social science researcher use frequently to measure ordinal data. In this process short item statements are included and respondents should indicate their extent of agreement or disagreement on a five-point scale such as “Definitely No”, “Probably No”, “Neutral”, “Probably Yes” and “Definitely Yes” *[11, p. 47]*.

To begin with perceived risk, low score values of both fourth and fifth questions indicate negative effect on intention to use mobile commerce. On the other hand, high score values from the sixths to twelfth question indicate negative effect on intention to use mobile commerce. Moreover, high score values of the indicators about trust, perceived usefulness, and perceived ease of use, indicate positive effect on intention to use m-commerce. Finally, the high score of intention to use m-commerce indicates positive effect on actual adoption of m-commerce. Table 6 shows an overview of the constructs along with indicators and attributes.

At this point, the author determines the item scales, as well as transforms two of them because in multi-dimensional scales there is a need to combine the results of different items to create an overall measure *[11, p. 52]*.

Perceived Risk

To measure perceived risk, nine questions were included in the questionnaire. Due to the fact that low scores of the fourth and fifth questions and high scores of the sixth to the twelfth questions indicate negative effect on the intention to use m-commerce, data transformation should take place in order for the results to be combined and provide an overall measure. In other words, for the fourth and fifth questions "Very unhappy" attribute was transformed and became 5, "Unhappy" became 4, "Neutral" became 3, "Happy" became 2 and "Highly satisfied" became 1. On the other hand, questions from 6 to 12 have the following scales: 1 for "Definitely No", 2 for "Probably No", 3 for "Neutral", 4 for "Probably Yes" and 1 for "Definitely Yes".

Trust, Perceived usefulness, perceived ease of use, adoption of m-commerce

To measure trust, perceived usefulness, perceived ease of use and adoption of m-commerce high score of attributes indicate positive intention to use or to adopt m-commerce. All of their indicators employ the same scaling attributes, that is to say, 1 for "Definitely No", 2 for "Probably No", 3 for "Neutral", 4 for "Probably Yes" and 1 for "Definitely Yes".

4. RESEARCH FINDINGS AND ANALYSIS

The aim of this chapter is to present research findings, analyze them and finally discuss the results. Initially, the author presents the response rate, respondent characteristics as well as the rest survey findings. Afterwards, the data was analyzed thought the statistical software package SPPS V22 to test each of the proposed hypotheses. Last, but not least the results of this survey were discussed.

4.1 Research Findings

There is a presentation of how many respondents finally answered the questionnaire along with their characteristics in terms of which web-services they use. Moreover, there is a presentation of survey findings emerged from the questions associated with the perception of risk, usefulness, ease of use and trust in the intention to use m-commerce as well as the actual adoption of mobile commerce.

4.1.1 Response rate and respondent characteristics

This survey was distributed from 7 to 14 October to individuals that are above 18-year-old and possess an internet-connected hand-held device. In total, 169 out of 215 respondents completed the survey by answering the questionnaire. However, due to the fact that some respondents omitted to answer some questions or double answered some items, 9 questionnaires were removed. In other words, the total amounts of valid responds were 160, that is to say, twice as many as the minimum determined sample size.

As can be seen from Table 7, most respondents belonged to the age categories 25-32 and 18-25. To delve into details, the age category of 25-32 takes 58.75% of the total respondents. Moreover, the amount of answered questionnaires concerning the categories of 18-25, 32-40 and 40+ is 23.12%, 11.88% and 6.25% accordingly.

Table 6 Age categories and number of respondents

Age Category	Frequency	Percent (%)
18-25	37	23.12%
25-32	94	58.75%
32-40	19	11.88%
40 +	10	6.25%
Total	**160**	**100%**

By observing Table 8, it is obvious that respondents use plenty of web-services through their hand-held device, which gives them the opportunity to use multiple channels to conduct m-commerce transactions. It has been shown that the leading web-service is "Social Networks" with 97% of usage, followed by email with 87%, mobile applications with 78%, web-browsing with 71% and other web-services with 26% percent.

Table 7 The web-services that respondents use

Web-Services	Frequency	Percent
Web browsing	114	71%
Email	139	87%
Social networks	155	97%
Mobile applications	124	78%
Other web-services	43	26%

4.1.2 Findings about Perceived Risk

To measure the construct of perceived risk nine questions (from fourth to twelfth) were created and in this subchapter the findings of them are presented.

The fourth question examined the attitude of respondents on how do they feel when the mobile device reveals information about their current location. By looking at Table 9, it is obvious that 41.25% of the respondents have neutral attitude while 48.74% of them have negative attitude as 51 and 27 individuals feel unhappy and very unhappy accordingly. It is worthwhile to mention that only 1 person answered that is highly satisfied.

Table 8 Attitude when current location is revealed

Answer	Frequency	Percent
Very Unhappy	27	16.87 %
Unhappy	51	31.87 %
Neutral	66	41.25 %
Satisfied	15	9.37 %
Highly Satisfied	1	0.62 %
Total	160	100%

The fifth question examined the attitude of respondents on how do they feel when the mobile device reveals their preferences and internet habits to online vendors. Table 10 shows that 41.87% of the respondents feel unhappy and 22.50% feels very unhappy. By summing up these results, we conclude that 64.37% of the total respondents have negative attitude towards this privacy risk. Moreover, it seems that only 8.12% has positive attitude with 10 and 3 respondents answering "Satisfied" and "Highly Satisfied" accordingly.

Table 9 Attitude when internet habits are revealed

Answer	Frequency	Percent
Very Unhappy	36	22.50%
Unhappy	67	41.87%
Neutral	44	27.50%
Satisfied	10	6.25%
Highly Satisfied	3	1.87%
Total	160	100%

In the sixth question respondents asked if they had any concern if their personal data might be used by the retailer for a secondary purpose such as to better market the offered products or services. Table 11 shows the majority of respondents answered "Probably Yes", namely, 41.88%. Moreover, 26.25% had neutral attitude while 18.75% is not that concerned because 16.25% and 2.5% answered "Probably No" and "Definitely No" accordingly.

Table 10 Respondents' concerns towards secondary use of personal data

Answer	Frequency	Percent
Definitely No	4	2.50%
Probably No	26	16.25%
Neutral	42	26.25%
Probably Yes	67	41.88%
Definitely Yes	21	13.12%
Total	160	100%

The next question (seventh), individuals were asked if they had any concern about the possibility of someone to perform unauthorized transactions in case their device was stolen or lost. Table 12 shows the findings of this question. It goes without saying the biggest proportions of respondents

answered “Probably Yes” and “Definitely Yes” with 57 and 46 responds accordingly. In other words, these two answers make 64.37% of the total answers. Also, 22 respondents had neutral attitude while 22 and 13 individuals answered “Probably No” and “Definitely No” accordingly.

Table 11 Respondents'' concerns towards unauthorized transactions

Answer	Frequency	Percent
Definitely No	13	8.12%
Probably No	22	13.75%
Neutral	22	13.75%
Probably Yes	57	35.62%
Definitely Yes	46	28.75%
Total	160	100%

The eighth question provides findings on respondents’ concerns on network security deficiencies. Table 13 shows that 60 respondents answered “Probably Yes”, 25 answered “Definitely Yes”. In addition, 30 individuals have neutral attitude as well as 34 and 11 answered “Probably No” and “Definitely No” accordingly.

Table 12 Respondents' concerns towards the security of networks

Answer	Frequency	Percent
Definitely No	11	6.88%
Probably No	34	21.25%
Neutral	30	18.75%
Probably Yes	60	37.50%
Definitely Yes	25	15.62%
Total	160	100%

The ninth question aimed to get responses whether the respondents had any concern towards security deficiencies in terms of mobile operating system. According to the results, 49 respondents answered “Probably Yes”, 29 answered “Definitely Yes”. In contrast, 38 and 17 respondents answered “Probably No” and “Definitely No” accordingly. Last, but not least, 27 respondents had neutral attitude towards that question. An overview of the results is shown on Table 14.

Table 13 Respondents' concerns towards operating system security

Answer	Frequency	Percent
Definitely No	17	10.62%
Probably No	38	23.75%
Neutral	27	16.88%
Probably Yes	49	30.63%
Definitely Yes	29	18.12%
Total	160	100%

The ultimate goal of the tenth question was to get responses on whether people have concerns about security deficiencies of mobile applications. The results on Table 15 indicate that the majority of respondents, namely, 58.74% of the surveyed sample have concerns towards this factor. In other words, 38.18% answered “Probably Yes” and 20.62% answered “Definitely Yes”. Contrarily, 19.37% of the respondents answered “Probably Not”, 9.37% answered that they definitely not having any concern and 12.50% has neutral attitude towards this factor.

Table 14 Respondents' concerns towards mobile application security

Answer	Frequency	Percent
Definitely No	15	9.37%
Probably No	31	19.37%
Neutral	20	12.50%
Probably Yes	61	38.12%
Definitely Yes	33	20.62%
Total	160	100%

The eleventh question aimed to examine the attitude of respondents on whether they have concerns about the quality of the delivered product which might not be as it was anticipated. Table 16 shows that 85 respondents have concerns towards this factor, namely, 57 individuals answered “Probably Yes” and 28 answered “Definitely Yes”. On the other hand, 34 respondents have neutral attitude, 19 have no concern at all and 22 have probably no concerns.

Table 15 Respondents' concerns towards the quality of delivered products

Answer	Frequency	Percent
Definitely No	19	11.87%
Probably No	22	13.75%
Neutral	34	21.25%
Probably Yes	57	35.62%
Definitely Yes	28	17.50%
Total	160	100%

The last question (twelfth) measuring the perception of risk was intended to identify if people have any concerns on whether are protected by mobile commerce legislation in case of dispute with the online vendor or not. According to Table 17, 53.74% of the respondents feel unsecure with 61 individuals answering that probably will not be protected and 25 showing that are definitely not protected. In contrast, 14.37% of the respondents have neutral attitude, 18.75% believe that probably do not have any concern and 13.12% feels that are totally protected by m-commerce legislation in case of dispute with the online vendor.

Table 16 Respondents' concern about the protection of m-commerce legislation

Answer	Frequency	Percent
Definitely No	21	13.12%
Probably No	30	18.75%
Neutral	23	14.37%
Probably Yes	61	38.12%
Definitely Yes	25	15.62%
Total	160	100%

4.1.3 Findings about Trust

To measure the construct of trust four questions (from thirteenth to sixteenth) were created and in this subchapter the findings of them are presented.

In the question number thirteenth, respondents were asked if they had the intention to buy something using their hand-held devices if the online vendor had good reputation. From the finding presented on Table 18, it is obvious that 86.25% of the respondents have positive attitude towards that factor. To further clarify, 50% of them answered "Probably Yes" while 36.25% answered

"Definitely Yes". In addition, 8.75% has neutral attitude, 2.50% answered "Probably No" and 2.5% would definitely not buy something if the online vendor had good reputation.

Table 17 Intention to buy if the online vendor has good reputation

Answer	Frequency	Percent
Definitely No	4	2.50%
Probably No	4	2.50%
Neutral	14	8.75%
Probably Yes	80	50%
Definitely Yes	58	36.25%
Total	160	100%

The next question, that is to say, fourteenth, examined the attitude on whether respondents would buy a product or service from an online vendor offering enticing promises, contracts and guarantees in case of dispute. 42.50% of the total respondents would probably buy goods under this condition while 31.87% would definitely buy. Contrarily, only 4.37% would definitely not buy and 9.37% would probably not buy. Also, 11.87% of the respondents have neutral attitude towards this factor.

Table 18 Intention to buy if the online vendor offers contracts and guarantees in case of dispute

Answer	Frequency	Percent
Definitely No	7	4.37%
Probably No	15	9.37%
Neutral	19	11.87%
Probably Yes	68	42.50%
Definitely Yes	51	31.87%
Total	160	100%

As for the condition in which an online vendor offers good encryption security, 48.75% of the respondents would definitely have the intention to buy a product or service. Moreover, 35.62% would probably have the intention to buy. Additionally, 10.62% of the total respondents have neutral attitude, 2.50% answered "Probably No" and 2.50% would definitely have no intention to purchase a product or service. Table 20 gives an overview of the results of that question.

Table 19 Intention to buy if the online vendor offers encryption security

Answer	Frequency	Percent
Definitely No	4	2.50%
Probably No	4	2.50%
Neutral	17	10.62%
Probably Yes	57	35.62%
Definitely Yes	78	48.75%
Total	160	100%

The last question examining the construct of trust aimed to get responses on the intention to buy a product or service if the online vendor offers transparency on how the users' data are going to be used. 43.75% of the respondents would definitely have the intention to buy while 35% would probably buy. Additionally, 13.75% of the respondents have neutral attitude, 5% would probably have no intention to buy and 2.50% would definitely not buy. In the Table 21 there is an overview of the results.

Table 20 Intention to buy if the online vendor offers transparency on how the data are used

Answer	Frequency	Percent
Definitely No	4	2.50%
Probably No	8	5%
Neutral	22	13.75%
Probably Yes	56	35%
Definitely Yes	70	43.75%
Total	160	100%

4.1.4 Findings about Perceived Usefulness

In order to measure the construct of perceived usefulness, the respondents were asked if they had the intention to use mobile commerce in case the online vendor provided them with detailed fraud protection, privacy and return policy. As it is shown on Table 22, 50.62% of the total respondents would definitely have the intention to use m-commerce if the online vendor offered them with such policies. Also, 35% answered that they would probably have the intention to buy. It is worthwhile to mention, that 11.25% of respondents had neutral attitude, and 3.12% negative attitude, namely,

1.87% would probably not and 1.25% definitely not have the intention to use m-commerce by just getting these policies.

Table 21 Perceived usefulness of getting policies

Answer	Frequency	Percent
Definitely No	2	1.25%
Probably No	3	1.87%
Neutral	18	11.25%
Probably Yes	56	35%
Definitely Yes	81	50.62%
Total	160	100%

4.1.5 Findings about Perceived Ease of Use

The perceived ease of use was measured by one and only question. Respondents asked if they would have the intention to use mobile commerce to proceed with a transaction if the vendor offered them with an easy way to find comprehendible policies in terms of fraud, privacy and return of products. In this question 50.94% of the respondents answered “Definitely Yes” and 38.12% “Probably Yes”. In other words, 89.06% of the respondents have positive attitude towards that factor. On the other hand, 5.62% of the people have negative attitude, that is to say, 5 respondents would probably have no intention to use m-commerce and 4 definitely not buy from an online vendor offering easy way of finding comprehendible policies. Last, but not least, 11.25% of the respondents had neutral attitude.

Table 22 Perceived ease of use of finding comprehendible policies

Answer	Frequency	Percent
Definitely No	4	2.50%
Probably No	5	3.12%
Neutral	18	11.25%
Probably Yes	61	38.12%
Definitely Yes	72	50.94%
Total	160	100%

4.1.6 Findings about Adoption of M-commerce

The last question of this survey aimed to test the relationship between the mediator construct of intention to use and dependent construct of the actual adoption of mobile commerce. To further clarify respondents were asked if they would actually adopt mobile commerce in case they had strong intention to use it. It is obvious from the Table 24 that 51.88% of the respondents answered "Definitely Yes", 32.50% answered "Probably Yes", 8.12% had neutral attitude, 5.62% answered "Probably No" and 1.88% of the respondents would not actually adopt m-commerce.

Table 23 Respondent's attitude towards actual adoption of m-commerce

Answer	Frequency	Percent
Definitely No	3	1.88%
Probably No	9	5.62%
Neutral	13	8.12%
Probably Yes	52	32.50%
Definitely Yes	83	51.88%
Total	160	100%

4.2 Data Analysis

In this subchapter the analysis of the research findings is presented along with results. Each hypothesis is tested and analyzed by using the statistical software package SPSS 22. As it was described in chapter 3.3.6, Likert scales where employed to accurately measure the outcome of questions. It is worthwhile to mention, that some questions are analyzed on their own to validate or reject a proposed hypothesis, while some others will be analyzed separately and their scores will be summed up to calculate a total score for specific constructs. Taking under consideration the fact that questions related to constructs employ liker scales (non-ordinal), all questions use the same Likert Scale as well as the descriptive statistics, that is to say, univariate analysis which analyses the score mean for central tendency and standard deviations for variability. Univariate analysis, or analysis of a single variable, is the simplest form of quantitative analysis and refers to a set of statistical techniques that can describe the general properties of one variable. The frequency distribution of a variable is a summary of the frequency (or percentages) of individual values or ranges of values for that variable *[11, p. 121]*.

4.2.1 Perceived Risk Analysis

In order to analyze the construct of perceived risk the score mean of nine items was summed up. When it comes to Q4 and Q5 the score emerged from 1 “Highly Satisfied” to 5 “Very Unhappy”. As for the questions from Q6 to Q12 the score emerged from 1 “Definitely No” to 5 “Definitely Yes”. In all of the questions high score of attributes indicate negative intention to use mobile commerce.

Table 24 Descriptive Analysis of “Perceived Risk” construct

Item	Score Mean	Standard Deviation
Q4	3.553	0.901
Q5	3.767	0.936
Q6	3.469	0.996
Q7	3.627	1.254
Q8	3.338	1.176
Q9	3.219	1.287
Q10	3.410	1.267
Q11	3.331	1.263
Q12	3.244	1.292
Total	3.440	1.152

As it can be seen on Table 25, the Total Score Mean for the perceived risk construct is 3.440. In other words, this score is defined as the respondents having neutral toward negative intention to use mobile commerce when risk factors exist. This outcome validates the hypothesis below:

H5: Perceived Risk has a negative effect on Intention to Use M-Commerce

4.2.2 Trust Analysis

In order to analyze the construct of trust the score mean of four items was summed up. The score for questions from Q13 to Q16 emerged from 1 “Definitely No” to 5 “Definitely Yes”. In all of the questions high score of attributes indicate positive intention to use mobile commerce as well as trust has a positive effect towards risk factors.

Table 25 Descriptive Analysis of "Trust" Construct

Item	Score Mean	Standard Deviation
Q13	4.157	0.868
Q14	3.887	1.096
Q15	4.256	0.927
Q16	4.132	0.994
Total	4.108	0.971

According to Table 25, the Total Score Mean for the trust construct is 4.108. Simply put, the score indicates that respondents have positive intention to use mobile commerce when the described trust factors are associated with risks. This outcome validates the hypotheses below:

H4a: Trust has a direct positive effect on Intention to Use M-Commerce

H4b: Trust has a direct positive effect on Perceived Risk

4.2.3 Perceived Usefulness Analysis

The construct of Perceived Usefulness was analyzed as well. The score of Q17 emerged from 1 "Definitely No" to 5 "Definitely Yes". The high score of attributes in this question indicates positive intention to use mobile commerce.

Table 26 Descriptive Analysis of "Perceived Usefulness" Construct

Item	Score Mean	Standard Deviation
Q17	4.327	0.838

The result of that question indicates perceived usefulness has a direct positive effect on intention to use m-commerce, due to the fact that score mean is 4.327. For this reason, the hypothesis below is validated:

H3: Perceived Usefulness has a direct positive effect on Intention to Use M-Commerce

4.2.4 Perceived Ease of Use Analysis

In this subchapter the construct of "Perceived Ease of Use" was analyzed. The score of eighteenth question emerged from 1 "Definitely No" to 5 "Definitely Yes". The high score of attributes in this

question indicates positive intention to use mobile commerce as well as positive effect on perceived usefulness.

Table 27 Descriptive Analysis of "Perceived Ease of Use" Construct

Item	Score Mean	Standard Deviation
Q18	4.200	0.937

The score mean of this question was 4.200, which validates the following hypotheses:

H2a: Perceived Ease of Use has a direct positive effect on Intention to Use M-Commerce

H2b: Perceived Ease of Use has a direct positive effect on Perceived Usefulness

4.2.4 Adoption of M-commerce Analysis

The last construct to be analyzed was the dependable variable of actual use (adoption) of mobile commerce. The score of the last question emerged from 1 "Definitely No" to 5 "Definitely Yes". For this construct, the high score mean of attributes indicates that behavioral intention to use m-commerce has a direct positive effect on actual adoption of m-commerce.

Table 28 Descriptive Analysis of "Adoption of M-commerce" Construct

Item	Score Mean	Standard Deviation
Q19	4.269	0.963

It is obvious from Table 29 that respondents have positive attitude as the score mean is 4.269. From this result the following hypothesis is validated:

H1: Behavioral Intention to Use M-commerce has a direct effect on actual adoption of M-commerce

4.3 Summary of results

The research findings and analysis of total responses, that is to say, 160 validated all the proposed hypotheses. In order to test whether the hypotheses have positive or negative effect towards constructs it was necessary to use descriptive analysis (univariate) by testing the score means of each or group of questions. In this topic H1, H2a, H2b and H3 where emerged from TAM model, while H4a, H4b and H5 were additional variables. In other words, risk has negative effect in the

intention to adopt m-commerce; trust has effect in the perception of risk; trust, perceived ease of use, and perceived usefulness have positive effect in the intention to adopt m-commerce; and the behavioral intention to use m-commerce has a direct positive effect in the actual adoption of it.

Plenty of researchers in this field examined the relationships between these constructs in information technology adoption and specifically in e-commerce or m-commerce context. Davis F. et al, accepted that the behavioral intention to use a technology has positive effect in the actual adoption of this technology. Moreover, Wang Y.S et al accepted that ease of use increases m-commerce engagement as well as the trust effect in this technology. Talyor S. and Todd P. confirmed that perceived usefulness has been shown to shape positive attitudes in the intention to use an information system. As for the construct of trust, Pavlou accepted that it is an antecedent of perceived risk by indicating that trust in e-commerce can reduce a consumer's perception of risk in the online transactions with a vendor. What is more, Lu, Amoroso and Hunisger, Holsapple and Sasidharan, and jurvenpaa trust is an important element affecting consumer behavior and it determined the success of technologies adoption such as e-commerce and m-commerce. Last, but not least, Pavlou P.A. indicated that perceived risk is a direct antecedent of behavioral intention to use m-commerce since the use of m-commerce for transactions involve a certain degree of uncertainty. Table 30 shows the hypotheses summary derived from the results of this study along with results of previous studies in terms of specific constructs related to electronic and mobile commerce adoption.

Table 29 Hypotheses Summary

Hypothesis	**Construct**	**Univariate Analysis**	**Previous Researches**
H1	Adoption of M-commerce	Accepted	Accepted: Davis F. et al, 1989
H2a, H2b	Perceived Ease of Use	Accepted	Accepted: Wang Y.S. et al, 2006
H3	Perceived Usefulness	Accepted	Accepted: Taylor S. Todd P., 1995
H4a, H4b	Trust	Accepted	Accepted: Amoroso D.L., Hunsinger D.S., 2009 Holsapple C.W., Sasidharan S., 2005 Lu J. et al, 2003 Jarvenpaa S.L. et al, 2000
H5	Perceived Risk	Accepted	Accepted: Pavlou P.A., 2003

CONCLUSIONS

The purpose of this thesis was to explore customers' perception in terms in terms of security risks and trust towards the adoption of mobile commerce. There are plenty of factors affecting the adoption of m-commerce. All of these are of paramount importance not only to e-businesses but also future researchers. To get into details, e-businesses that employ mobile commerce activities can take advantage of the knowledge concerning customers' perception towards this field and therefore provide mobile users with tools or information they aim to obtain. On the other hand, future researcher can get an overview of how much security risk and trust related factors affect mobile users and therefore investigate them in depth or combine them with other mobile commerce adoption factors.

In order to answer the research problem, initially, there was a vital need to find factors associated with trust, risk, usefulness and ease of use. Secondly, the conceptualization of framework and methodology was necessary to be done. At last, the analysis of research finding was of paramount importance to finally answer the research problem, that is to say, whether the determinants of trust affect negatively the perception of risk as well as which determinants of trust and perceived risk directly affect in a negative or positive way the intention to adopt mobile commerce.

In Chapter 1 and 2 there was an attempt to identify how mobile commerce developed and what factors, from customer's perspective, affect the intention to use or adopt it. In the third chapter, methods of technology acceptance were analyzed in order to use one as a basis of the proposed research model and adjust to it some additional external constructs, namely, trust and perceived risk. Moreover, when it comes to methodology, methods were questioned by indicating strengths and weaknesses. The outcome of this process is a justified methodology able to solve the research problem or to test the proposed hypotheses.

As it was described in methodology, a questionnaire instrument was chosen to measure customers' responses. From the analysis of those, the author was able to validate or reject the proposed hypotheses. The final outcome was to confirm all of them by conducting descriptive analysis of Likert summative scales. The conclusions of this survey are described below:

1. First and foremost, the results of H5 indicated that the perception of risk in terms of privacy, m-payments, legislation and product quality deters customers from using mobile commerce. As for the privacy, customers are disappointed when their current location and internet habits are revealed to online vendors and the latter is using the above data to better market the offered products or services. Moreover, customers have negative intention to use m-

commerce to proceed with mobile payments as they feel the risk of unauthorized transaction in case the device is lost or stolen, the wireless network, operating system and mobile application might be unsecure. What is more, the perception of risk that the quality of the delivered product might not be as it was anticipated as well as the fear of not being protected by mobile commerce legislation has negative effect in the intention to use m-commerce.

2. Contrarily, the test of H4a and H4b showed that the determinant of trust reduces the perception of risk in the intention to use m-commerce, namely, when the online vendor has good reputation, offers good encryption security, transparency on how the data are going to be used, enticing promises, guarantees and contracts in case of dispute, the customers place trust on him and have strong intention to use m-commerce.
3. Moreover the result of testing H3, indicates that perceived usefulness of getting policies in terms of fraud protection, privacy and return of a delivered product have a direct positive effect on intention of customers to use m-commerce.
4. In addition, the ease of use in getting the above policies has a direct positive effect not only on intention to use mobile commerce but also to perceived usefulness of getting policies. Simply put, customers prefer to find easily and comprehendible existent fraud protection, privacy and return policies in order to have intention to use m-commerce. The above result derived by testing H2a and H2b.
5. The last results of this research is when customers feel free of risks and have high level of trust in the intention to use mobile commerce they actually are able to adopt it.

This study provides many implications not only to practice but also to the theory. For this reason, recommendations and suggestions for the adoption of the results are necessary.

From a practical perspective, there are plenty of recommendations that should be adopted by mobile technology manufacturers, software developers, online vendors and lawmakers. First and foremost, there is a need for more secure software and wireless networks. For this reason, data encryption and security protocols should be improved in order for the people to be less hesitant in placing personal details such as credit card number, password and the like. As for the online vendors, there should focus on improving not only their online reputation but also their m-commerce websites or applications in terms of trust. To further clarify, good online reputation increases the possibility of gaining more revenues as the customers place trust on the vendor. In addition, online merchants should include all the necessary policies with regards to privacy, return and fraud protection policies that are not only easy to find in m-commerce website and application but also easy to understand. Also, the way personal data are going to be used should be transparent. Last, but not

least, lawmakers should focus on improving m-commerce legislation to better protect customers in case of dispute with online vendors.

There are plenty of implications in the theory, as well. To delve into details, the author met the purposes of this study, namely, to perform an empirical research and to explore the factors that influence the adoption or deterrence of mobile commerce. After having discovered these factors derived from theory or other relevant fields, they were verified. In other words, the conclusions proved the novelty of the research which contributed to the theory regarding the adoption of m-commerce in terms of security risks and trust, as there was not in-depth discussion on how specific determinants can affect the actual adoption of m-commerce.

Although the implications are plenty, it must be noted there are some limitations. Initially, the effects of subjective norm, performance, effort expectance, social influence, experience, gender, age and voluntariness of use for the adoption of m-commerce in terms of perceived risk and trust should be further examined. Future researchers can further investigate this topic by adjusting determinants in UTAUT model. Moreover, due to the fact that cluster sampling technique was used, the results are not 100% generalizable to the Greek population. In order to achieve this, simple random sampling method of the entire population is necessary. For this procedure, other modes of survey administration can be used such as telephone, mail, or online survey (if necessary). The last limitation was to examine how the online vendors are performing towards that topic to meet customers' needs. For this reason, case studies can also be examined in future researches in combination with surveys.

To further continue the academic discussion in this area, future research can be triggered based on the limitations mentioned above.

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SUMMARY IN ENGLISH

This work is of theoretical and practical importance, that is, generation of new knowledge associated with mobile commerce adoption in terms of security concerns and trust which will help not only future researchers but also e-businesses.

Despite the fact researchers have examined the adoption of m-commerce in a holistic way, the author found there was no research focusing solely and in-depth on the determinants of trust and perceived risk. The problem was to examine how the above determinants affect the intention to adopt m-commerce.

The objects are mobile commerce, security concerns and trust. The purpose of this study is twofold, namely, empirical and explanatory. As for the objectives, it was necessary to review the literature, propose a research model, analyze the results, and verify or reject the proposed hypotheses. When it comes to the hypotheses, there was a test on whether trust, perceived risk, perceived usefulness, and perceived ease of use negatively or positively affect the constructs of the proposed model.

The author used theoretical and empirical collection methods. As for the theoretical ones, analogy, generalization and modeling methods were used. Concerning the empirical ones, due to the fact that quantitative approach was chosen, a survey instrument, that is, questionnaire was used. After the results had been collected, SPSS 22 was used to perform descriptive data analysis of Likert summative scales. At last, the results along with the research limitations were discussed.

The final outcome of this study was to confirm all the proposed hypotheses. As for the conclusions, the perception of risk in terms of privacy, m-payments, m-commerce legislation and quality of delivered products has negative effect in the intention to use mobile commerce. Additionally, trust elements such as good reputation, enticing promises, good encryption security and transparency, reduce the perception of risk and increase the intention to use m-commerce. Also, the availability of policies that are easy to understand and find, has positive effect in the intention to use m-commerce. Last, but not least, when customers feel free of risks and have high level of trust in the intention to use mobile commerce they actually adopt it.

Keywords

Mobile Commerce, Security Concerns, Trust, Perceived Risk, Privacy, Mobile Transactions, M-commerce Legislation, Technology Acceptance Model, M-commerce Adoption

SUMMARY IN LITHUANIAN

Šio darbo teorinė ir praktinė svarba yra naujų žinių, susijusių su saugumo ir pasitikėjimo problemų sprendimais mobilios komercijos kontekste, kūrimas kuris pasitarnaus ne tik mokslinei bendruomenei, bet ir e-verslui.

Nepaisant to, jog mobilios komercijos įsisavinimas plačiai analizuotas holistiniu požiūriu, magistrinio darbo autorius nerado atliktų išsamių tyrimų išsamiau aptariančių pasitikėjimo ir saugumo veiksnių poveikio mobilios komercijos kontekste. Darbo problema formuluojama, kaip patikimumo ir saugumo veiksniai daro įtaką mobilios komercijos įsisavinimui.

Tiriamieji objektai yra mobili komercija, saugumas ir patikimumas. Šio tyrimo tikslas yra dvejopas: empirinis ir aiškinamasis. Siekiant tyrimo tikslo, buvo išstudijuota literatūra, pasiūlytas mokslinio tyrimo modelis, išanalizuoti rezultatai ir įvertintos suformuluotos hipotezės.

Mokslinio tyrimo eigoje autorius panaudojo teorinius ir empirinius duomenų analizės ir rinkimo metodus. Teorinėje dalyje buvo panaudoti panašumo, apibendrinimo ir modeliavimo metodai. Empirinėje dalyje įgyvendintas kiekybinis tyrimas, duomenys renkami apklausos būdu struktūruoto klausimyno pagalba. Surinkti duomenys apdoroti SPSS aplinkoje atliekant aprašomųjų duomenų analizę pagal Likerto suminių vertinimo skales.

Galutinis šio tyrimo tikslas buvo patikrinti suformuluotas hipotezes. Kalbant apie išvadas, privatumo rizikos suvokimas, mobilių mokėjimų, mobilios komercijos įstatymų ir gaunamų produktų kokybė turėjo neigiamą įtaką mobilios komercijos naudojimui. Be to, pasitikėjimo elementai, tokie kaip gera reputacija, viliojantis pažadai, geras šifravimo patikimumas ir skaidrumas, sumažina rizikos suvokimą ir padidina mobilios komercijos naudojimą. Be to, lengvai suprantamos ir surandamos politikos galimybė, teigiamai veikia mobilios komercijos neaudojimo galimybę. Paskutinis, bet ne mažiau svarbus dalykas, kai klientai nebejaučia rizikos ir turi aukštą pasitikėjimo lygį naudoti mobilią komerciją, jie iš tikrųjų ją priima.

Raktiniai žodžiai:

Mobili komercija, saugumo klausimai, pasitikėjimas, numanoma rizika, mobilios perlaidos, mobili komercija, technologijų pritiakymo modelis, mobilios komercijos įsisavinimas.

SUPPLEMENT

A. Questionnaire in English

Questionnaire

Mobile Commerce: Customer trust and security concerns

What is Mobile Commerce?

It is the process in which a customer proceeds with transactions through a mobile device such as smartphone, tablet etc. In other words, when someone purchases a product or service using his mobile device.

For the payments, one of the following is necessary to be used:

A. Credit or Debit Card (Bank Card)
B. Mobile pre-paid credits or monthly contract bill
C. NFS and or other mobile payment

Please answer the questions by marking them with **X**

1. How old are you?
   - ☐ 18-25
   - ☐ 25-32
   - ☐ 32-40
   - ☐ 40 +

2. Do you possess any internet-connected mobile device?
   - ☐ Yes
   - ☐ No

3. Which web-services do you have experienced with on your mobile device?
   (You can choose more than one answers)
   - ☐ Web Browsing
   - ☐ Email
   - ☐ Social networks
   - ☐ Mobile applications
   - ☐ Other web-services: …..

When visiting an online retail website through your mobile device:

		Very Unhappy	Unhappy	Neutral	Satisfied	Highly Satisfied
4.	How do you feel when your mobile device reveals information about your current location?					
5.	How do you feel when your mobile device reveals information about your preferences or internet habit such as which pages you visit?					

		Definitely No	Probably No	Neutral	Probably Yes	Definitely Yes
6.	Do you have any concern that your personal data might be used by the retailer for a secondary purpose such as to better market the offered products or services?					

When you have the intention to buy something through your phone by using you credit or debit card, would you have any concern about the possibility of:

		Definitely No	Probably No	Neurtal	Probably Yes	Definitely Yes
7.	Someone to perform unauthorized transactions if your phone is stolen or lost?					
8.	The network you use (3G and Wi-fi) have security deficiencies?					
9.	The operating system of your phone have security deficiencies towards viruses and the like?					
10.	The application of your phone to have security deficiencies towards viruses and the like?					

In case you have intention to buy something over your mobile device, would you have any concern that:

		Definitely No	Probably No	Neutral	Probably Yes	Definitely Yes
11.	The quality of the delivered product might not be as it was anticipated?					
12.	You will not be protected by mobile commerce in case of dispute with the vendor?					

Would you have the intention to buy something using your mobile device, if the online vendor:

		Definitely No	Probably No	Neutral	Probably Yes	Definitely Yes
13.	Has good reputation?					
14.	Offers enticing promises, contracts and guarantees in case of dispute?					
15.	Offers good encryption security?					
16.	Offers transparency on how your data are going to be used?					
17.	Provides you with detailed fraud protection, privacy and return policy?					
18.	Provides you with an easy way to find and understand the above policies?					

19. When you feel safe about security concerns in the intention to use m-commerce, would you actually use it?

Definitely No	Probably No	Neutral	Probably Yes	Definitely Yes

Thank you for participating in this survey!

B. Questionnaire in Greek

Ερωτηματολόγιο

Κινητό ηλεκτρονικό εμπόριο: Η εμπιστοσύνη και οι ανησυχίες των πολιτών σε θέματα ασφαλείας

Τι είναι το κινητό ηλεκτρονικό εμπόριο;

Είναι η διαδικασία κατά την οποία ένας καταναλωτής πραγματοποιεί συναλλαγές οικονομικού χαρακτήρα μέσω κινητής συσκευής όπως smartphone, tablet κλπ. Με απλά λόγια, αν κάποιος αγοράσει ένα προϊόν ή μια υπηρεσία χρησιμοποιώντας το κινητό του.

Για τη πληρωμή είναι απαραίτητη η χρήση ενός από τα παρακάτω:

A. Πιστωτική ή κάρτα ανάληψης
B. Μονάδες ή συμβόλαιο κινητού
C. Τεχνολογία NFC ή άλλος τρόπος πληρωμής

Απαντήστε στις παρακάτω ερωτήσεις εισάγοντας **X**

1. Ποια είναι η ηλικία σας;
   - ☐ 18-25
   - ☐ 25-32
   - ☐ 32-40
   - ☐ 40 +

2. Έχετε στην κατοχή σας κάποια κινητή συσκευή με σύνδεση στο ιντερνέτ, όπως για παράδειγμα κινητό τηλέφωνο ή tablet;
   - ☐ Ναι
   - ☐ Όχι

3. Ποιες υπηρεσίες του διαδικτύου έχετε χρησιμοποιήσει;
   (Μπορείτε να επιλέξετε περισσότερες από μια απαντήσεις)
   - ☐ Πλοήγηση σε ιστοσελίδες (Web-surfing)
   - ☐ Ηλεκτρονική αλληλογραφία (Email)
   - ☐ Κοινωνικά δίκτυα (Facebook, Twitter κλπ
   - ☐ Εφαρμογές (Applications)
   - ☐ Άλλες υπηρεσίες: ….

Όταν επισκέπτεστε μια ιστοσελίδα καταστήματος μέσω της κινητής σας συσκευής:

		Πολύ Δυσαρεστημένος	Δυσαρεστη-μένος	Ουδέτερη Στάση	Ικανοποιη-μένος	Πολύ Ικανοποιημένος
4	Πως αισθάνεστε όταν η συσκευή σας αποκαλύπτει πληροφορίες σχετικά με την τρέχουσα τοποθεσία σας;					
5	Πως αισθάνεστε όταν η συσκευή σας αποκαλύπτει πληροφορίες σχετικά με τις προτιμήσεις ή ενέργειές σας (π.χ. ποιες σελίδες επισκέπτεστε);					

		Σίγουρα Όχι	Πιθανότατα Όχι	Ουδέτερη Στάση	Πιθανότατα Ναι	Σίγουρα Ναι
6	Ανησυχείτε αν τα παραπάνω προσωπικά σας στοιχεία χρησιμοποιηθούν από το κατάστημα για την καλύτερη προώθηση των προϊόντων ή υπηρεσιών του;					

Όταν έχετε την πρόθεση να αγοράσετε κάτι χρησιμοποιώντας την πιστωτική / κάρτα ανάληψης ή το λογαριασμό του κινητού σας, ανησυχείτε για την πιθανότητα ότι:

		Σίγουρα Όχι	Πιθανότατα Όχι	Ουδέτερη Στάση	Πιθανότατα Ναι	Σίγουρα Ναι
7	Κάποιος μπορεί να πραγματοποιήσει μη εξουσιοδοτημένη συναλλαγή, αν το κινητό χαθεί ή κλαπεί;					
8	Το ασύρματο δίκτυο που χρησιμοποιείτε (3G ή Wi-fi) έχει ελλείψεις ασφαλείας;					
9	Το λειτουργικό σύστημα της συσκευή σας έχει ελλείψεις ασφαλείας (ευάλωτο σε ιούς κλπ);					
10	Η εφαρμογή της συσκευή σας έχει ελλείψεις ασφαλείας (ευάλωτο σε ιούς κλπ);					

Όταν έχετε την πρόθεση να αγοράσετε κάτι μέσω της κινητής σας συσκευής:

		Σίγουρα Όχι	Πιθανότατα Όχι	Ουδέτερη Στάση	Πιθανότατα Ναι	Σίγουρα Ναι
11	Ανησυχείτε ότι η ποιότητα του προϊόντος ίσως δεν είναι τόσο καλή όπως αναμενόταν;					
12	Ανησυχείτε ότι σε περίπτωση διαμάχης με τον πωλητή, δεν προστατεύεστε από τη νομοθεσία περί κινητού ηλεκτρονικού εμπορίου;					

Θα είχατε τη πρόθεση να αγοράσετε κάτι μέσω της κινητής σας συσκευής, αν το ηλεκτρονικό κατάστημα:

		Σίγουρα Όχι	Πιθανότατα Όχι	Ουδέτερη Στάση	Πιθανότατα Ναι	Σίγουρα Ναι
13	Έχει καλή φήμη;					
14	Προσφέρει δελεαστικές υποσχέσεις και εγγυήσεις σε περίπτωση διαμάχης (π.χ. ελαττωματικό προϊόν);					
15	Προφέρει καλή ασφάλεια κρυπτογράφησης πληροφοριών (π.χ. στοιχεία πιστωτικής κάρτας);					
16	Παρέχει διαφάνεια στο πως θα χρησιμοποιηθούν οι προσωπικές σας πληροφορίες;					

17	Παρέχει λεπτομερή πολιτική προστασίας προσωπικών δεδομένων, πολιτική επιστροφής και πολιτική απάτης.					
18	Παρέχει ευκολία εύρεσης των παραπάνω πολιτικών, οι οποίες είναι κατανοητές από τους χρήστες;					

19. Όταν νιώσετε απολύτως ασφαλής από κινδύνους στο να χρησιμοποιήσετε το κινητό ηλεκτρονικό εμπόριο, θα το κάνατε τελικά;

Σίγουρα Όχι	Πιθανότατα Όχι	Ουδέτερη Στάση	Πιθανότατα Ναι	Σίγουρα Ναι

Σας ευχαριστώ πολύ για τη συμμετοχή σας!