



Technical University of Crete
Production Eng. & Management
Dept.

Satisfaction Analysis of the Web Banking Services in Greek Banks

Master Thesis By

Petros Asmargiannakis

Supervisor: *Assistant Professor Stelios Tsafarakis*

Examining Committee: *Professor Nikolaos Matsatsinis, Professor Evangelos Grigoroudis*

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Abstract

The present thesis is a comparative customer satisfaction analysis of the web banking services in Greek Banks. Customer satisfaction measuring is an important part of market research activities allowing the company to get in touch with the buyer and remodel its services in order to improve his experience. The analysis was conducted on a representative sample of customers via a questionnaire. The satisfaction level was studied using the Multicriteria Satisfaction Analysis (MUSA) principles. The results revealed a quite high total satisfaction index, composed from six sub-indices. Appearance and user interface is the top scoring sub-index, followed by services provided, navigation, online customer services, information provided and security. Furthermore, based on the results of this analysis, we conduct enlightening conclusions about the current web banking services' strong points and weaknesses, as expressed by the participants' opinions and we evaluate their positioning against competition.

Keywords: Internet Banking, Customer Satisfaction, Multicriteria Satisfaction Analysis.

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Introduction

Customer satisfaction is a basic function in modern business research and through its observation organizations can make a significant contribution to a process of continuous service improvement. The measuring of customer satisfaction can be considered as a feedback system that provides a picture of customer's view and preference in a meaningful and immediate way. This can be an estimate of a company's performance against a set of satisfaction dimensions and identifies its strengths and weaknesses.

This paper examines the e-Banking System's importance to society and the reasons why a Customer Satisfaction Measure is significant both for the development of the system itself and for society as a whole. To carry out this work, a survey was conducted in the form of a questionnaire of 50 people of different ages. The methodology of the survey has been based on the basic principles of multicriteria analysis (MUSA), and in particular, on models of analytic-synthetic approach and linear programming. The results presented are focused on identifying the critical points that Banking Organizations should focus on, as well as the identification of key customer groups and their behavior. It is expected that this research can be a support during the current difficult period for the state's economy and consequently for the Greek Banking System.

Chapter 1- The concept of web banking

1.1. Competition of banking systems

Banking systems worldwide have experienced major changes over the last two decades, attracting a great deal of attention in both academic and policy areas. Among other things, forces such as globalization, technological change, deregulation, the introduction of the Euro, plus the increasing European integration have fundamentally transformed the European banking industry. Moreover, the enlargement of the European Union with ten new Member States on May 2004 and two additional Member States on January 2007 has thoroughly re-shaped the European banking industry.

As a response to increasing competitive pressure, banks reacted with an intense process of restructuring and growth initiatives, in an attempt to adopt strategies aiming at improving efficiency, in order to expand output and increase the range of services offered (Goddard et al., 2001). This has led the banking industry to experience an unprecedented level of consolidation through mergers and acquisitions among large financial institutions, in order to exploit potential benefits of large scale operations. The consolidation process aimed at reaping profitability, reducing cost inefficiency, increasing market power, and exploiting scale and scope economies. Moreover, technological advances and deregulation have promoted a process of de-specialization, reducing the differences among sectors.

In such a context, banks have started to measure the risks taken to produce acceptable returns. This chapter provides a brief analysis of the main characteristics and recent developments observed in the banking systems of

the old EU countries (EU-15), of the new EU Member States (EU-10) and of the South Eastern European (SEE) region that make these banking markets a distinct field of research.

The EU-15 banking industry

The EU-15 banking sector has undergone substantial changes over the last decade. In particular, developments in the EU legal environment including the deregulation of entry into domestic markets, various attempts towards harmonization of regulations, the directives regarding a single banking license, home country control and freedom of cross-border services, the creation of the single currency in 1999, and the Financial Services Action Plan (2001-2005), all have contributed to a formulation of a more competitive European banking industry.

As a consequence, barriers to market entry are constantly being overcome by new entrants offering financial services, while the pressure for innovation in products, services and procedures appears to have been strengthened. EU-15 banks have reacted to intense competitive pressures in their home markets by expanding their activities internationally, particularly into business areas and countries which offered higher profit margins. Thus, the share of non-domestic branches and subsidiaries of credit institutions in the banking assets of the EU-15 countries reached more than 20 percent (ECB, 2004). Moreover, EU banks have significantly expanded their presence in the EU-10 countries, in order to exploit the high growth potentials of these economies, where they have acquired a dominant position with significant lending activities. EU-15 credit institutions also reacted to increasing

competition by restructuring and reorienting their activities from traditional bank lending towards investment activities, such as creating and selling new capital market products. This is also reflected on a shift in bank revenue flows from interest income to non-interest income, such as fees, commission and profit on trading activities (Bikker, 2004).

Moreover, EU-15 banks initiated a cost restructuring process in order to deal with the increasing competitive pressures. As a result, the ratio of total operating expenses to assets decreased in most EU-15 banking sectors over time, flagging out banks' efforts to restrain their cost exposure. The introduction of organizational changes (e.g. outsourcing), the centralization of information technology and back-office activities and the establishment of unified platforms appear to be widely applied strategies aiming at reducing cost, standardizing operating and information procedures and exploiting specialization according to the customer segment (ECB, 2003).

As a result of the structural changes occurred in the European banking landscape and the continuing consolidation process, a decreasing number of institutions managed a greater volume of bank products and services at the European aggregate level, as well as in the majority of EU Member States, giving rise to larger banks and more concentrated national banking sectors. The consolidation trend that has been observed over several years in the EU banking industry continued in most countries during the examined period, as it is demonstrated by the number of banks (fewer) and the distribution of bank sizes (unequal) in a given market. During the period 1998 to 2003, the number of banks in the old EU financial landscape was reduced by about 20 percent, from 9,337 in 1998 to 7,444 in 2003. The decline in the number of firms in the old EU-15 countries reflects mainly mergers and acquisitions between credit institutions (ECB, 2004). Consolidation in the Euro-zone has been essentially limited to within

borders and type of institutions, sometimes with implicit government guidance. The largest reduction has taken place among the smaller savings and co-operative banks in the larger EU banking sectors. At country level, the pace of consolidation greatly varied during the examined period, with larger countries presenting the most substantial decrease in the total number of banks. Major reductions in the number of banks occurred in Germany and France (23 percent and 31 percent respectively), while only Finland and Ireland reported an increase.

1.1. The Concept of Internet Banking

GENERAL

Modern management philosophy has adopted the view that customer satisfaction is a safe criterion for the efficiency and effectiveness of an organization or business. In addition, measuring customer satisfaction provides a sense of accomplishment and fulfillment for all staff involved at any level of the customer service process. In this way, measuring satisfaction encourages employees to reach higher levels of productivity (Perumal & Shanmugam, 2004)

The evolution that has taken place in recent years in all market segments has made it imperative for all businesses to get to know their customers better. Therefore, it is necessary to consider processes and exploit data that will give those benchmarks that corporate administrations owe to focus their interest on, in order to increase their market share and profits. The above necessity is more pronounced in the banking sector due to the recent developments that have taken place resulting from the financial crisis and a series of mergers and acquisitions (Ely, 2000).

Taking into account that the internationalization of the banking market combined with the global financial crisis calls for the creation of large and strong banking groups, it is certain that reclassifications will continue in the near future, and constant and close contact with the consumer audience remains necessary. This relationship is even more important when the market is geographically limited to a provincial city. Thus, a customer satisfaction survey of a bank receiving messages from the venue in which it operates is a vital tool in the hands of management. Advantages from measuring customer satisfaction can be summarized in the following points (Sirmakezis, 2003)

- Bank has the possibility to see whether its services meet customer expectations
- The measuring of satisfaction provides the Bank's level of performance and
- The measuring of satisfaction can be considered as a feedback system that provides customers with a meaningful and immediate view
- By measuring satisfaction, the elements that need to be improved emerge, as well as the ways in which improvement will be achieved
- The measuring of satisfaction acts as an incentive to banks in order to increase productivity.

By measuring satisfaction, one very important point is the significance attributed by the client to the individual elements that constitute the final product (e.g. in a restaurant the final product is the quality of the food, but individual elements that make up the restaurant's image are prices, variety, service, cleanliness, etc.). In the present study, the priority and the demand that different sets of clients give to these elements is being considered. The

aim is to assign more emphasis to some of these elements and less to some others, in order to improve the position and overall performance of the Banking System. The impact of such data remains rather vague and at the same time difficult to control. Thus, the behavior of different customer groups is often impossible to interpret without considering qualitative variables and using a suitable model to be compatible with them (Choiet al, 2008).

1.3. Definition

The international term “Internet Banking” is referred in Greek as "Online Banking", but more often the term "Electronic Banking" or E-Banking is used equally. Although there is often no distinction between the terms Internet Banking and E-Banking, one is a specific sub-category of the other (Sirmakezis, 2003).

More specifically, with the term e-banking, we mean all those services that banks provide over the Internet, without the physical presence of the client at a branch of a bank. Alternatively, we could define electronic banking as the automated provision of new and traditional products and services of a financial nature, directly to customers through electronic, interactive communication channels. Depending on the channel used to distribute the services, we distinguish e-Banking in Internet Banking where the Internet is used as a means of conducting banking activities in Mobile Banking where transactions are made by mobile phone or PDA and Phone Banking where the phone is used. Therefore, the concept of e-banking is wider and embraces the concept of Internet Banking. More specifically, Internet Banking refers to the ability of an internet subscriber to have full access to

the banking system and, as a result, to select and use products and services over the Internet as he or she would if in a "physical" branch of the bank. (Chang et al, 2009).

1.4. Historical Background

To make Internet Banking an indispensable component is related to the ability to access the Internet, a tool that has invaded our lives in recent years and tends to gain a dominant position in our everyday life. It all started in the late 1960s, when the Advanced Research Projects Agency (ARPA) in the US, geared to high-tech research projects, launched a research activity on networks, creating ARPAnet as the precursor of the Internet. In 1971, only four supercomputers were connected to the network (Dutka, 1994).

In 1995, total nodes were tens of thousands, and more than five million users around the world were connected in a daily basis, on networks in order to communicate, exchange views, get knowledge or information and use programs. One very important era in the history of Internet is the year 1993, when the World Wide Web was built at CERN in Switzerland. The global web has contributed to the creation of a wider and more easily accessible network infrastructure. In 1994, Netscape Navigator, the first browser, was discovered, and it made it possible to browse the Internet by anybody who had a computer and a modem. The history of Internet Banking begins in the late 1980s when the largest US banks introduced the concept of Home Banking (or PC Banking). Through the use of E-Banking, banks have enabled their clients to accomplish their basic banking transactions

from home via a computer. Banks developed the appropriate networks and provided free software to their customers in order to spread this new service to the most demanding and affluent customers. The life cycle of Web Banking was short, since Internet Banking prevailed in the mid-1990s.

The most important advantage offered by Internet Banking in relation to its predecessor was the fact that banks were no longer required to maintain private networks which entail high costs. In addition, customers did not need to be supplied with any particular software to access the bank's system. Internet, as an open system, has been a challenge for banks that have seen the opportunity to broaden their customer base. In 1995, American Wells Fargo was the first bank to give its customers the ability to access online their bank accounts. In October 1995, the first "Internet Security Bank" was established in Kentucky of United States. In Greece, the first Internet Banking application was introduced in February 1998. This first innovative way of banking had more than 100000 Internet subscribers for Egnatia Bank, presenting the integrated WebTeller service through which consumers were able to handle banking transactions through the Internet.

1.5. Advantages - Deductions

The use of the Internet and new technologies by financial institutions has changed the way that financial transactions take place. The physical presence of the traders is no longer required. The advantages and disadvantages of this new state of affairs are affecting both banks and customers.

In particular:

1.5.1. Benefits for customers

Availability

Internet Banking services are never closed (only some hours for maintenance purposes). Therefore, customers are not limited by the opening hours of the "physical" bank branches and can make Internet banking transactions 365 days a year, 24/7, the way they want. This is of great importance for busy customers who are not prepared to wait in a bank queue to be served (Aggelis, 2005).

Portability

There is no geographical limitation related to the services of Internet Banking. In other words, customers can connect to their bank accounts from anywhere in the world. Therefore, the new alternative distribution channel abolishes borders and eliminates distances. Nowadays, the bank is just as far as a button on the computer. In addition, there is no need of specialized software for customers, as it was in the past (Becker et al, 2009).

Ease and speed of Transactions

All available services offered through Internet Banking, are concentrated on one single website of the bank so that the customer can easily and quickly choose the transaction he / she wishes to make. With just one click and within a few seconds transactions can be completed. For example, they can pay their home bills or transfer money to other customer accounts. On the contrary, in the case of "traditional" banking, a transaction takes a lot of minutes or even hours, waiting in the queue (Becker et al, 2009).

Effectiveness

Most online Banking systems offer their own websites easy-to-use tools such as sms-Alert, loan installments, portfolio management, and more. The use of these tools makes it more efficient for clients to manage accounts and assets.

1.5.2. Disadvantages for customers

Time-consuming customer registration

A new customer can subscribe to Internet Banking services by completing an application, submitted by the customer himself at a bank branch or sent electronically. In some cases, the new customer may need to wait 1 to 2 days until the passwords are ready and can activate the Internet Banking services.

Difficulty in handling

Banking websites that provide Internet Banking services can be difficult for customers with a limited Internet experience. Opening an online account or online loan application may be simple for some clients who are familiar with it, but some other users hesitate to make online transactions, due to their limited knowledge on new technologies.

Distrust of users

Several Internet users still face electronic banking with mistrust. The phenomena of online fraud, coupled with inadequate customer briefing about banks' security systems, discourage them from using Internet services. Electronic fraudsters, unable to cope with the high levels of internet banking security systems, have turned to alternative network customers aiming to gain access to personal information and IDs in the networks.

To achieve this, they use a set of methods (phishing) that include misleading phone calls and misleading emails, spyware, viruses, and other malicious software on users' computers (Viruses, Trojans, Keyloggers). Using the above methods, they try either to extract the necessary information directly from the users of the alternative networks or to capture them via monitoring techniques. Banks, at their end, advise Internet Banking users to be alert and adhere to a number of safe practices and advice in order to avoid being victims of fraud. (ANGELIS , 2005)

1.5.3. Benefits for banks

Reduction in operating costs

Allocating part of the transactions on a website for e-banking service, a bank manages to reduce operating costs, since transactions executed between customers and bank employees in a bank branch cost to the bank significantly more than the automated online transactions of e-banking (ANGELIS B., 2005).

Reinforcing customer loyalty

Many bank analysts argue that e-banking services enhance client loyalty as the relationship between the customer and bank is placed on a new basis. Therefore, customers who are familiar with online services are much more reluctant to change a bank. Additional surveys on the demographic characteristics of Internet Banking customers indicate that they are highly educated people with increased annual income. This is a strong indication that these customers are more profitable for banks than their average bank customer.

1.5.4. Disadvantages for banks

High initial installation costs

As it is the case with most new technologies, the initial installation cost of constructing a web banking system is too high. A big investment is needed in order to acquire the necessary hardware and software web banking system. Additionally, there is substantial cost involved for educating its staff on new technologies. The depreciation of the investment is expected to occur in the medium to long term, e.g. when the necessary customer base is created and can generate the expected economies of scale. The existence of these economies will result in the profitability of the bank (Turban et al, 2006).

Transaction security and private data protection

Electronic attacks and unauthorized access to banking electronic systems are frequent. The security of transactions and the protection of traders are issues of utmost importance for banks. Since no computing system is 100% secure, banks must somehow secure their clients' assets from hacker attacks and online fraud. In many cases, banks have to invest additional amounts, in order to provide more security, and anti-Phising technologies.

Chapter 2- Measuring Satisfaction of Internet Banking Services

2.1. Service Characteristics

As a service it can be defined any primary or secondary activity that does not directly produce a product with physical substance. (Evans, Lindsay, 2001). The main differences between goods and services are: (Gunaris, 1997)

- **Intangibility:** a distinctive feature of services whereby it is impossible to perceive, by touch or human senses, as it is the case with natural goods.

- **Inseparability:** a distinctive feature of services that shows the inability to separate the production of the service from the place of consumption, the production of the service from the consumer's participation in production, and the experience of the other consumers present in the process of production from the final result of production.

- **Heterogeneity:** a distinctive feature of services that reflects variation in quality features from providing a service in relation to the next.

- **Perishability:** a distinctive feature of services whereby services cannot be stored, their unused capacities cannot be stored and cannot be recorded.

Due to these features, service marketing presents some particularities in relation to the marketing of goods. In particular, some problems that are associated with the four above-mentioned service features are the following: (Athanasoulis, 1996):

- Problems that are caused by the intangibility refer to the lack of ability to store services, patent protection, pricing and the difficulty in using communication for services.

- The second characteristic of services, indiscriminate, results in the difficulty of mass production.

- Lack of standardization (heterogeneity) makes it difficult to apply quality control

- Corruptibility renders service impossible to maintain / store.

2.2. The Concept of The Banking Service

Banks are financial firms that are considered to be the intermediaries between capital seekers who want to invest capital and those who have the need to borrow capital to finance their activities. The main function of the bank is interest-bearing borrowing (Kiochos, Papanikolaou, 1997). At the same time, banks are engaged in a wider range of brokerage and customer service. The banking activities are thus divided into: (Lyberopoulos, 1994).

- Passive (deposits, bond issues)

- Mediation (capital movements, letters of credit, export / import arrangements, issuance of letters of guarantee, foreign exchange trading)

- Counseling or servicing of their clients (for example, short-, medium-, long-term, business advice on capital structure, industrial strategy, mergers and acquisitions, portfolio management, commercial information, custody and

securities management, treasury leasing, etc.) The categories in which banks can be distinguished depend on the criteria used (Sinkey, 1999):

- With regard to the structure, there are banks without branches, banks with branches and banking holding companies (an organization that owns or controls one or more banks).

- Depending on their main business orientation, the three main categories are: (a) the provision of services to large companies; (b) the provision of banking services to the general public; and (c) large companies and the general public at the same time.

- In terms of geographical presence or market coverage, commercial banks are described as Community banks (operating in local markets), regional banks (operating at regional level), inter-regional banks (operating in many states or regions) or multinational banks (operating in national or international markets).

Banking services have, in terms of marketing, the following characteristics that differentiate them from products (Turban et al, 2006).:

- They are immaterial, like all services, which means they are not perceived by the senses before their sale and do not need storage and transport for disposal, in the way products need.

- They rely on faith. This means that the customer has no prior knowledge for exactly what he is buying, because there are no specific and specified quality specifications like the products. As an example, a quality criterion may be the speed of service.

- An employee of the bank is part of the service offered. Instead, the vendor of products cannot be part of the product that sells. The quality of the offered

banking services is inextricably linked to the level of knowledge, skills and behavior of employees who offer banking services.

- Customer is an integral part of the production process with his (queues) presence, level of knowledge, perceptual competence, requirements and behavior.

- Banking services are inseparable as to the place and time of their production and use.

- Banking services show great apparent homogeneity. For customers, banking services are, at first glance, the same for all commercial banks. Each bank must therefore find ways to establish its identity and ensure the desired image for its customers for every service it offers.

- There is a wide range of services to offer.

- Banks are geographically dispersed. Each commercial bank considers it necessary to expand - in line with its capabilities - its branch network so as to further facilitate the transactions of its existing customers and to cover a wider market at national level.

- Banking services are sold before they are produced and the time element in the customer relationship is much more pronounced than most other services and products. The customer relationship is of a long-term nature, in a similar way it is with the insurance services.

- It cannot be maintained. Undrawn bank branches and people, are permanently and irretrievably gone.

2.3. Quality Measurement in e-banking

As mentioned above, the nature of online banking service provision is seen by many as generating several risks and there is a diffuse lack of confidence for this type of service. Logically, in an online environment, there is no physical contact between the buyer and the seller, and it is extremely difficult to develop a sense of trust between the two interested parts. This is the reason why banks are trying to bridge this gap, so that online collaboration with their clients is becoming more and more effective. But before banks start improving their online customer service, they have primarily taken care to increase the level of service quality that they encounter in their physical stores.

Besides, this is also one of the most important factors that affect customer confidence in the bank's online services and its effect is higher than the bank size (Wong, Loh and Bak ,2010). That is, if the service in the store is poor, the size of the bank is not capable of affecting the consumer's confidence towards the bank. Because of this effect, banks have taken care of developing and improving the five dimensions of service quality, i.e. reliability, security, responsiveness, materials and empathy.

In a survey conducted by Yap, Wong, Loh and in 2010, the impact of each traditional dimension of service quality on building confidence in e-banking differs from dimension to dimension. The results of their research showed that empathy and responsiveness have no practical application in building trust and that the reputation created for the bank's services has a positive impact on customer confidence. On the contrary, the credibility and security that are being developed primarily in banks' shops play an important role in enhancing customer confidence.

Parasuraman, Ziethaml and Berry (1988) have developed the SERVQUAL model, which is an instrument for measuring the quality of various services.

This model is based on the original 10 dimensions of quality developed by themselves in 1985, which are the assets, reliability, responsiveness, communication, solvency, security, ability, courtesy, knowledge client and accessibility. The final 5 dimensions of quality measured by SERVQUAL are:

1) Foreclosed assets, consisting of physical facilities, equipment, personnel and communication materials.

2) Reliability, the ability of the service to perform the service that has been promised reliably and accurately.

3) Response, willingness to help customers and provide immediate service.

4) Consistency, knowledge and courtesy of staff and their ability to inspire confidence.

5) Empathy, care and individual attention given to customers.

The differentiation in recent years lies in the fact that the online services are quite different in the mode of operation than the traditional services, and this is because:

1) There is an absence of sales staff, i.e. there are no meetings between the company's staff and the customers, as in traditional services.

2) There is an absence of traditional real estate assets, i.e. online services, the process is entirely in a virtual environment.

3) There is customer self-service, i.e. consumers conduct the purchase or transaction on their own and have the absolute control of the process. (Hongxiu Li and Reima Suomi, 2009).

2.4. Quality dimensions of e-services

Zeithaml, Parasuraman, and Malhotra (2000), studying the features of the online services and web pages, altered the SERVQUAL model on the ES-QUAL model, which is suitable for measuring quality of online / web services and resulted in 11 dimensions. These dimensions are reliability, responsiveness, accessibility, flexibility, ease of navigation, efficiency, trust, security, pricing, website aesthetics and personalization. Over the next few years as their own research continued, they reached the final stage of E-S-QUAL, which consists of four dimensions:

- 1) Efficiency: The ease and speed of access to and use of the site.
- 2) Performance: The extent to which website promises for order delivery and availability are met.
- 3) Availability of the system: The proper technical operation of the site.
- 4) Privacy: The extent to which the site is secure and protects customer information.

They also studied the measurement of the quality of service retrieval provided by the site and created E-RecSQUAL, which consists of three dimensions, which are:

- 1) The response: Effective troubleshooting and returns through the website .
- 2) Compensation: The extent to which the website compensates its customers for any problems.
- 3) Communication: The availability of help by telephone or online dealers. (Zeithaml, Parasuraman, Malhotra, 2005).

As technology is constantly evolving and the way in which trading is done has changed, it is a direct consequence that commercial banks could not be unaffected by this change. Thus, e-banking is becoming more and more popular and has turned into one of the most important tools of the banks, capable to offer them a competitive advantage and the desired distinction over their competitors. Given that there are no physical and geographical constraints, the target audience of electronic banks has increased significantly. That is why the foundations should be set up so that the online shops of the banks meet the basic dimensions of the quality of electronic services and meet the requirements and needs of the customers.

As stated in the research Rod et al., (2009), in order to have a complete quality of service in e-banking, there should be primarily online customer service quality. By this, it is meant that there is no face to face interaction with a bank employee, but still, online customers expect to be served with respect, be provided with all the necessary information from the website and receive prompt and reliable service. The same research also reports that the quality of the web-based information system contributes to the overall quality, namely, the constant updating and upgrading of the website and, as far as possible, a more pleasant and user-friendly design.

To achieve the above, a bank should initially set the dimensions it will measure in order to track the strong and weak points the online system. Aiming to this, systems that measure the quality of e-services have been developed, based on five dimensions, such as availability of information, ease of use, security / privacy, graphics and reliability (Herington Scott Weaven C., 2009). In this dissertation, a combination was made composing the most important dimensions required for electronic activity of banks, based on the research conducted primarily

by Chien-Ta Bruce Ho Wen-Chuan Lin, (2010), Loonam, O'Loughlin, (2008) and Zeithaml, Parasuraman, Malhotra (2000 and 2005). These dimensions are:

Reliability

Reliability is a factor that refers to the correctness of the design of the website and incorporates elements such as the functionality of the website and the reliability of its design. Considerations such as 24-hour service, continuous financial information renewal and proper website design are essential in order to develop e-Banking reliability for a bank site. As e-banking users are also customers of bank branches, poor electronic reliability could lead clients to change the preferred bank, a quite damaging effect for any bank.

Response

Response of the e-banking system is considered to be a very important and crucial factor in terms of building relations between the customer and the bank. Wider understanding of consumer needs, achieved through personalized service, is proposed as a significant improvement and development of banking websites. To this end, technology should be used to improve communication and the relationship between people involved in the system, and a way to pursue this goal is to include in the design a complaints' section.

Usability of the website

The usability of the website is one of the utmost important dimensions and is, therefore, considered a basic condition for measuring the quality of e-banking. The navigation and the aesthetics of the page are crucial, so there should be ease of use and intuitive functions to make it easier for the user to stay focused and satisfied with the online service of the bank. In addition, banks seek to have fast

web pages, colors and graphics, and personalized pages based on customer needs.

Security

According to Hutchinson and Warren in their 2003 article "Security for Internet banking: a framework", security is especially important on an electronic page because is obviously connected of transactions of small but also large amounts of money. This is the reason why banks must ensure that they correctly communicate the name of their certified site so that customers can protect themselves from patrons, protect users' codes in any possible way, protect themselves against any electronic threat, have firewalls installed, and set limits on failed attempts to users. Online users of e-banking are looking for protection of the information provided, authentication of the user and easy access without hesitation due to uncertainty on the certified website of the bank.

Confidence

While the number of the Internet users is constantly growing, it is unfortunate that e-banking users are not rising at the same rate. A factor contributing to this aversion to users is the lack of confidence in banks' electronic systems, which is directly related to data confidentiality and the security of the banking system. In a virtual environment, the degree of uncertainty for financial transactions is greater than in traditional operations. There is a diffused interdependence of the dimensions of security and reliability with trust. In a 2006 survey by Flavián, Guinalíu, Torres, entitled "How bricks and mortar attributes affect online banking adoption", confidence development has been found to be one of the biggest challenges faced by the bank, connected to the way online trust is largely related to consumer confidence in the bank itself and its branches. The more the consumer trusts the bank, the more likely it is to adopt and use its online

services. The perception of the risk related to the use of online systems varies among individuals. In a survey conducted by Grabner-Kräuter and Faullant in 2008 entitled "Consumer acceptance of Internet banking: the influence of the internet trust", it was found that the general trust of people on the internet clearly affects their particular confidence in e-banking. Also, people's trust in the internet is negatively related to perceived risk in e-banking.

It has also been found that people's perception of risk is associated with the attitude of consumers towards electronic banking. Last but not least, the result of the survey was that it highlighted the fact that people's familiarity with the internet increases their confidence in it. However, unlike previous Flavián, Guinalfú and Torres research mentioned that confidence in the bank plays a small role in building confidence with its online store.

Quality of information

The content and accuracy of the information provided is practically very important in e-banking. Visitors to the website are very interested in general information after looking for specific information related to their personal account. Visitors are asked to provide the necessary information as quickly as possible, to quickly access their account and to minimize and understand the amount of useful information.

Accessibility

In terms of e-banking and generally any e-service, direct access to the content of the web site plays a major role. However, it has been noticed that it is difficult for a consumer to change a website and a bank due to a possible inability to access the site. This is because of the chronic habit of staying with a particular bank and the general consumer passivity. However, this should not reassure the banks that clients will remain loyal if they have not direct access to their online

services, since consumers habits in modern times are becoming more and more volatile.

System Recovery

System Recovery is a distinct category according to Loonam and O'Loughlin, (2008). Due to the uniqueness of the nature of financial services and the risk of a possible electronic fraud, self-recovery of the system from a potential damage is not allowed. Also, when there are failures in the system there is a diffuse feeling of dissatisfaction with the needs and dissatisfaction. However, due to the particular characteristics of these services it is extremely rare to record a change of table by visitors. That is, people show great tolerance for such incidents on the part of the banks, but as has already been mentioned, this can very easily change over the next few years. For this reason, banks are increasingly requested to improve their electronic systems to lengthen public service hours and introduce methods that will provide a real-time solution.

Adaptability / Flexibility

The main obstacles to the adaptability and flexibility of the electronic banking system are the basic security principles that must be respected in order for the banking system to be trusted and secure. In this respect, customer requirements for greater authorization, greater system flexibility and control are not always feasible. In addition, over the years, features that first impressed users have now become essential. Nevertheless, banks must evolve their electronic systems as much as possible and provide as much flexibility as possible wherever needed, provided that they do not sacrifice safety for flexibility.

Personalization

It is no surprise that e-banking services are lagging behind in personalizing the services offered to users, which is the key factor driving consumers to still visit the banks' physical stores. This means that people for their most important financial transactions prefer to be in a face-to-face contact with the person in charge and enjoy personalized attention and attitude. That is why banks will have to adjust their online stores so they can provide the coveted personalization of the processes their users are looking for to feel as secure as possible and feel as if they are receiving the necessary attention.

Preferential treatment

The last measurement of the quality of e-banking is that of the preferential treatment that is linked to the added value that is gained using e-banking. This factor contributes to the increasing satisfaction of bank customers using their online stores. Such advantages are the most favorable prices and lower charges for specific uses, compared to those of traditional banks and their competitors.

According to the customer's perception of ISO 9001 in e-banking, it is now widely accepted that internet customers are very expensive to acquire and very difficult to book because of the ease with which service providers can change. This is a major problem for all online services, and therefore electronic banks, since a loyal customer buys more, spends more and proclaims satisfaction much more. Thus, many banks are looking for the link between the perceived quality of their e-services and the satisfied customers. Research has shown that in traditional, non-online services, the introduction and continuance of a standardized quality measurement system such as ISO 9001 has greatly improved the organization and management of the whole system, resulting in more and more customer satisfaction and loyalty. In a survey by Honore, Yaya, Marimon and Casadesus

(2011), the question of whether the implementation of an ISO 9001 system is likely to influence consumer perceptions of the quality of electronic banking services has interesting results. Based on the results of the survey was revealed that there is no difference between certified and non-certified organizations in terms of the quality of online services, web satisfaction and online fidelity. To substantiate these results there are several arguments. Firstly, there is an absolute lack of human interaction in e-banking as online customers have the absolute control over their accounts and the ISO 9001 certification is not necessary to standardize the functions and ensure the quality of the service. Secondly, most banks are well organized and offer high quality online services, so it is highly probable that an ISO 9001 certification will not be able to bring about a distinct difference in the performance of e-banking services. Finally, it is worth noting that it may not be obvious that adopting an ISO 9001 standard is likely to positively influence the perceived consumer quality of online banking services, but it remains unclear in this research whether such certification provides potential benefits to internal processes of the bank, which improve efficiency, reduce costs, motivate employees and so on.

2.5. Customer satisfaction

Customer satisfaction is one of the most important issues concerning business organizations of all types, which is justified by the customer-orientation philosophy and the main principles of continuous improvement of modern enterprises. For this reason, customer satisfaction should be measured and interpreted into a number of measurable parameters. Customer satisfaction measurement may be considered as the most reliable feedback system, considering that it examines the clients' preferences and expectations in an

effective, direct, meaningful and objective way. In this way, customer satisfaction is a baseline standard of performance and a possible standard of excellence for any business organization (Gerson, 1993).

2.6. Definition of Satisfaction

The most popular definitions of customer satisfaction are based on the fulfillment of customer expectations. According to Oliver (1996) & Hill (1996), satisfaction is a measure of how much the product or service offered fulfills the customer's expectations. In addition to customer expectations, there are alternative benchmarks for the definition of satisfaction. Spreng & Olshavsky (1992) believe that comparing the performance of a product or service should be based on wishes rather than customer expectations. Churchill & Suprenant (1982), believe that the performance of the individual product characteristics - especially in the case of durable goods - is a very important indicator of customer satisfaction. Finally, the definition of customer satisfaction is, in some cases, considered alongside other related concepts such as quality, value and service.

2.7. Musa method

General

The MUSA (Multicriteria Satisfaction Analysis) method is the multicriteria or multicriteria analytical - synthetic approach to the problem of satisfaction measurement and analysis. This original methodology is based on the multidimensional analysis of decisions, adopting the basic principles of the analytic - synthetic approach and the theory of value systems or utility. The main assumptions concerning the development of the MUSA method focus on the following points (Grigoroudis and Siskos, 2000):

- Rational consumer: This case is related to the existence of rational customers and is found in the whole area of the science of Decisions.

- Satisfaction criteria: The MUSA method assumes the existence of a set of characteristics of the product or service under consideration, according to which customers understand their satisfaction. This set of attributes is the criteria for customer satisfaction and must meet certain attributes.

- Adjunctive synthesis model: Finally, it is assumed that there is an additive synthesis model of all the satisfaction criteria and, in particular, an additive value function. In the context of multicriteria decision analysis, these functions fulfill the status of monotony. It should also be noted that this method is based on primary data directly derived from all of the company's customers and therefore it is necessary to incorporate it into a more general methodology of applying satisfaction measurement programs.

MULTicriteria Satisfaction Analysis (MUSA) method

The MUSA method is a preference disaggregation model following the principles of ordinal regression analysis (inference procedure). The integrated methodology evaluates the satisfaction level of a set of individuals (customers, employees, etc.) based on their values and expressed preferences. Using satisfaction survey's data, the MUSA method aggregates the different preferences in unique satisfaction functions. This aggregation–disaggregation process is achieved with the minimum possible errors. The main advantage of the MUSA method is that it fully considers the qualitative form of customers' judgments and preferences. The development of a set of quantitative indices and perceptual maps makes possible the provision of an effective support for the satisfaction evaluation problem.

After completing the questionnaires by customers, the collection follows a first processing of the answers given, the input of the data derived from them in the MUSA method and the application of the method for extracting the results regarding customer satisfaction . After collecting the questionnaires and prior to entering the data into the MUSA method, a preliminary check of the collected data is made, in principle, for the logical consequence of customer responses. The questionnaire, in addition to questions about satisfaction dimensions, also includes a question about total customer satisfaction. There should be a reasonable correlation between answers to partial and total satisfaction questions.

If a large questionnaire size does not have this logical correlation then the dimensions of satisfaction must be reprocessed, and the questionnaire revised. After the preliminary check is completed, there data are approved for the application of the MUSA method for the customer satisfaction survey. The data refer to the dimensions of satisfaction, the levels of satisfaction, the number of clients who participated in the survey, as well as the answers they gave to each dimension of satisfaction and total satisfaction. By using all of this data, the corresponding linear program is solved using the MUSA method and the results depict the customer satisfaction. The results of the MUSA method include:

- Weights assigned to each dimension of satisfaction.
- The average satisfaction index for each dimension of satisfaction but also the overall satisfaction index.
- The average demand factor for each dimension of satisfaction but also the overall.
- The average efficacy index for each dimension of satisfaction.

- The function of total satisfaction and the partial satisfaction functions for each dimension of satisfaction.

- The action diagram

- The improvement chart.

The main results from the implementation of the MUSA method are those mentioned above and presented both numerically and in graphs. What's important is that this software also builds action and improvement charts.

Modeling decision problems

Multi-Critical Analysis includes methods and models designed to improve the decision-making process in a partially organized environment in which multiple criteria prevail. These multicriteria problems belong to the category of "poorly structured problems" as their solution does not exist but requires a number of investigations and interactive processes. The basic theoretical approaches to multi-criteria analysis are:

1. Approximation of value systems or utility: It seeks to develop a system of values that gathers preferences of decision-makers into a set of criteria based on rigorous assumptions the full and transition relationship (Fishburn, 1970, 1972, 1982; Keeney and Raiffa, 1976; Keeney, 1992; Von Winterfeldt and Edwards, 1993). It offers a quantitative way of helping to make the final decisions.

2. Approach of Outreach Relations: The approach of extroversion relations, using a non-compensatory process, aims at developing extroversion relationships that allow for asymmetry between decision-making (Roy, 1976, 1985, 1989, 1990;

Vanderpooten, 1989; Brans and Mareschal , 1990; Vincke, 1992; Roy and Bouyssou, 1993). This particular approach is not limited to a mathematical model but leads to some actions for preference-based decision making. This helps the decision maker to take a "good" decision.

This approach is intended to analyze the behavior of decision makers (Siskos, 1980; Jacquet-Lagrèze and Siskos, 1982; Jacquet-Lagrèze, 1984; 1990; Siskos and Yannacopoulos, 1985; Siskos et al. 1993). Specific iterative interactive processes are used where the components of the problem and the overall judgments of the decision-maker are analyzed and then concentrated on a system of values. The main objective of this approach is to help the decision maker to improve his / her knowledge of the state of the problem.

4. Multicriteria Mechanism Improvement Approach: It is an extension of mathematical programming with a view to solving problems without distinct alternative actions and more than one objective function (Evans and Steuer, 1973; Zeleny, 1974, 1982; Zionts and Wallenius, 1976; 1983; Jacquet -Lagrèze et al., 1987; Siskos and Despotis, 1989; Korhonen and Wallenius, 1990; Wierzbicki, 1992; Jaszkievicz and Slowinski, 1995). The solution is evaluated through iterative processes that lead to a satisfactory decision-making level in the criteria, the construction of a utility model for the selection of solutions evaluated by a maximization utility process or by a combination of the two above-mentioned methods.

Fundamentals

The MUSA (Multicriteria Satisfaction Analysis) method is a multidimensional preference screening approach that provides quantitative customer satisfaction measures, taking into account the quality of customer judgment (Siskos et al., 1998; Grigoroudis and Siskos, 2002). The goal of the MUSA method is to

aggregate individual judgments into a function of collective value, assuming that global customer satisfaction depends on a set of criteria or variables that represent the characteristic service / product properties. This set of criteria is denoted as $X = (X_1, X_2, \dots, X_n)$ where a specific criterion i is represented as a monotone variable X_i . In this way, the assessment of customer satisfaction can be considered as a multicriteria analysis problem. These criteria are called satisfaction dimensions and justify the concept of the analytical - synthetic approach of the MUSA methodology. For the harvesting of the appropriate information, a questionnaire is completed in which customers evaluate the service or product provided, ie they must express their criticism and satisfaction on the basis of the criteria mentioned above. For these judgments, a predetermined systemic satisfaction scale is used. The MUSA method follows the general principles of qualitative regression analysis under constraints, using linear programming techniques to solve it. The basic equation for qualitative regression is as follows:

$$\tilde{Y}^* = \sum_{i=1}^n b_i X_i^* - \sigma + \sigma^-$$

The MUSA method evaluates the global customer satisfaction and Y_i variable with the Y^* variable partial satisfaction, taking into account customer judgments Y and X_i . This formula applies to a customer who has expressed some criticism, so the error variables should be evaluated for each customer separately. The algorithm of the MUSA methodology concludes with the phase of the meta-optimization analysis, which is performed to analyze the stability of the method, since it is based on the general principles of linear reflection. This phase involves

the formulation and solution of n linear problems, as well as the number of satisfaction criteria. This analysis allows for the stability analysis of the optimum solution, when the range of values obtained by the variables in the various semi-optimal solutions is stable, otherwise the solution is unstable. (Grigoroudis&Siskos, 2000; Grigoroudis&Siskos, 2010)

Measuring customer satisfaction

There is a number of researches, suggesting several alternative approaches to customer satisfaction assessment. All proposed models and techniques, nevertheless, need to adopt the following basic principles (Grigoris, 1999):

- a) The data of the problem are based on customers' judgment and should be collected directly from them.
- b) Measuring customer satisfaction is a multifaceted assessment problem, as customer satisfaction depends on a set of variables that represent typical service properties.
- c) Typically, a type of summing technique is used to gather some evaluations to a measure of universal satisfaction score. Based on these assumptions, the problem of customer satisfaction can be formulated within the multicriteria analysis assuming that total customer satisfaction depends on a set of criteria or variables that represent typical service properties

Definition of customer satisfaction

Customer satisfaction is defined in two main ways (Grigoroudis and Siskos, 2000):

- As the result of the experience of using or consuming a product or a service, thus considering satisfaction as a final situation

"... Satisfaction is an emotional response to the customer's experience, which is connected to specific products and services, or to specific features of that customer ..." (Westbrook and Reilly, 1983)

- As the assessment process according to the customer's expectations, considering satisfaction as a process with an emphasis on the psychological factors of perception and evaluation that affect it.

"... satisfaction is the consumer's reaction to the evaluation process, which examines discrepancies between past expectations and the true level of performance of the product as perceived by the consumer after use ..." (Tse and Wilton, 1988)

2.8. Satisfaction analysis results

The main results from the aforementioned preference disaggregation approach are focused on global and partial explanatory analysis. Global explanatory analysis lays emphasis on customers' global satisfaction and its primary dimensions, as indicated in Figure 1, while partial explanatory analysis focuses on each criterion and their relevant parameters separately. Satisfaction analysis results, in more detail, consist of:

1. Global satisfaction index: this average index shows in a range of 0-100% the level of global satisfaction of the customers; it may be considered as the basic average performance indicator for the business organization.

2. Added value curve: this curve shows the real value (0-100) that customers give for each level of the global ordinal satisfaction scale; the form of the curve indicates if customers are demanding.

3. "Fragile" customers: the % of customers receiving satisfaction value less than a particular level, calculated using the global added value; this curve represents the probability distribution function of the added value curve. In this way, if a particular level of the added value curve is believed to be critical, the percentage of 'fragile' customers can be calculated.

4. Criteria/Subcriteria satisfaction indices: these indices show in a range of 0-100% the level of partial satisfaction of the customers according to the specific criterion/subcriterion, similarly to the global satisfaction index.

5. Weights of criteria/subcriteria: they show the relative importance within a set of criteria or subcriteria. Combining weights and satisfaction indices, a series of Performance/Importance diagrams can be developed (Figure 2). These diagrams are also mentioned as action, decision, and strategic or perceptual maps (Customers Satisfaction Council, 1995; Dutka, 1994; Naumann and Giel, 1995).

Each of these maps is divided into quadrants according to performance (high/low), and importance (high/low), that may be used to classify actions: - Status quo (low performance and low importance): Generally, no action is required. - Leverage opportunity (high performance/high importance): These areas can be used as advantage against competition. - Transfer resources (high performance/low importance): Company's resources may be better used elsewhere. - Action opportunity (low performance/high importance): These are the criteria/subcriteria that need attention. This grid can be used in order to identify priorities for improvement. The bottom right quadrant is obviously the first priority,

for the attributes are important to customers but company's performance is rated moderately low.

The second priority may be given to the satisfaction criteria/subcriteria in the top right quadrant, especially if there is room for improvement. The third priority issues are indicated in the bottom left quadrant; although these issues may not be exceptionally pertinent at the time of the analysis, they may be more important in the future, and company's performance is certainly not good. Finally, last priority for improvement can be given to the criteria/subcriteria in the top left quadrant because this category is the least important and company's performance is relatively good. Apparently, priorities for improvement can vary among different companies, depending on the potential capabilities of improving the particular category.

Action diagrams can indicate what dimensions of satisfaction should be improved, but they are not in a position to determine what will be the result of improvement actions nor the amount of effort needed to achieve the expected improvement. This problem is solved by the construction of the improvement charts, where:

- Average intensity indices indicate the amount of effort required to improve a feature, since the more demanding the customers, the more the level of satisfaction needs to be improved in order to fulfill their expectations.
- The outcome of improvement actions depends both on the importance of the criterion and on its contribution to customer non-satisfaction. For this reason, a set of average efficiency indicators is defined

$$I_i = b_i(1 - S_i) \quad \forall i = 1, 2, \dots, n$$

Each improvement chart is divided into quadrants depending on the demands and the effectiveness of satisfaction dimensions, resulting in the identification of improvement priorities:

These indices are defined in [0, 1] while it can easily be proved that:

$$\begin{cases} I_i = 1 \Leftrightarrow b_i = 1 \wedge S_i = 0 \\ I_i = 0 \Leftrightarrow b_i = 0 \vee S_i = 1 \end{cases} \quad \forall i = 1, 2, \dots, n$$

The business should focus on enhancing efficiency efforts that are highly effective while customers do not appear particularly demanding.

- The second priority of improvement actions is the criteria that either are highly effective and highly demanding or have low efficiency while customers do not seem particularly demanding.
- Finally, the characteristics that are low efficiency and high demand are the last priority for improvement. Similarly to the previous paragraph, it is possible to build absolute and relevant improvement charts. Final decision strategies should take into account all the available information of the MUSA method in order to achieve the most effective support of the decision.

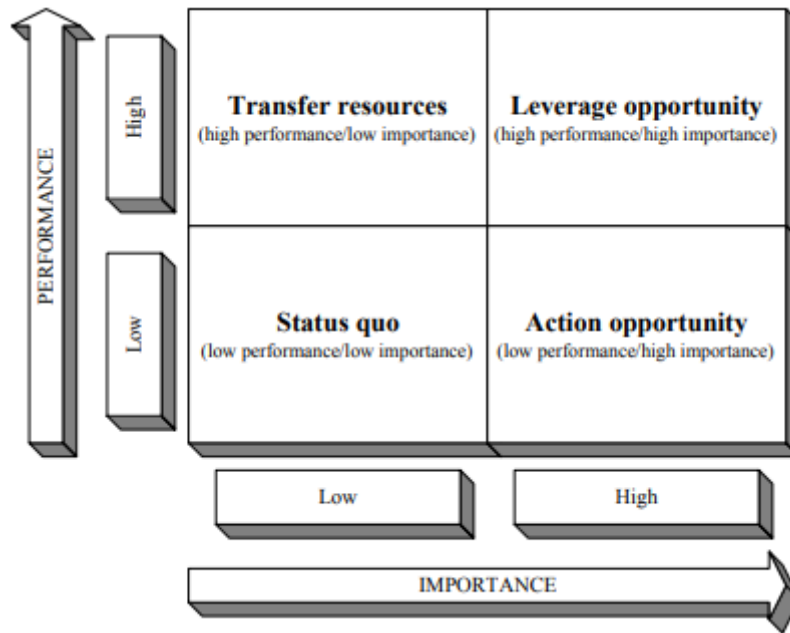


Figure 1- Performance/Importance diagram

Methodological frame: The main stages of the customer satisfaction survey were based on the methodology presented in Figure 2. This research process consists of the steps below (Hayes, 1992):

1. Preliminary analysis: customer satisfaction research objectives should be specified in this stage; preliminary market and customer behavioral analysis should be conducted in order to assess satisfaction dimensions (customers' consistent family of criteria)

. 2. Questionnaire design and conducting survey: using results from the previous step, this stage refers to the development of the questionnaire, the determination of survey parameters (sample size, collection data form, etc.) and the survey implementation.

3. Analysis: the implementation of the model is included in this stage providing several results as described in the previous paragraph. Analysis is performed into the total set of customers. Provided results involve basic descriptive statistical models, as well as the multicriteria preference disaggregation MUSA model.

4. Results: using the results from the analysis stage, final proposals for company's improvement strategy can be formulated; a reliability testing process for the results of the model is also included in this stage

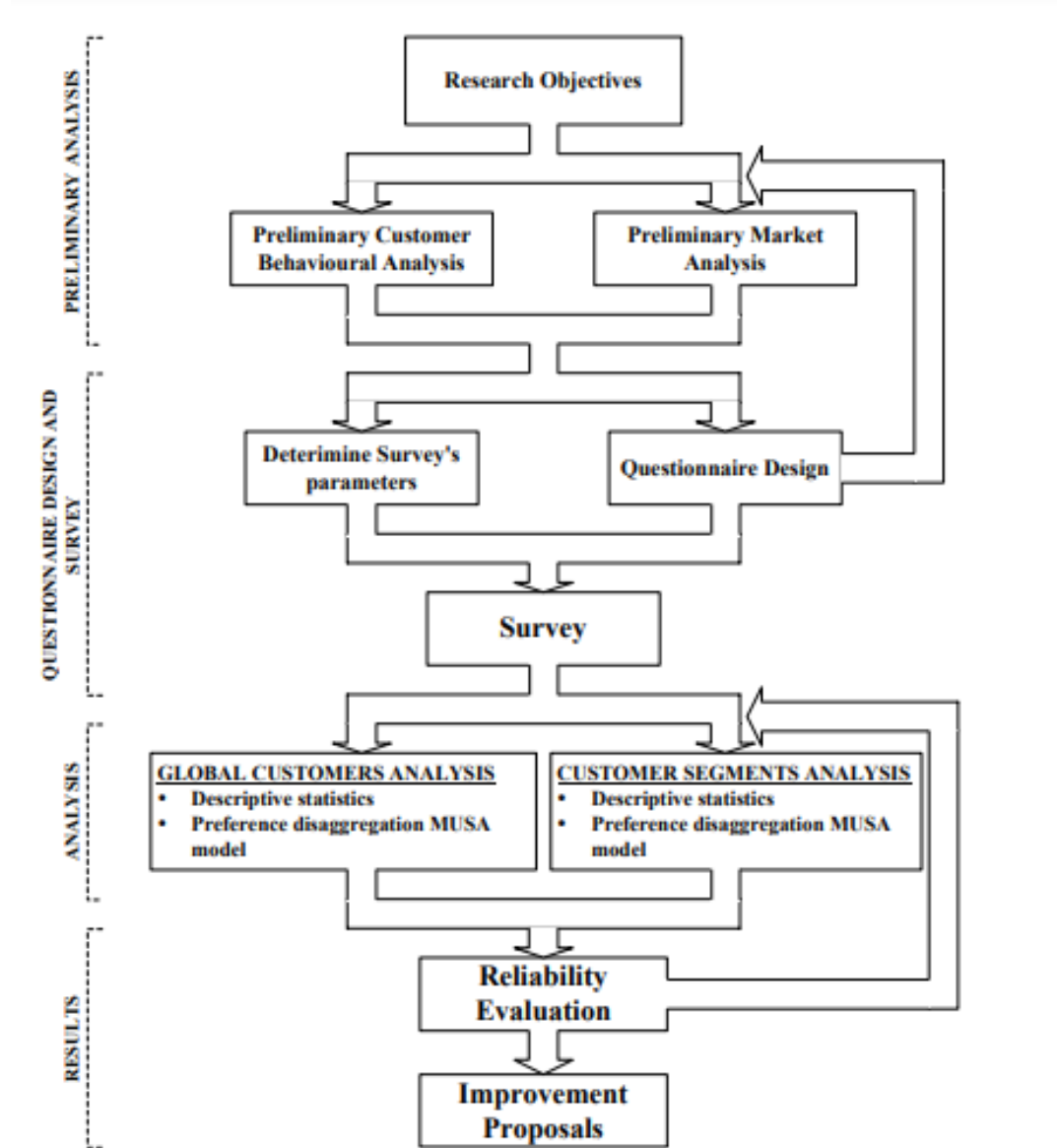


Figure 2- Customer satisfaction survey process

Chapter3 - Design of Research

3.1. Method

A quantitative approach was employed in order to collect relevant data that would answer the research question and the associated sub-questions, and permit accurate results. To achieve these objectives, a survey was employed to investigate how many users are currently using e-banking and the satisfaction of products, services, appearance, navigation and security of Greek web banking.

As literature suggests, there are two main types of surveys; descriptive, that attempt to describe current attitudes, behaviors and conditions, and analytical, attempting to describe and explain why current situations exist (Wimmer and Dominick's, 2011, p. 185). By considering these two types of surveys together, a wider, more representative sample of valuable data was collected for this research. Moreover, the present survey allowed the collection of a set of data from a variety of respondents aiming to examine their demographic characteristics, as well as their personality traits, their online participation on web banking sites and the satisfaction of each element. (Wimmer & Dominick, 2011, p. 185).

Multi Criteria Analysis - MUSA METHOD

The MUSA (MultiCriteria Satisfaction Analysis) method is a methodology that evaluates the satisfaction of a set of individuals (customers, employees, etc.) based on the system of values and preferences of a set, which is considered as

one unit. MUSA method is based on multi-criteria decision analysis. The main purpose of MUSA multi-criteria methodology is to synthesize the preferences of a set of clients in a quantitative mathematical function.

More specifically, the method assumes that the overall satisfaction of an individual customer depends on a set of variables that represent the characteristics of a product or a service offered. The assessment of satisfaction of a set of clients can be considered as a problem in the scientific field of Multi Criteria Analysis, assuming that a customer's total satisfaction depends on a set of criteria $X = (X_1, X_2, \dots, X_n)$. All of these criteria are essentially the characteristics of the product or service that affect customer satisfaction.

In order to collect data, using the MUSA method, it is necessary to create an appropriate questionnaire to be distributed to consumers for evaluation of products or services offered by a business. The purpose of the questionnaire is to quantify total customer satisfaction and to measure individual satisfaction based on specific criteria. These criteria constitute the dimensions of customer's satisfaction.

3.2. Research questions

The survey was designed and implemented with the main purpose of providing a useful handbook for Banking Organizations to identify all the strengths and weaknesses of web banking services. That is, the measurement of overall customer satisfaction aspires to identify those points that e-banking system needs to improve or safeguard in order to enhance its competitive advantage. At the same time, the outline of different requirements of the individual customer categories, as well as the formation of an overall image of web-Banking System complete the whole project.

In particular, this research is intended to answer the following questions:

- What is the degree of satisfaction of the Greek web- Banking System, of all its clients.
- What is the degree of customer satisfaction of Greek e-banking system from its various specific features?
- What are the factors that have a particular impact on customer satisfaction?
- Which factors require immediate response and remedial action by Banking Organizations and what will be the result of such actions for the entire banking system
- Which points make up the company's competitive edge and how it can be exploited to improve its competitive position
- What is the degree of customer satisfaction based on various demographic characteristics
- What changes should be made to meet the needs of specific categories of customers with great significance and the results will result

3.3. Unit of Analysis and Sample

The unit of analysis comprises active e-banking users, who are defined as those who log in to the platform/ website, and/or complete some action, for instance making payments or monitoring their bank accounts within three months. The survey focused on Greek web banking users aged between 18 to 65 years old.

In order for the results to be as representative and unbiased as possible, a number of 70 online survey responses were sought, in order to be able to exclude from the analysis of the results inappropriate or uncompleted survey responses, that would affect the reliability and validity of the research. Finally, after the exclusion of unusable responses, 50 valid responses were selected and used for the analysis. The sample of 50 participants consists of 27 males and 23 females.

3.4. Questionnaire

The designed questionnaire consists of 33 questions (8 questions detecting socio-demographic and web-banking usage information and 25 questions related to the customer satisfaction). The questionnaire can be shown in Appendix A.

SCALE MEASUREMENT

Satisfaction levels were defined at a five-level scale for reasons of simplicity and ease of completion as follows:

- Absolutely satisfied
- Very satisfied
- Satisfied
- Slightly satisfied
- Dissatisfied

The above scale as used throughout the questions of the questionnaire.

In addition to the satisfaction questions, a section with the demographic characteristics of respondents was included in the questionnaire. In this way, an attempt was made to outline the characteristics of the Banking Bank's customers. Thus, questions were included on the questionnaire, regarding clients' gender, age and their monthly income. Specifically, five age groups (18- 25 years old, 26-35 years old, 36-45 years old, 46-55 years old, 56-65 years old and over 65 years of age) were used. The questionnaire also gathers information for the frequency of internet use, the range of Internet Banking Services used by the respondents and for how long they have been using internet banking.

The questionnaire was formed based on the determination of satisfaction dimensions presented above. A more general aim was to provide the most concise form of the questionnaire for the easier and quicker completion of the questionnaire.

3.5Global satisfaction analysis

Our satisfaction model consists of six criteria, related to web banking satisfaction:

1. QUANTITY OF INFORMATION & USEFULNESS (3 items)
2. SERVICES PROVIDED (2 items)
3. SECURITY (4 items)
4. NAVIGATION (3 items)
5. APPEAREANCE, USER INTERFACE (3 items)
6. ONLINE CUSTOMER SERVICE (3 items)

For each criterion, following the MUSA method, a summarizing question was added (Overall satisfaction from the criterion), resulting to n_i+1 items for each

criterion. In this respect, a resuming question was added to the end of the questionnaire seeking input for the Total Satisfaction Index.

Reliability was examined for all subscales and the total satisfaction questionnaire, by the means of Cronbach alpha reliability coefficient. The total alpha for the Satisfaction questionnaire was 0,968, which is an excellent value, showing that the data will reveal reliable results. The α coefficients for the subscales is:

1. QUANTITY OF INFORMATION & USEFULNESS ($\alpha = ,892$)
2. SERVICES PROVIDED ($\alpha = ,887$)
3. SECURITY ($\alpha = ,953$)
4. NAVIGATION ($\alpha = ,858$)
5. APPEAREANCE, USER INTERFACE ($\alpha = ,972$)
6. ONLINE CUSTOMER SERVICE ($\alpha = ,860$)

The Six criteria with the sub-criteria are formed to a tree structure, depicted in figure 3 below, which has guided the design and the analysis.

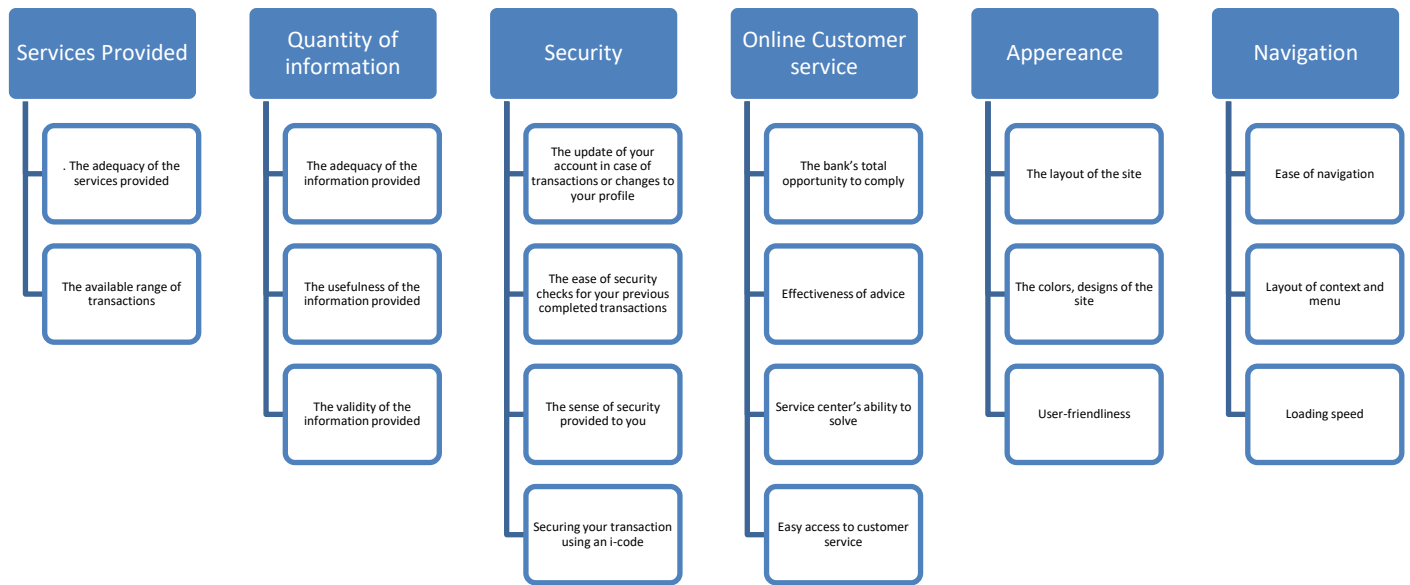


Figure 3- Criteria Satisfaction

Chapter 4- Results

4.1. Demographics and Client characteristics

The analysis of the present section includes the description of the demographic data of the sample, as well as investigation of possible correlations between demographics and satisfaction scores per criterion as expressed by the banks' clients.

Gender

Initially, looking at the gender of the clients (table 1), we see from the chart below that the participation of women and men is almost the same. As 54% are men and 46% women.

Table 1. Distribution of the respondents by gender

		Gender			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	23	46,0	46,0	46,0
	Male	27	54,0	54,0	100,0
	Total	50	100,0	100,0	

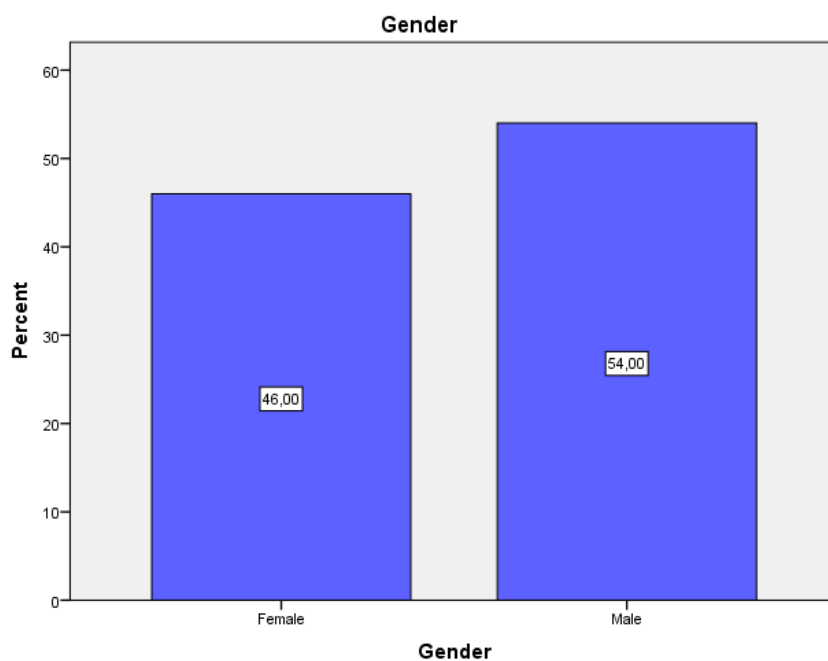


Figure 4. Distribution of the respondents by gender

Age

The distribution of the respondents by age (table 2), reveals that the majority are between 46-55 years (28%) and 56-65 (also 28%).

Table 2. Distribution of the respondents by age group

Age				
	Frequency	Percent	Valid Percent	Cumulative Percent
18-25	5	10,0	10,0	10,0
26-35	3	6,0	6,0	16,0
36-45	11	22,0	22,0	38,0
Valid 46-55	14	28,0	28,0	66,0
56-65	14	28,0	28,0	94,0
>65	3	6,0	6,0	100,0
Total	50	100,0	100,0	

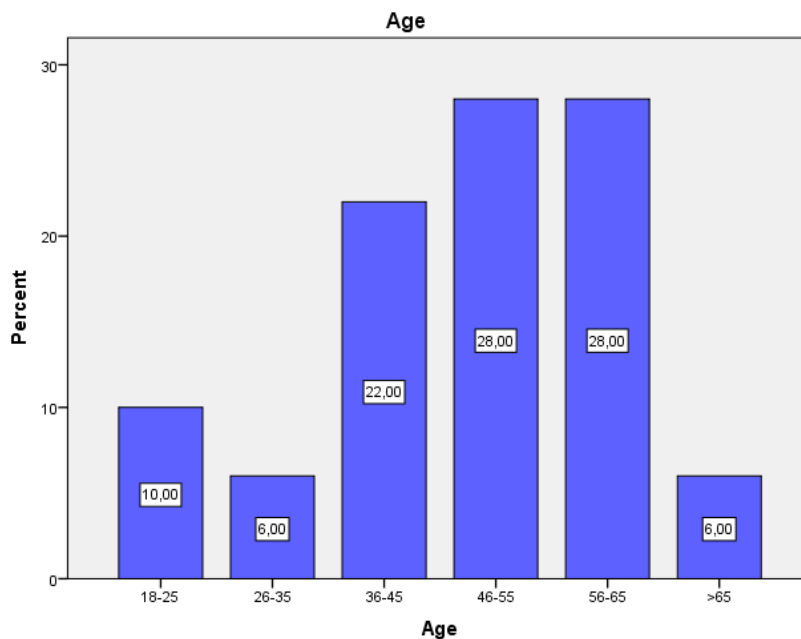


Figure 5. Distribution of the respondents by age

Monthly salary

The distribution of the sample by monthly salary (table 3) shows that the most populated group is those earning 1001-1500 euro per month (38%), followed by the ones earning 501-1000 euro per month, while the rest of the categories have smaller frequencies.

Table 3. Distribution of the respondents by monthly salary

Monthly Salary				
	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 0-500	7	14,0	14,0	14,0
501-1000	17	34,0	34,0	48,0
1001-1500	19	38,0	38,0	86,0
1501-2000	5	10,0	10,0	96,0

>2000	2	4,0	4,0	100,0
Total	50	100,0	100,0	

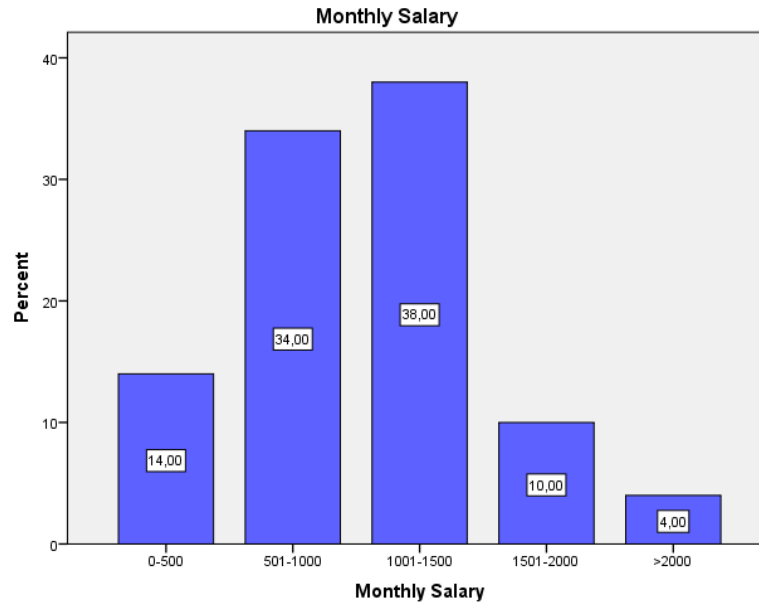


Figure 6. Distribution of the respondents by monthly salary

How often do you use internet banking?

Referring to the frequency of internet banking usage (table 4), the majority of the respondents stated that they use it once a week (32%) or 1-2 times per week (26%).

Table 4. Frequency of Internet Banking Usage

How often do you use internet banking				
	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Every Day	7	14,0	14,0
	2-3 times per week	14	28,0	42,0
	once a week	16	32,0	74,0
	1-2 times per month	13	26,0	100,0

Total	50	100,0	100,0
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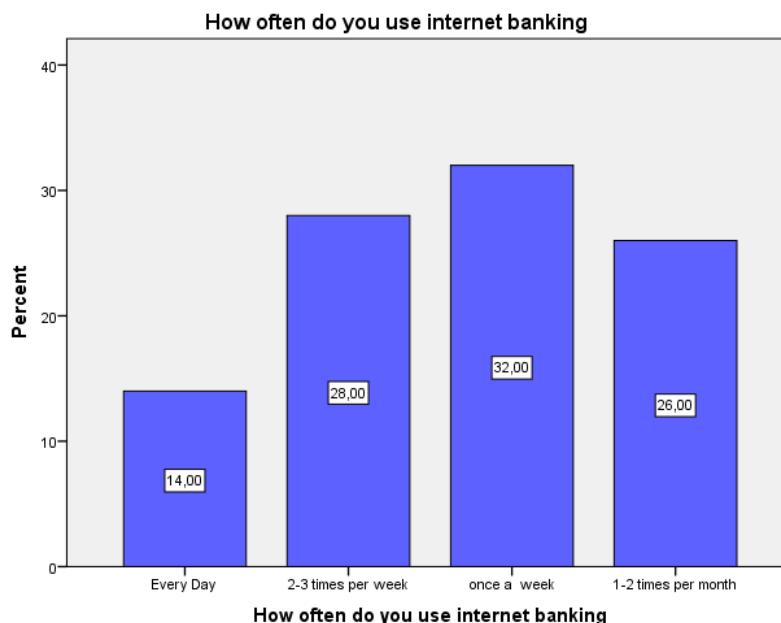


Figure 7. Frequency of Internet Banking Usage

What kind of transactions do you make using Internet Banking?

Regarding the type of transactions, the respondents, in principle, gave more than one response, meaning that they use internet banking for more than one purpose (50 respondents, 123 responses, table 5). The vast majority (94%) of the respondents uses internet banking for bills' payment, and a big percentage (72%) for money transfers among accounts and other payments. Almost half of the sample (44%) responded that they make use of internet banking for account control and management, fewer for card and PIN management (26%) and only 10% for Purchase of Shares.

Table 5. Internet banking types of use

\$type_of_transactions Frequencies				
		Responses		Percent of
		N	Percent	Cases
type of transactions ^a	Type of Transactions (Account audit, Statements)	22	17,9%	44,0%
	Type of Transactions (Transfers from an Account to another, Sending Internal / External Payments)	36	29,3%	72,0%
	Type of Transactions (Payments of Public Benefit Accounts, bills etc)	47	38,2%	94,0%
	Type of Transactions (Purchase of Shares)	5	4,1%	10,0%
	Type of Transactions (Card, PIN Management etc)	13	10,6%	26,0%
Total		123	100,0%	246,0%

a. Dichotomy group tabulated at value 1.

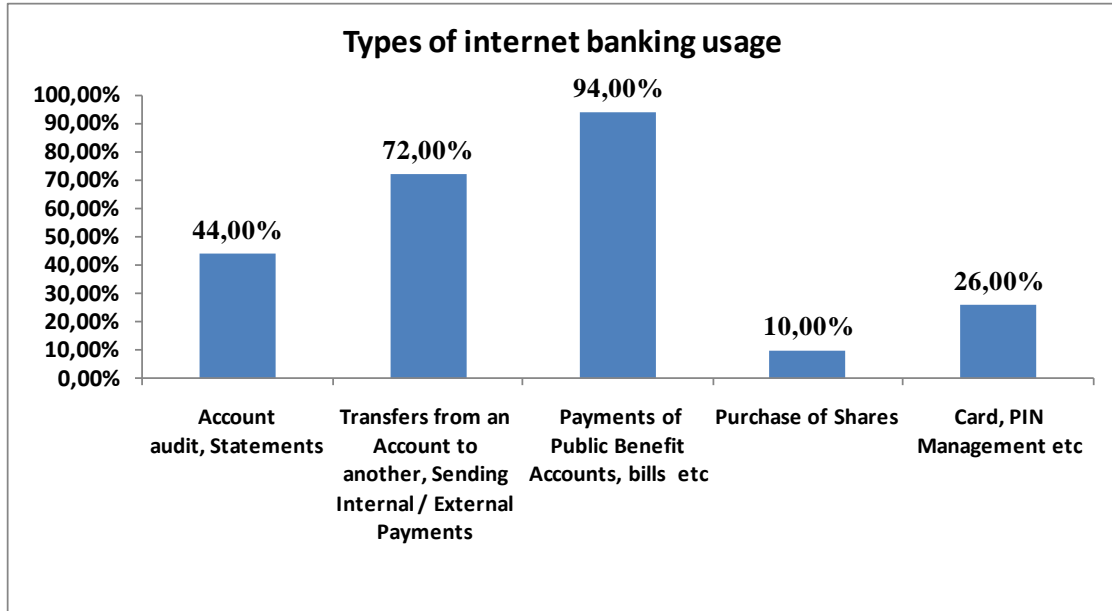


Figure 8. Internet banking types of use

How much time do you spend in daily basis, using Internet for business, entertainment, or for informational purposes?

Almost half of the respondents (46%) use internet 2-3 hours per day, 38% of them use it up to 1 hour per day, and the rest use it less (table 6).

Table 6. Time spent on Internet use

How much time do you spend in daily basis, using Internet for business, entertainment, or for informational purposes				
	Frequency	Percent	Valid Percent	Cumulative Percent
Up to 1 hour per day	19	38,0	38,0	38,0
2-3 hours per day	23	46,0	46,0	84,0
Valid 4-8 hours per day	6	12,0	12,0	96,0
More than 8 hours per day	2	4,0	4,0	100,0
Total	50	100,0	100,0	

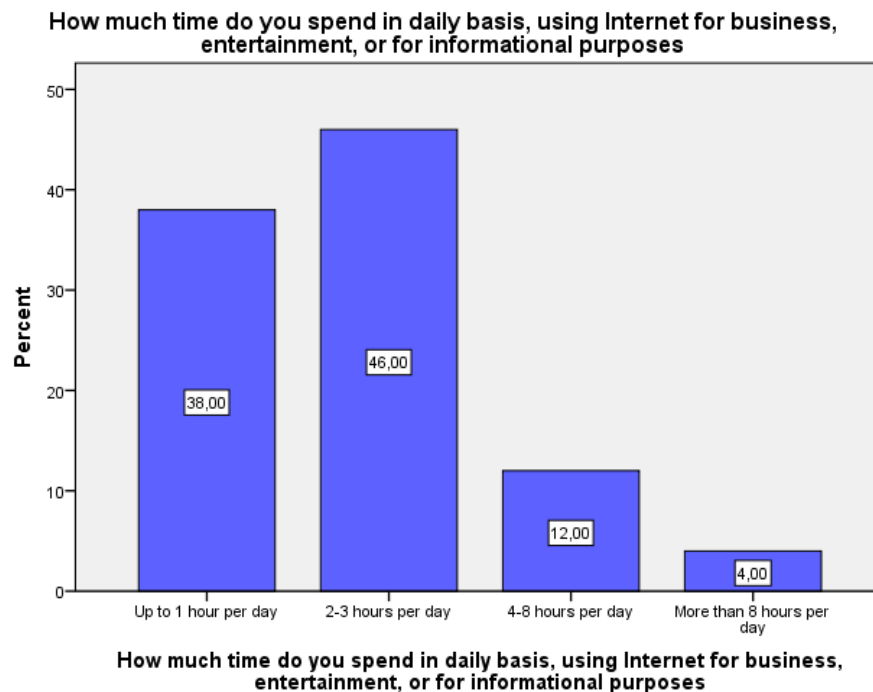


Figure 9. Time spent on Internet use

How long time have you been a user of Internet Banking?

The time that the respondents use Internet Banking is 1-3 years for the majority of them (56%), 4-7 years for a percentage 32% of the sample, and fewer participants (8%) use it for less than one year or more than 7 years (4%).

Table 7. How long time have you been a user of Internet Banking

	Frequency	Percent	Valid Percent	Cumulative Percent
<1 year	4	8,0	8,0	8,0
1-3 years	28	56,0	56,0	64,0
Valid 4-7 years	16	32,0	32,0	96,0
>7 years	2	4,0	4,0	100,0
Total	50	100,0	100,0	

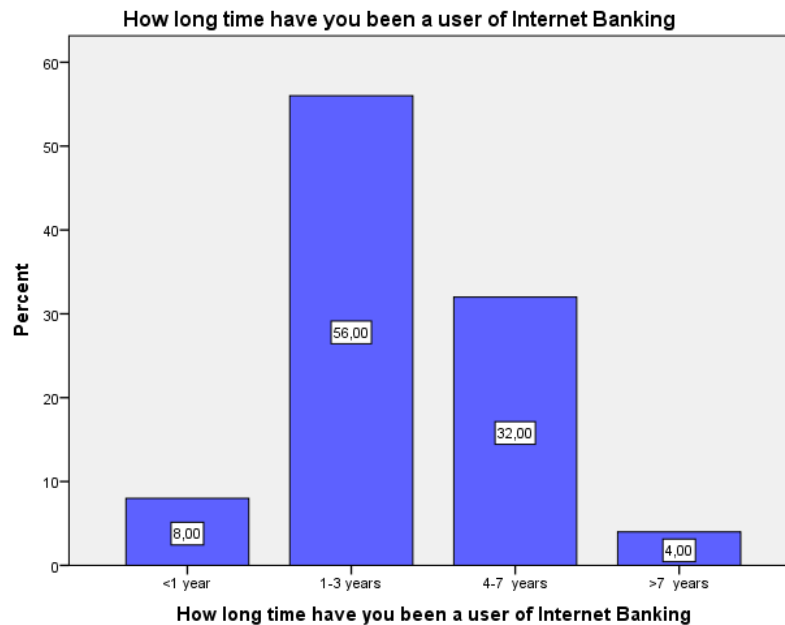


Figure 10. Years of Internet banking use

Which bank you mainly use for Internet Banking

The distribution of the participants according to the bank they mostly use is presented in table 8 and shows that Piraeus bank (30%) and National Bank of Greece (26%) are the banks used by most clients. Eurobank (20%) and Alpha Bank (18%) are used less.

Table 8. Bank

Which bank you mainly use for Internet Banking				
	Frequency	Percent	Valid Percent	Cumulative Percent
National Bank of Greece (Ethniki) i-bank	13	26,0	26,0	26,0
Piraeus bank winbank	15	30,0	30,0	56,0
Valid Alpha Bank Web Banking	9	18,0	18,0	74,0
Eurobank e-banking	10	20,0	20,0	94,0
Other	3	6,0	6,0	100,0
Total	50	100,0	100,0	

4.2. Customer Satisfaction results

As described above, our satisfaction model consists of Six criteria, related to web banking satisfaction (QUANTITY OF INFORMATION & USEFULNESS, SERVICES PROVIDED, SECURITY, NAVIGATION, APPEAREANCE, USER INTERFACE and ONLINE CUSTOMER SERVICE).

Customers seem to be quite satisfied from the provided service, given that the average global satisfaction index has a quite high value (86%). In addition, the added value curve for the global set of customers is presented in the same graph and shows that the analysis has revealed that the sample consists of non demanding clients (Figure 11).

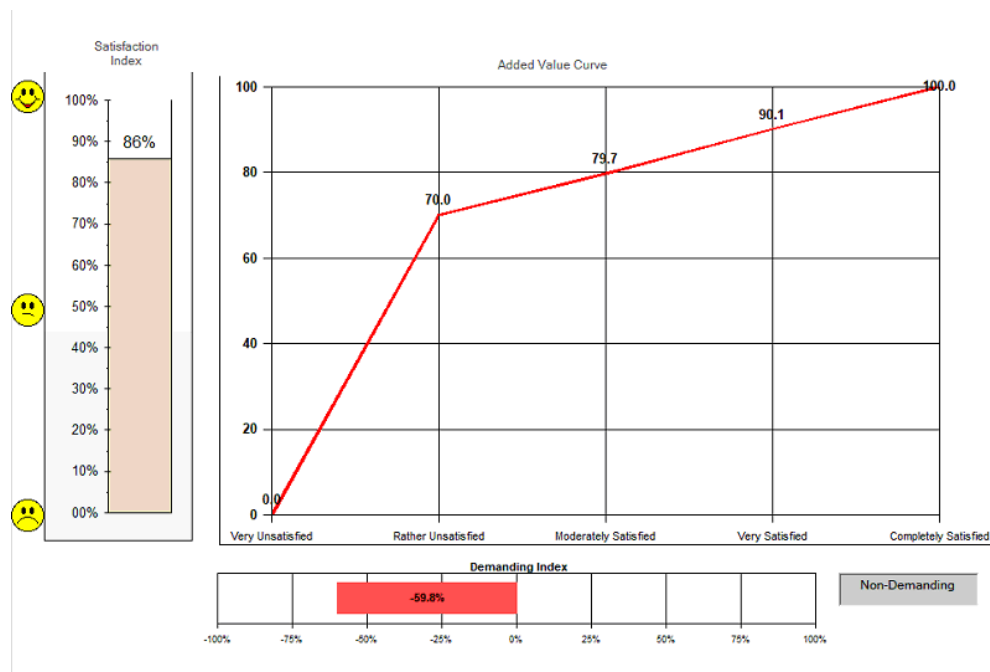


Figure 11- Global Satisfaction Index and demanding curve

Moreover, criteria satisfaction analysis shows that customers are also quite satisfied according to the criteria of “USER FRIENDLINESS” (86,3%), “QUANTITY & USEFULNESS OF INFORMATION” (86%), “ONLINE CUSTOMER SERVICE” (83,2%), “NAVIGATION” (82,5%), “SECURITY”(81,5%), and least, but still high “SERVICES PROVIDED” (76%). With regard to the importance of the criteria (weights of criteria), information provided by the site has the highest weight (21,5%) and services provided has the lowest (11,8%), while the rest of the criteria have been allocated equal weights of 16,7% (Figure 12).

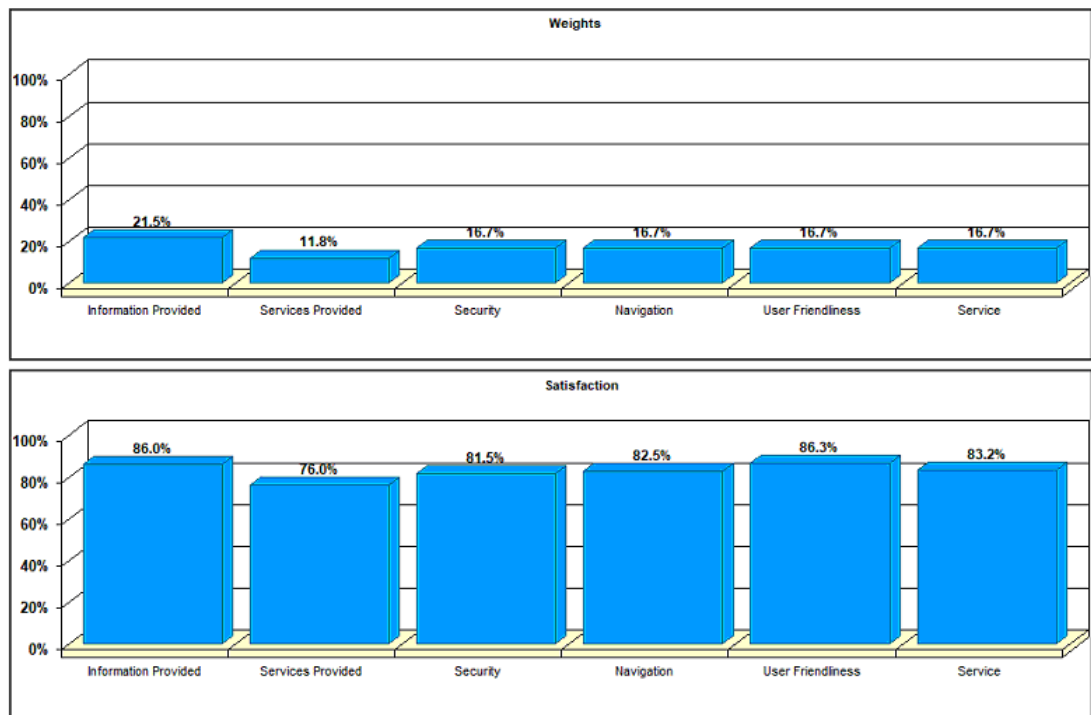


Figure 12- Average satisfaction indices and weights

4.3. Demanding Indices results

In figure 13 one can observe the demanding indices for all six sub-criteria. As also presented in the added value curve (figure 11), the indices show that the sample consists of non demanding clients. The analysis has also produced an output presenting the impact for the six criteria, which is at low levels.

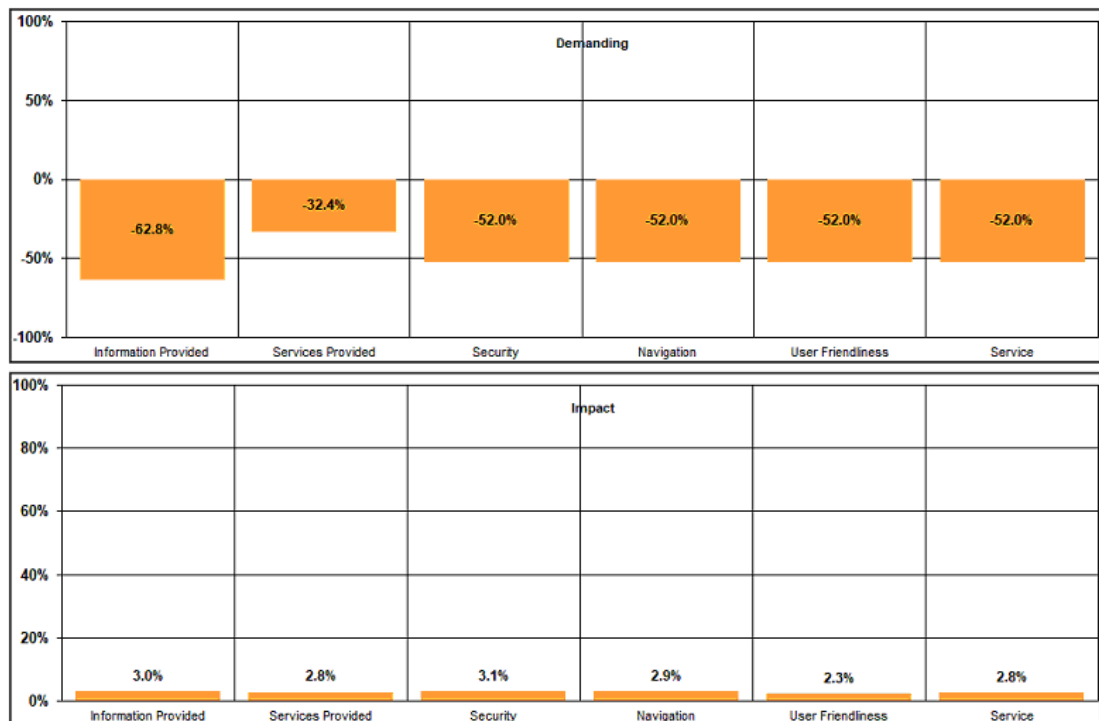


Figure 13- Demanding Indices and Impact

4.4. Sub-criteria Weight Analysis

4.4.1. Information Provided

As seen in graph in figure 14, the “Information Provided” sub-criterion that accumulates the heaviest weight, is “adequacy” of information (55,4%), being also the one that has the highest score for satisfaction (94,4%).

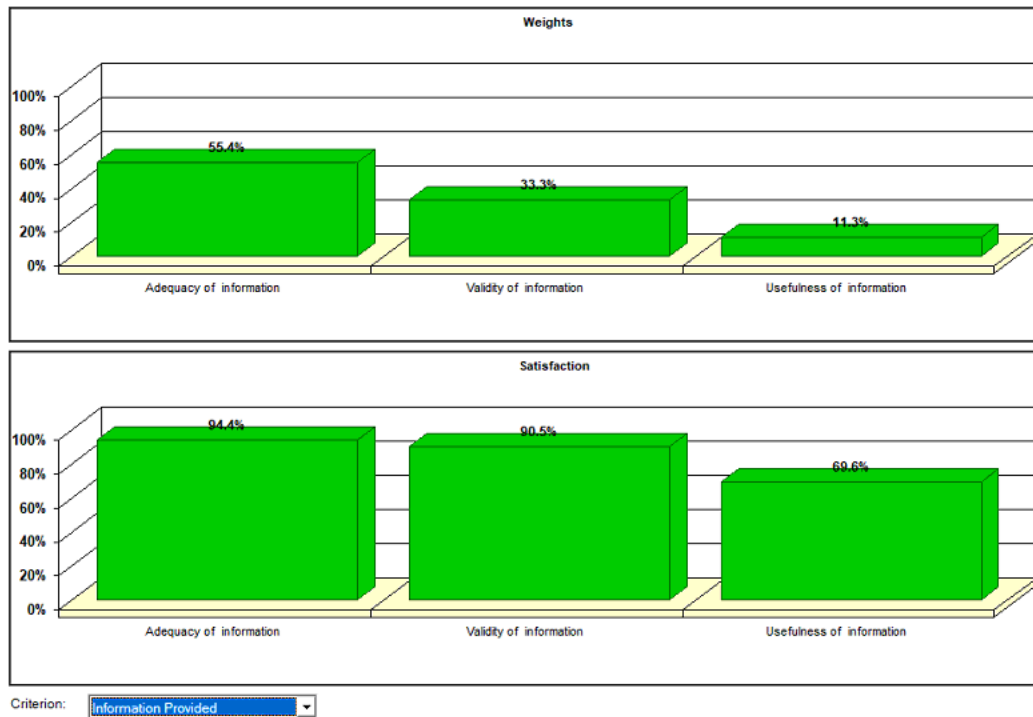


Figure 14- Information Provided Sub-criteria

4.4.2. Services Provided

“Services Provided” has two sub-criteria (availability and adequacy), which share equal weights and have high satisfaction scores of 93,5% and 91,1% respectively.

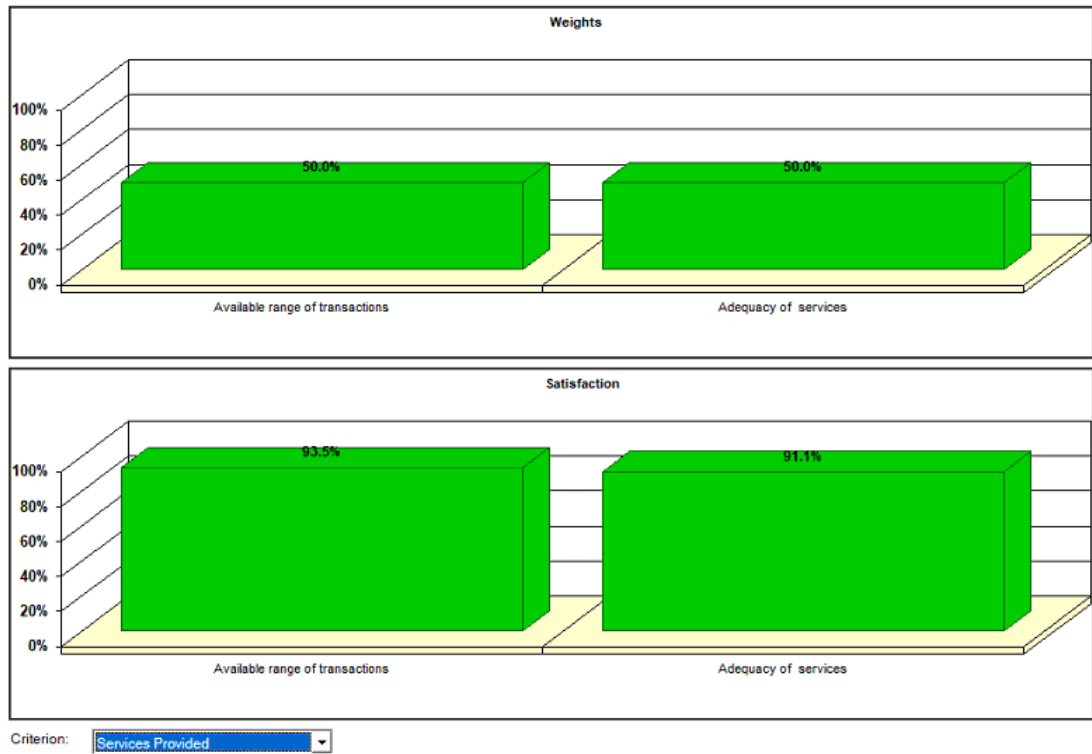


Figure 15- Services Provided Sub-criteria

4.4.3. Security

As seen in figure 16 t-criterion that weights most, out of the four sub-criteria of security is the one labeled “transaction securing using an i-code”, showing its importance for the clients. The same sub-criterion is the one that demonstrates the highest satisfaction from the clients.

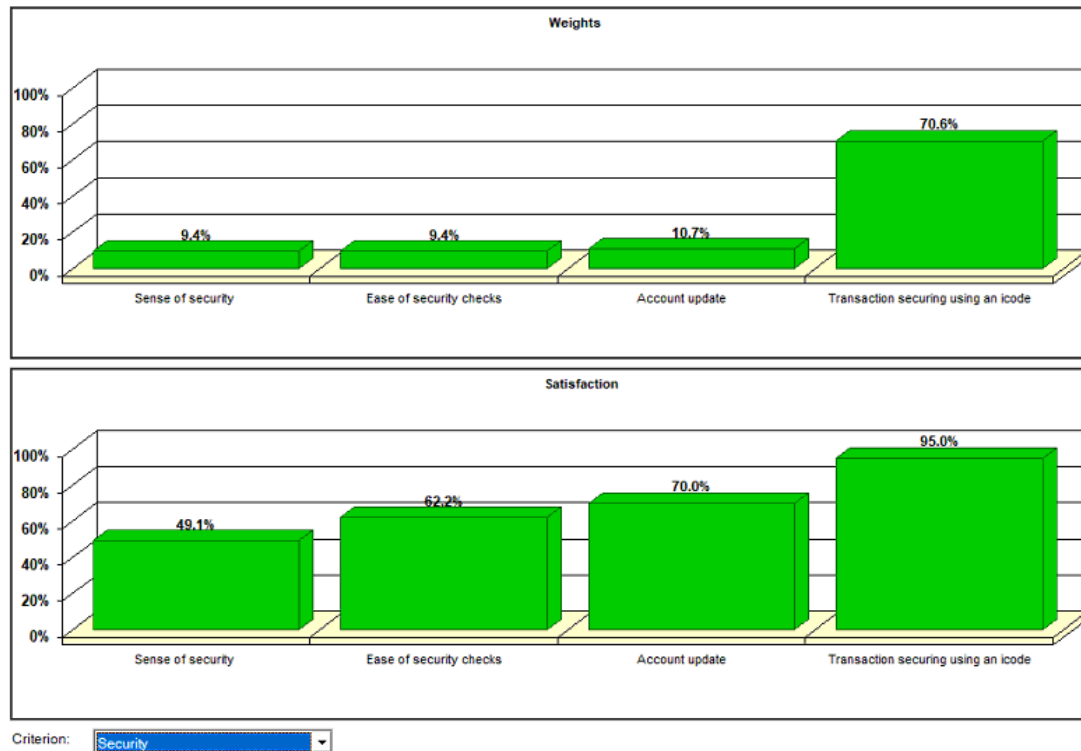


Figure 16- Security Sub-criteria

4.4.4. Navigation

“Layout of context and menu” is the sub-criterion demonstrating the highest weight (54,8%) and satisfaction (95%) level for the Navigation criterion (figure 17).

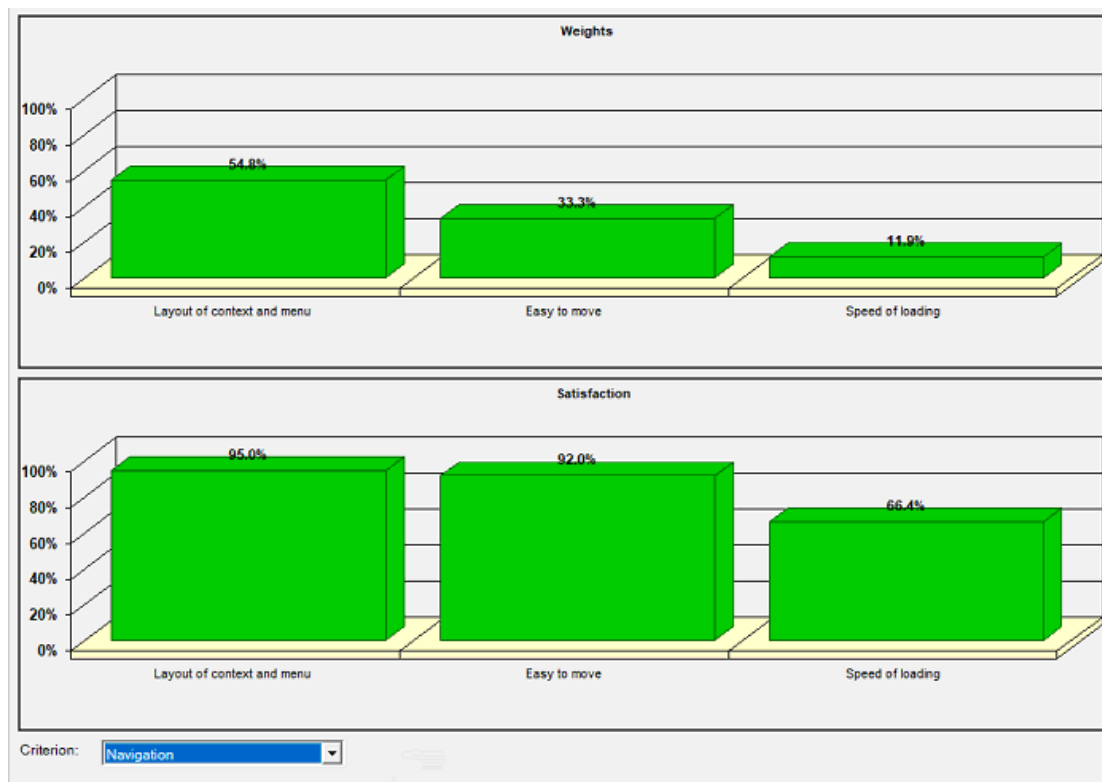


Figure 17- Navigation Sub-criteria

4.4.5. User Friendliness

With regard to the criterion which describes the layout of the site and its user friendliness, all three sub-criteria share equal weights (33,3%), and very similar satisfaction levels varying between 92,1% and 93,5% (figure 18).

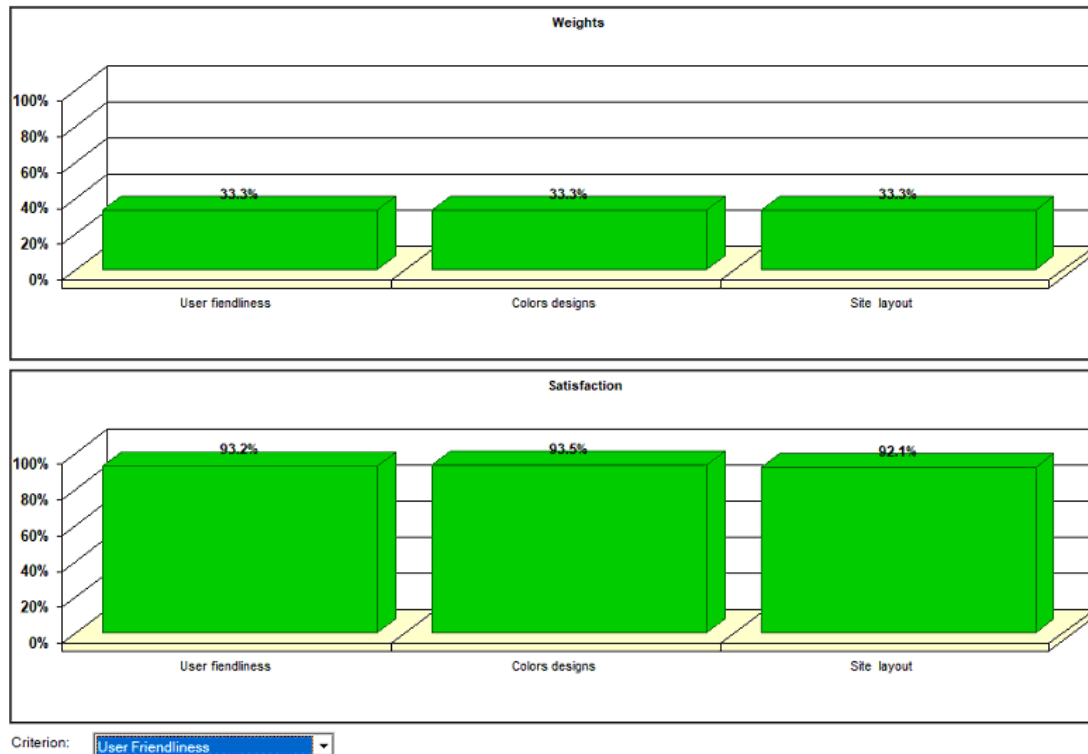


Figure 18- User Friendliness Sub-criteria

4.4.6. Online Customer Service

With regard to the criterion that describes the online customer service, in the same manner as above, all three sub-criteria (easy access, service ability and effectiveness) share equal weights (33,3%). The satisfaction levels are 89,3%, 90% and 91,1% respectively (figure 19).

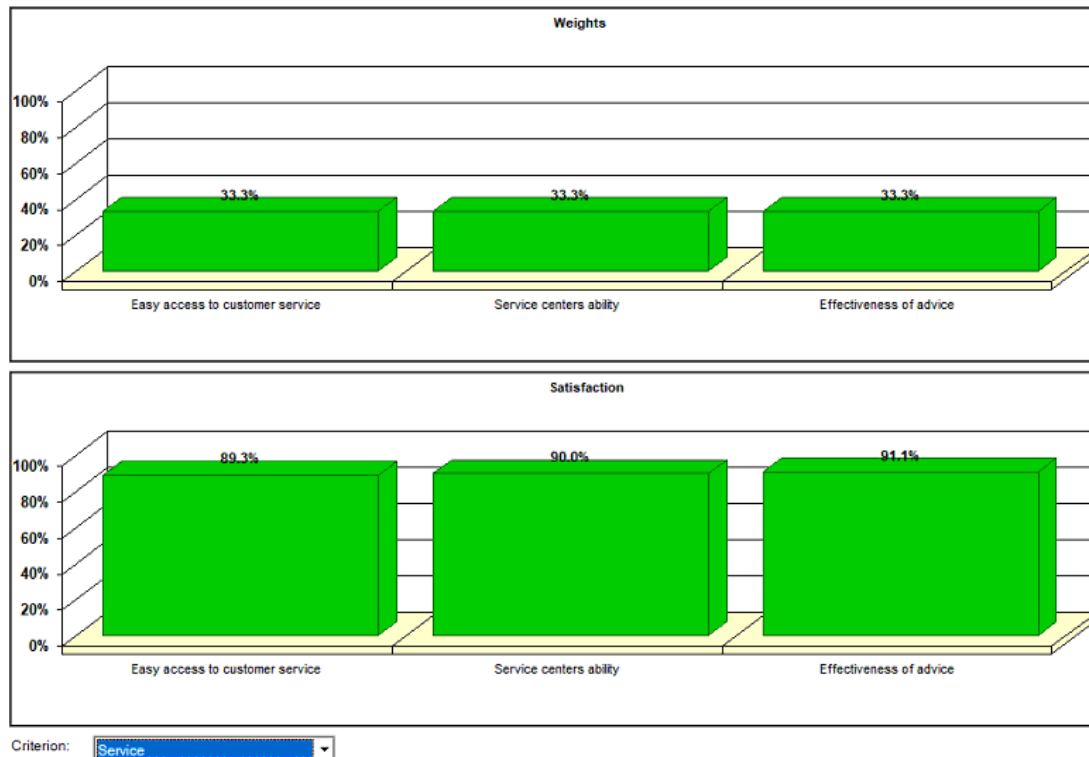


Figure 19- User Friendliness Sub-criteria

4.5. Sub-criteria Demanding Indices Analysis

As mentioned above, the total demanding index (-59,8%), as well as the criteria demanding indices (information=-62,8%, services provided=-32,4%, security=-52%, navigation=-52%, user friendliness=-52%, client service=-52%) show the participants comprise a non-demanding sample. This is also the case with sub-criteria demanding indices, listed below in graphs 20-25.

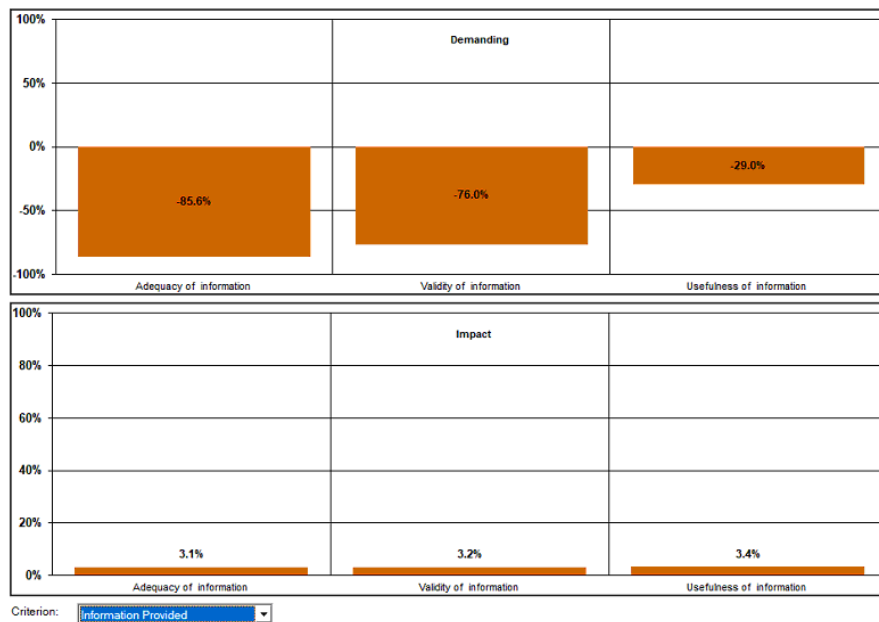


Figure 20- Information sub-criteria Demand indices

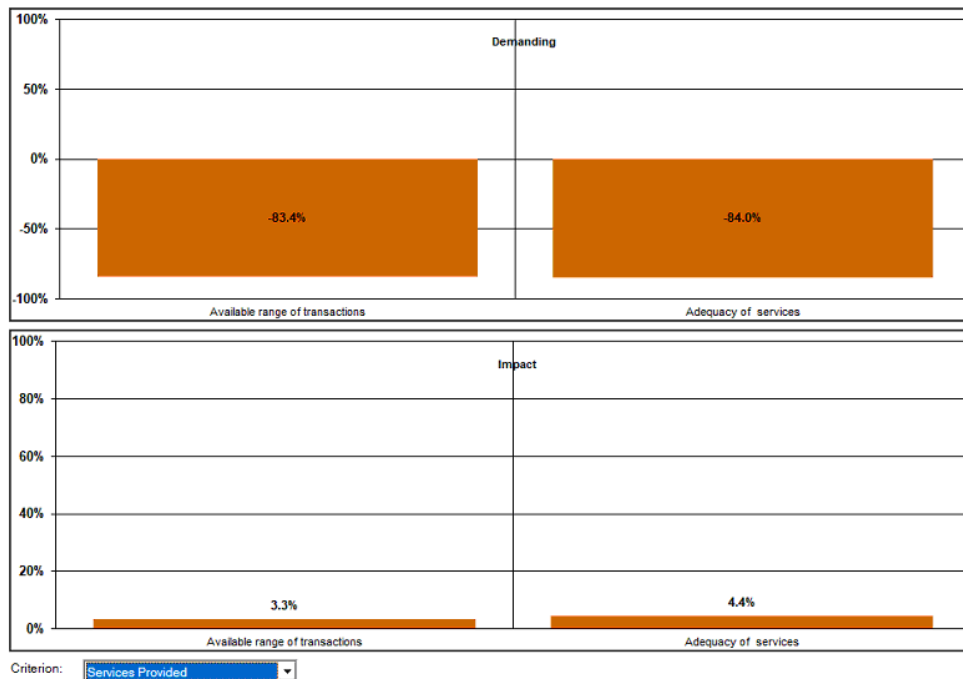


Figure 21- Services sub-criteria Demand indices

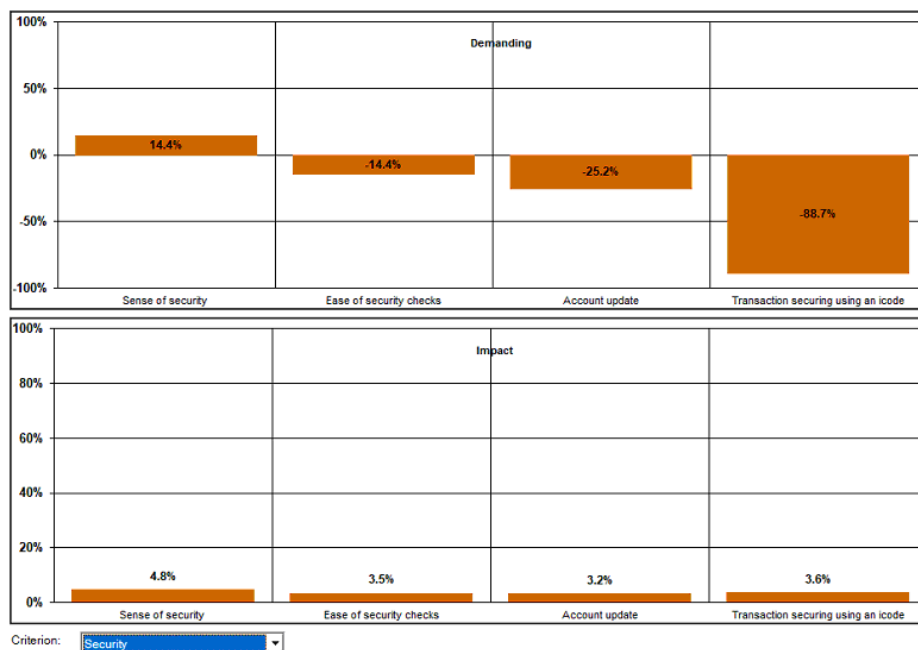


Figure 22- Security sub-criteria Demand indices

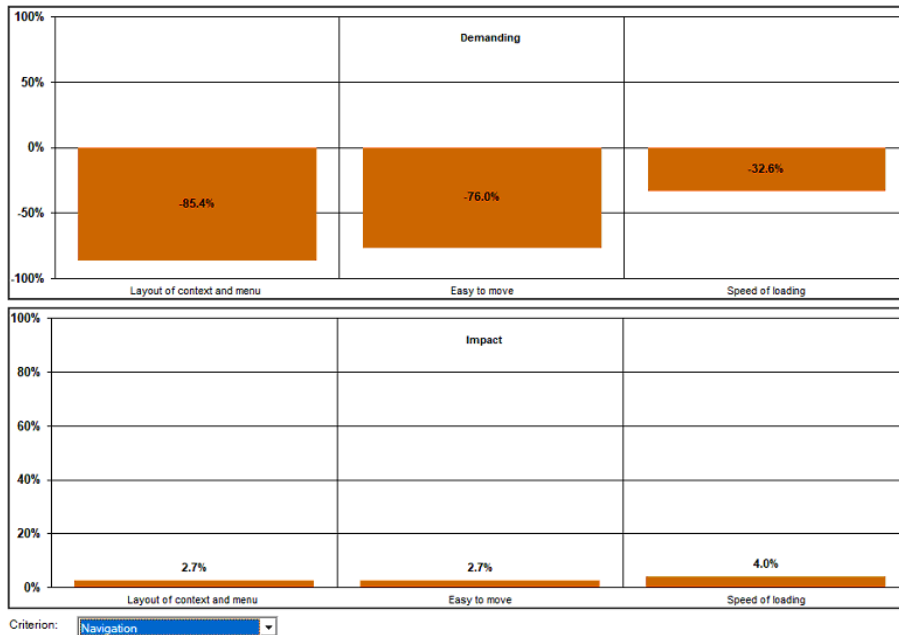


Figure 23- Navigation sub-criteria Demand indices

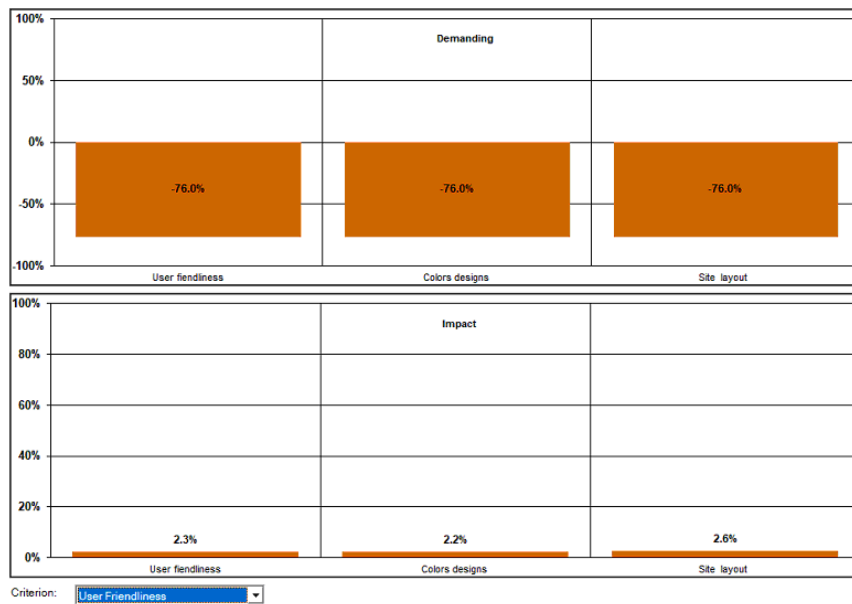


Figure 24- User Friendliness sub-criteria Demand indices

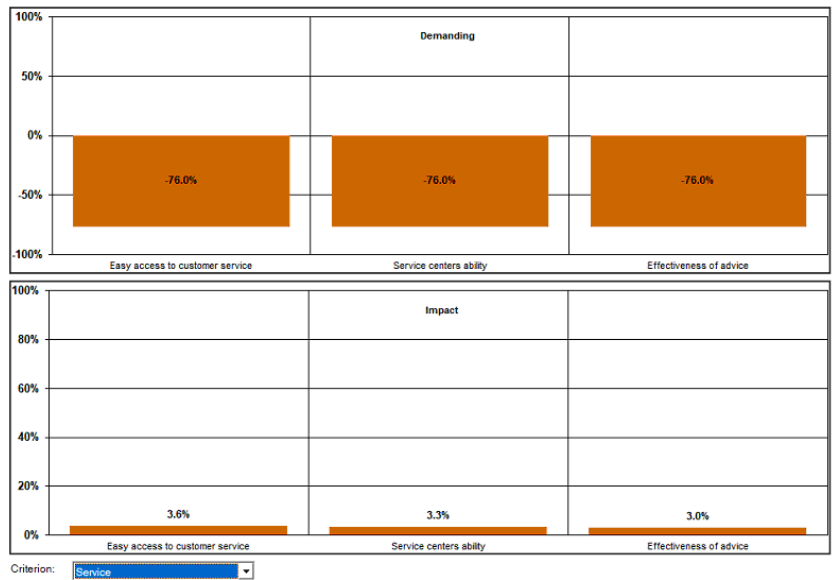


Figure 25- Customer service Sub-criteria

4.6. Action Maps

Action maps result from MUSA method as the output of the system in the form of importance/performance charts. In the global action map depicted in figure 26, it can be seen that out of the six criteria the one having the status quo position with low importance and low performance is “Services Provided”. This outcome is indicative that although online banking systems exhibit low performance regarding the services they provide, they need no special effort to improve it, since it is of low importance to the clients. The criteria of Customer-Service, Navigation and Security are placed on the center of the global action map, indicating a medium importance, as well as a medium performance. Out of the three, Customer-service is performing best. User friendliness lies on the border of quadrants transfer resources and leverage opportunity, indicating that for this particular criterion the performance of on-line systems are relatively better than clients concern. Last, “Information Provided” lies in the quadrant of high importance and high performance, indicating leverage opportunity.

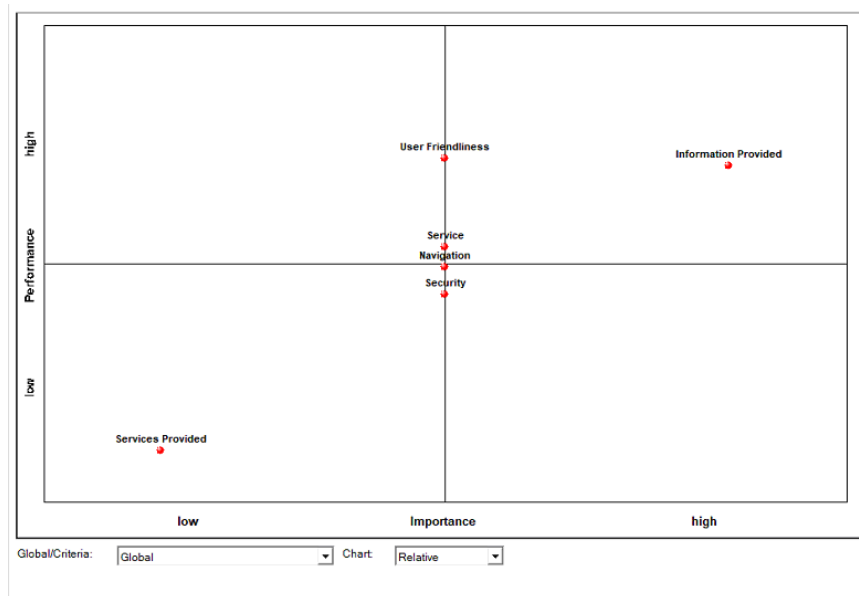


Figure 26- Global action map

Regarding the criterion of “Information provided”, the usefulness of the information provided is in the status quo cell, with low importance and low performance levels. Validity of the information has medium importance for the clients and high performance from the side of the banks. This implies that some resources could be transferred to other activities. On the top right cell, one can observe the sub-criterion “Adequacy of information”, which is of high importance to the clients and also of high performance from the banks, thus characterized as leverage opportunity (figure 27).

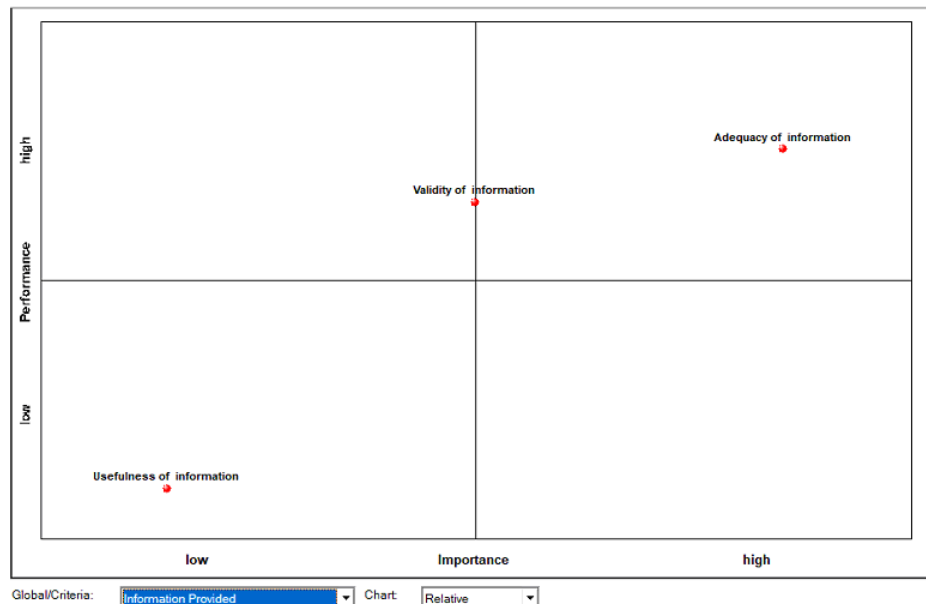


Figure 27- Information Provided action map

Looking at the “Services provided” action map, it is evident that the service provider needs to invest effort on the adequacy of information, since it is of medium importance for the clients, but of low performance by the provider. On the other hand, the available range of transactions demonstrates high performance,

showing that there is a wide range available, but medium importance, thus it is a good opportunity, but banks need no further investment at this end (figure 28).

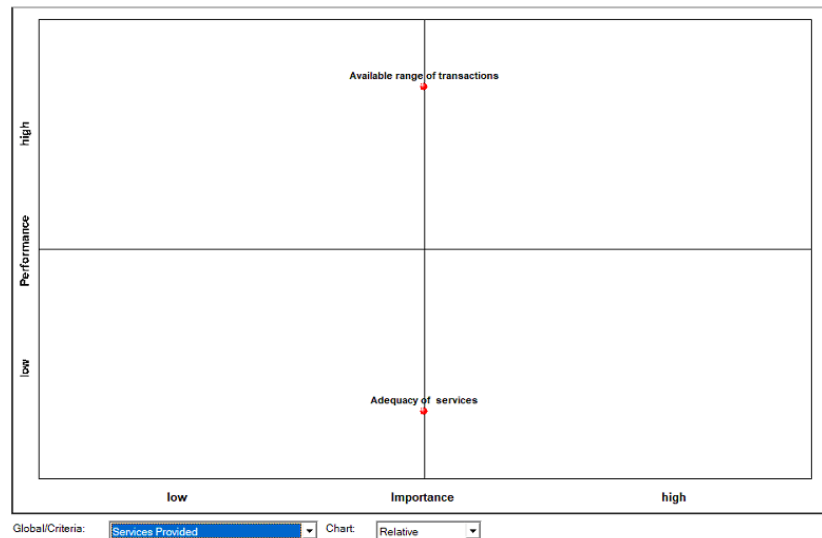


Figure 28- Services Provided action map

Surprisingly, although security would be expected to be one of the criteria with utmost importance for the clients, in the global action map it is located on the middle of importance axis, indicating a medium importance from clients. It could be the case that clients take security for granted, as far as banking services is concerned. Looking at figure 29, it can be speculated that the three sub-criteria that are of low importance for the clients are sense of security, ease of security checks and account update in case of transactions and changes. These are also of low to medium performance by the provider. However, of very high importance, as well as performance, is transaction securing using an i-code. This gives a hint that clients place transaction securing on top of the security sub-criteria.

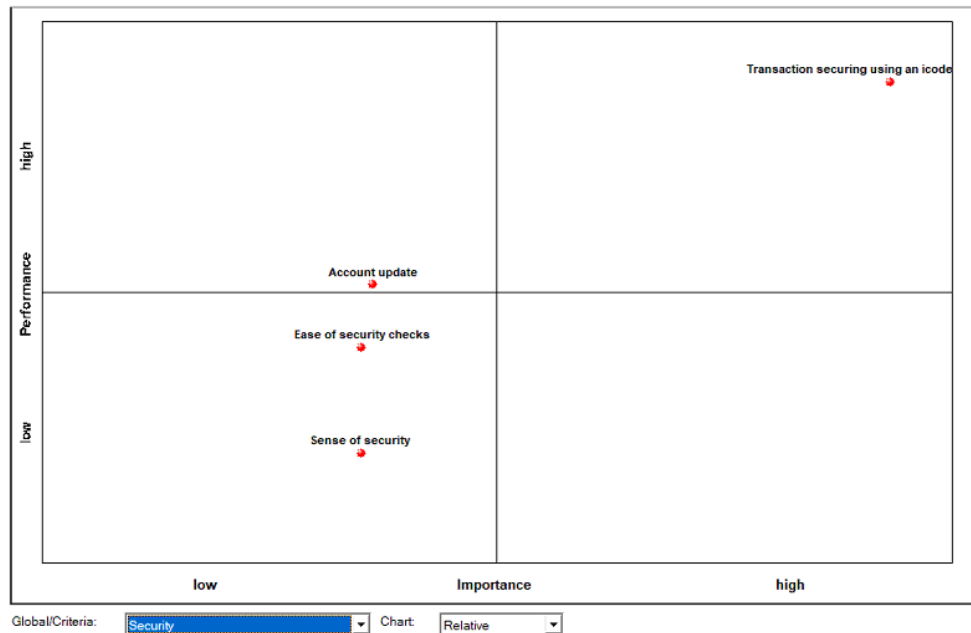


Figure 29- Security action map

Referring to the sub-criteria of the navigation criterion the one that needs no particular action since it is of,low importance for the clients. The placement of the sub-criterion ease to move is of medium importance to the clients and high importance from the service provider. This is a strength of the internet banking navigation component, but need no further development. The layout of the content and menus is the strong point of navigation, since it is of high importance and high performance being the sub-criterion that acts as the reason that navigation criterion is attractive (figure 30).

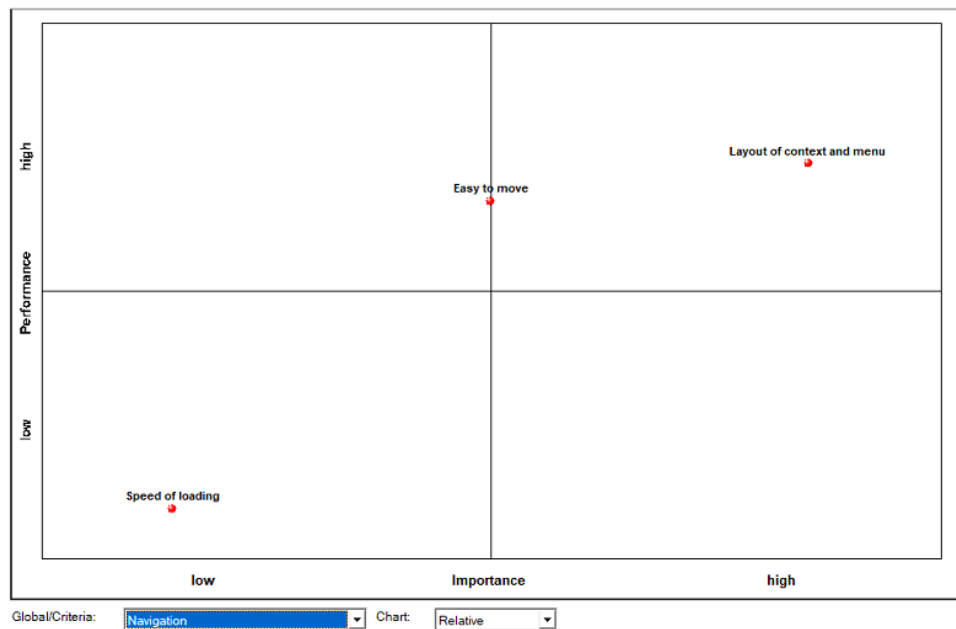


Figure 30- Navigation action map

Looking at the criterion of the site appearance and user friendliness, the site layout is the first sub-criterion found so far that needs improvement action by the internet banking providers. As it is presented in figure 31, the “site layout” sub-criterion lies in the high-importance-low-performance cell, indicating need for action and improvement by the providers. Customers find it important to be presented with a pleasant and friendly layout of the site, when they are performing their transactions, and the services seems to be poor and low performing with regard to this characteristic. On the other hand colors and designs, as well as user friendliness are performing at high levels, although rated at medium levels of importance.

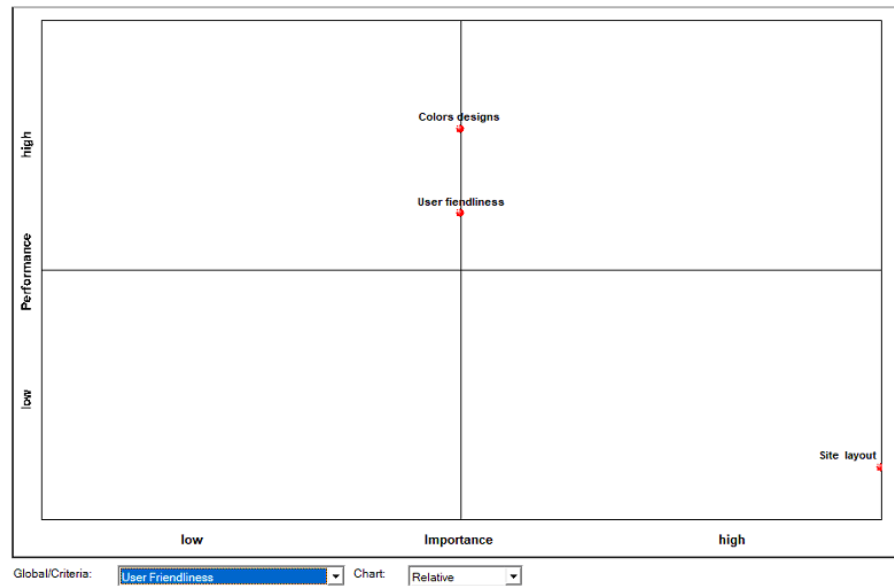


Figure 31- User friendliness action map

As far as the customer on-line service is concerned, the action map depicted in figure 32 shows that the effectiveness of advice is the strong point of the criterion and the reason why clients select the service. This sub-criterion is of high importance, as well as of high performance. The sub-criterion easy access to client service is an area that needs action, since it combines medium importance by the clients and low performance by the provider.

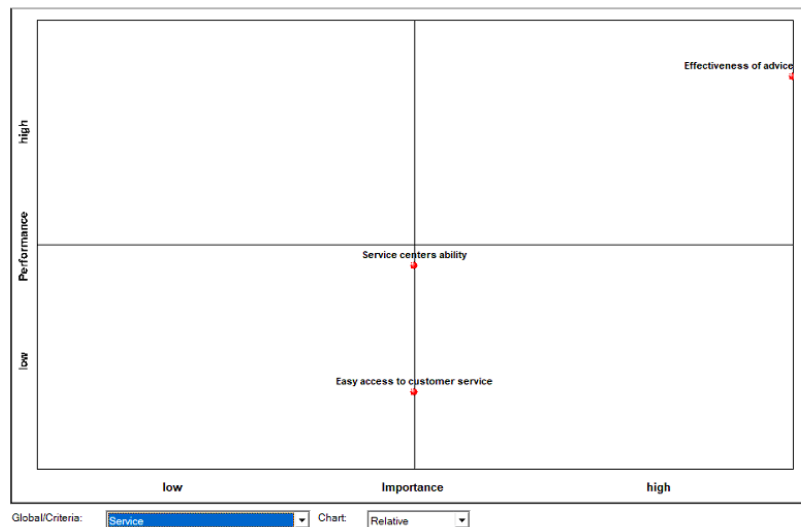


Figure 32- Customer service action map

4.7. Improvement Charts

The global improvement chart shows that the first priority for improvement are the areas of security, navigation and information provision, since they are placed in the bottom right quadrant demonstrating high impact and low client demand, which makes it rather essential and easy to implement these improvements. Second priority shown by the chart, is Customer Service and User Friendliness. Those criteria are of low impact to the client and also low demand/effort by the provider, making the improvement implementation, a medium task.

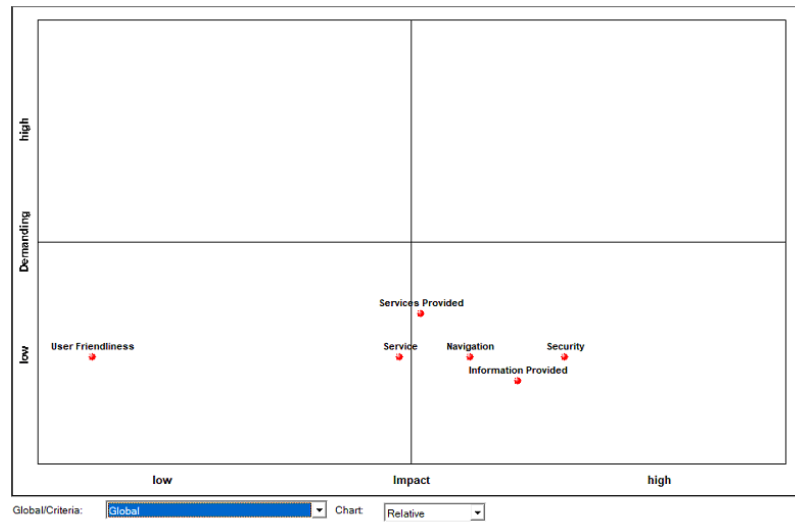


Figure 33- Global improvement chart

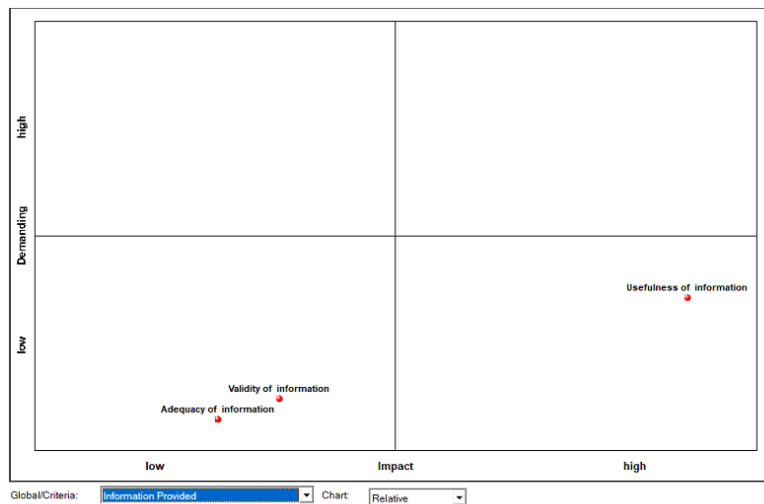


Figure 34- Information improvement chart

Information provision improvement chart demonstrates that the first priority for action is the usefulness of the provided information, since it is of high impact to the clients, and also of low demand. In a second action step, adequacy and validity of information are placed, making the improvement of those two criteria a second priority, since they are of low importance to non-demanding clients.



Figure 35- Services provided improvement chart

The two sub-criteria of services provision are placed in the bottom of the chart, since clients are not demanding. Adequacy of services is of high importance for the clients, making this area a first priority for action as far as the offered services are concerned, and the portfolio range a second priority (figure 35).

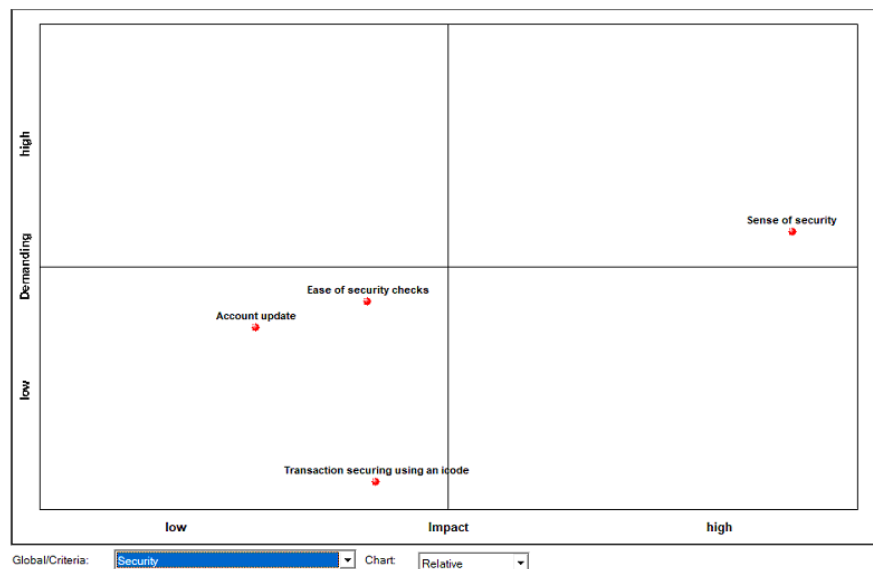


Figure 36- Security improvement chart

All sub-criteria of security (figure 36) need improvement action, with priority to the sense of the security perceived by the customers. The sense of security is the sole sub-criterion with high importance to the clients, who are also demanding in relation to this matter. These findings show that there is a great deal of effort related to the improvement of sense of security. In relation to transaction securing using an i-code, the demand of the customers is very low, placing it to second priority, while ease of security checks and account update are of low - to medium demand and impact.

Looking at the navigation improvement chart (figure 37), it can be seen that the speed of loading of the site is of high importance for non-demanding clients, making it straight forward goal for the service provider to proceed to action for the improvement for this item. The sub-criteria of ease of movement and layout are on low impact for non-demanding clients, thus placed as a second priority for improvement action.

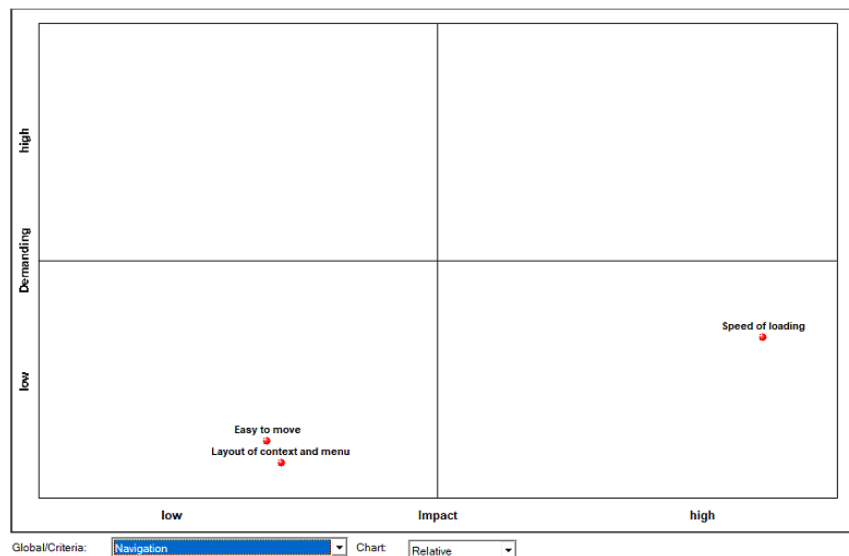


Figure 37- Navigation improvement chart

Improvement chart for the site appearance and user friendliness is presented in figure 38. For all three sub-criteria customers are presented as non-demanding, with a slight variation that places the site speed of loading higher than

the ease of moving and the site layout. This implies that little effort is needed for a high impact aspect, that places the action for layout improvement at first priority.

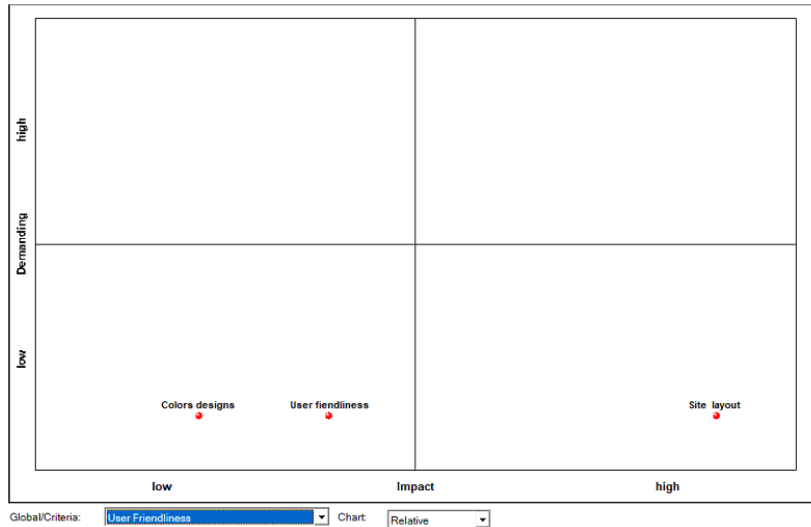


Figure 38- User Friendliness improvement chart

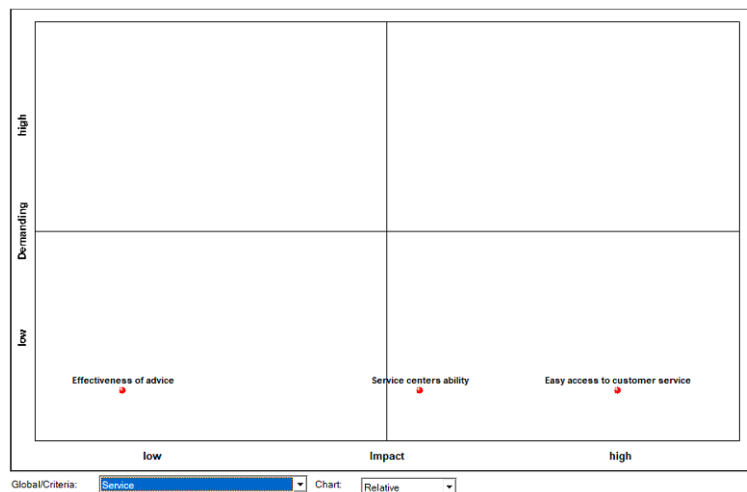


Figure 39- Customer Service improvement chart

Customer service improvement chart depicted in figure 39 shows that the ease of service access and the center's ability to serve the clients are of high

importance to the clients. These sub-criteria, are consequently, of low effort and first priority for implementation, whereas effectiveness of advices comes as a second, since it is of low priority to the clients.

4.8. Satisfaction criteria per Bank

A non-parametric test Kruskal Wallis was conducted, in order to determine if there are significant differences in satisfaction levels for the several criteria among the bank institutions (table 9).

Table 9. Kruskal Wallis test for comparison of satisfaction among banks

	Bank	N	Mean Rank	Kruskal Wallis X^2	p
Overall satisfaction from quantity of information provided	National Bank of Greece (Ethniki)	13	28,35	6,542	,088
	Piraeus bank	15	26,53		
	Alpha Bank	9	22,78		
	Eurobank	10	15,65		
Overall satisfaction from services provided	National Bank of Greece (Ethniki)	13	25,88	8,396	,038
	Piraeus bank	15	23,03		
	Alpha Bank	9	32,39		
	Eurobank	10	15,45		
Overall satisfaction from safety and reliability provided	National Bank of Greece (Ethniki)	13	28,92	6,086	,107
	Piraeus bank	15	23,40		
	Alpha Bank	9	26,83		
	Eurobank	10	15,95		
Overall satisfaction from navigation	National Bank of Greece (Ethniki)	13	25,77	2,401	,493
	Piraeus bank	15	22,43		
	Alpha Bank	9	28,39		
	Eurobank	10	20,10		
Overall satisfaction from design and user friendliness	National Bank of Greece (Ethniki)	13	24,77	10,900	,012
	Piraeus bank	15	22,40		
	Alpha Bank	9	34,78		
	Eurobank	10	15,70		
Overall satisfaction from service quality	National Bank of Greece (Ethniki)	13	21,65	7,582	,055
	Piraeus bank	15	29,40		
	Alpha Bank	9	26,72		

	Eurobank	10	16,50		
	National Bank of Greece (Ethniki)	13	24,54		
Total satisfaction from the internet banking services	Piraeus bank	15	25,10	3,205	,361
	Alpha Bank	9	27,67		
	Eurobank	10	18,35		

For the test, 3 respondents that replied “other” were not included in the analysis, since the sample of 3 was considered too small, plus the fact that there is no information for the name of the bank.

The results revealed that there are significant differences for two out of the six criteria, namely services provided and design and user friendliness. No significant differences were found for the rest four criteria (adequacy and usefulness of information, safety, navigation and client service quality), a finding that shows that all banks perform at approximately the same levels for these criteria. In addition, no significant differences were found with regard to the total satisfaction index.

The differences show that for the criterion of “Overall satisfaction from services provided ”the highest satisfaction was expressed by clients of Alphabank (mean rank 32,39) and the worst by Eurobank (mean rank 15,45) at a significant level ($X^2_{(3)}=8,396$, $p=0,038$ and partial $H^2=0,27$).For the criterion of “design and user friendliness” the same banks distinguish: the highest satisfaction was expressed by clients of Alphabank (mean rank 34,78) and the worst by Eurobank (mean rank 15,70) at a significant level ($X^2_{(3)}=10,900$, $p=0,012$ and partial $H^2=0,49$). National bank clients and Piraeus bank clients expressed similar, medium rankings.

These results are indicative that client satisfaction may vary among different criteria for different banks, but as a total, internet banking experience and satisfaction does not depend on which is the service provider.

4.8.1. Demographics

In addition, an examination on whether the demographic characteristics of the respondents make a difference on the level of their internet banking satisfaction was performed. With regard to the gender, a Mann Whitney U test was conducted, to investigate if there are significant differences in satisfaction between males and females. The results revealed that that there is no significant difference in Total Satisfaction Index between males and females (Mann-Whitney $U=294,50$ $p=0,721$).

Referring to the different ages, a Kruskal Wallis test showed that the age affects satisfaction levels ($X^2(5)= 16,989$ $p=0,005$). In particular, young clients seem to be less satisfied (26-35 years old mean rank = 8,50 and 18-25 mean rank = 15,90), than older (36-45 mean rank= 29,50 and 46-55 mean ran = 20,57), while older and elderly clients demonstrate the highest levels of satisfaction (56-65 years old mean rank=32,64 and >65 years old mean rank=33,50). These results show that people get less demanding with age (Table 10).

Table 10. Kruskal Wallis test -Total Satisfaction per age

Kruskal Wallis test		Ranks		Kruskal Wallis Chi-Square
	Age	N	Mean Rank	(p)
Total satisfaction from the internet banking services	18-25	5	15,90	16,989 ($p=0,005$)
	26-35	3	8,50	
	36-45	11	29,50	
	46-55	14	20,57	
	56-65	14	32,64	
	>65	3	33,50	
	Total	50		

4.8.2. Multivariate Analysis (MANOVA)

In order to examine the effects of independent variables (gender, age, salary, e-banking usage frequency, time spent for internet daily and duration as an internet banking user) on the satisfaction criteria scores, a multivariate analysis was conducted (Manova). The results of the analysis demonstrated that gender, time spent on internet and frequency of internet use have no impact on any of the six criteria ($p > 0,05$), whereas, the rest of the independent variables have an impact on some of the dependent sub-criteria satisfaction scores.

Specifically, age has a significant multivariate effect (Wilks' Lambda $F=2,201$, $p=0,001$). The test between-subjects-effects (table 11) revealed that the effect is significant for the satisfaction regarding services provided, ($F=4,946$, $p=0,001$), design and user friendliness ($F=3,261$, $p=0,014$), and customer service quality ($F=3,883$, $p=0,005$). The effect shows that satisfaction denotes higher scores for the older ages for all three criteria (figure 40).

Table11. MANOVA- Tests of Between-Subjects Effects for age

Tests of Between-Subjects Effects						
Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Age	Overall satisfaction from quantity of information provided	6,835	5	1,367	2,344	,057
	Overall satisfaction from services provided	17,911	5	3,582	4,946	,001
	Overall satisfaction from safety and reliability provided	10,381	5	2,076	2,282	,063
	Overall satisfaction from navigation	7,843	5	1,569	2,119	,081
	Overall satisfaction from design and user friendliness	9,739	5	1,948	3,261	,014
	Overall satisfaction from service quality	10,410	5	2,082	3,883	,005

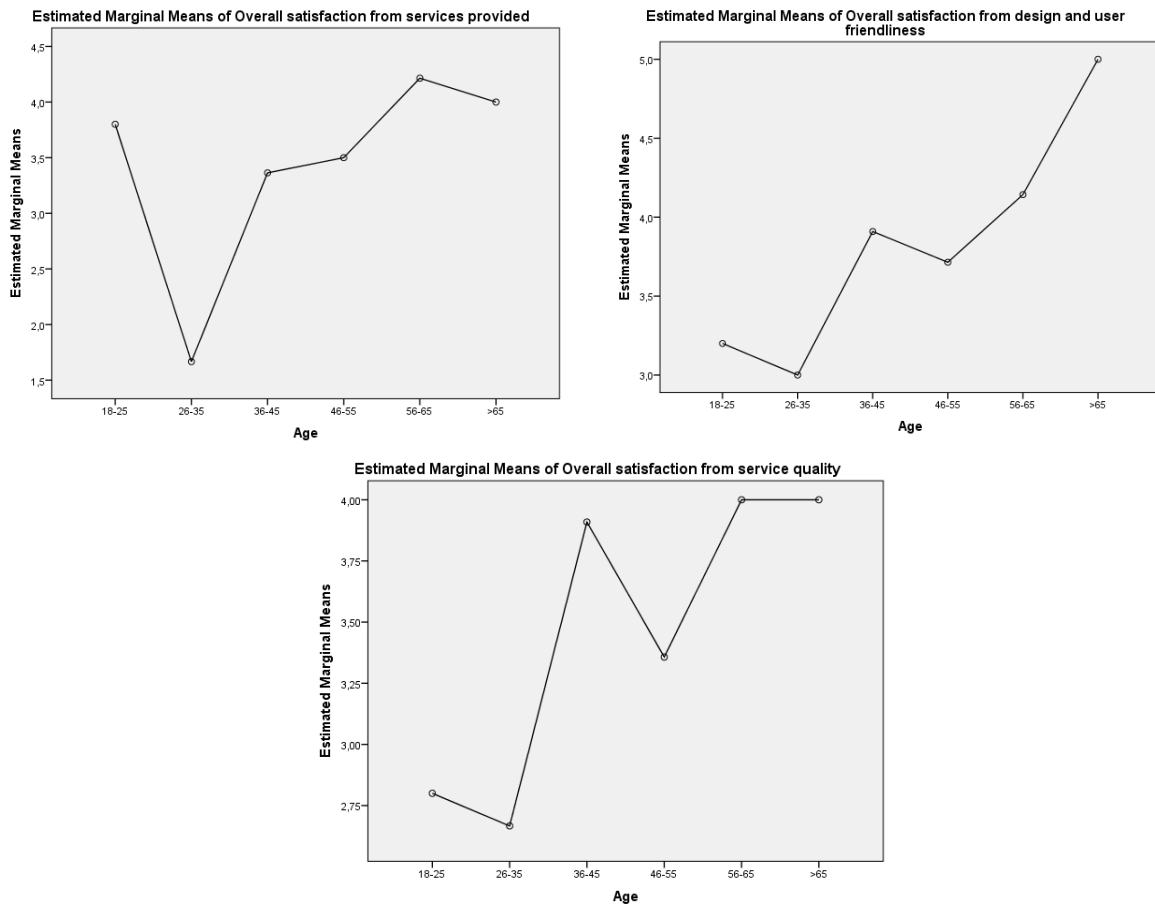


Figure 40- Satisfaction by age

Similarly, duration of e-banking usage has a significant multivariate effect (Wilks' Lambda $F=2,070$, $p=0,011$). The test between-subjects-effects (table 12) revealed that the effect is significant for the satisfaction regarding information provided, ($F=4,319$, $p=0,009$), safety ($F=6,795$, $p=0,001$), and customer service quality ($F=5,907$, $p=0,002$). The effect shows that satisfaction denotes higher scores for users with longer e-banking history, for all three criteria (figure 41).

Table12. MANOVA- Tests of Between-Subjects Effects for duration of e-banking usage

Tests of Between-Subjects Effects						
Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Duration of Internet Banking User	Overall satisfaction from quantity of information provided	7,143	3	2,381	4,319	,009
	Overall satisfaction from services provided	6,735	3	2,245	2,399	,080
	Overall satisfaction from safety and reliability provided	15,483	3	5,161	6,795	,001
	Overall satisfaction from navigation	4,491	3	1,497	1,917	,140
	Overall satisfaction from design and user friendliness	4,091	3	1,364	1,965	,132
	Overall satisfaction from service quality	9,455	3	3,152	5,907	,002

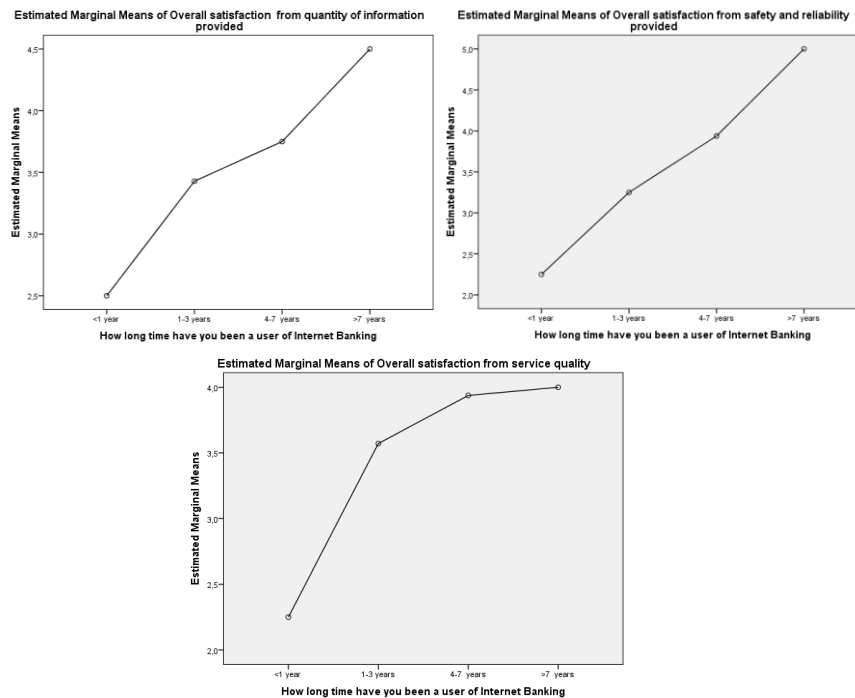


Figure 41- Satisfaction by duration of e-banking usage

Last, monthly income, also has a significant multivariate effect (Wilks' Lambda $F=1,764$, $p=0,023$). The test between-subjects-effects (table 13) revealed that the effect is significant only for the look and user friendliness of the site ($F=5,386$, $p=0,001$). Users with bigger income, are more satisfied (figure 42).

Table13. MANOVA- Tests of Between-Subjects Effects for salary

Tests of Between-Subjects Effects						
Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Salary	Overall satisfaction from quantity of information provided	3,152	4	,788	1,208	,320
	Overall satisfaction from services provided	7,562	4	1,890	2,015	,108
	Overall satisfaction from safety and reliability provided	4,269	4	1,067	1,041	,397
	Overall satisfaction from navigation	6,696	4	1,674	2,234	,080
	Overall satisfaction from design and user friendliness	11,662	4	2,915	5,386	,001
	Overall satisfaction from service quality	2,736	4	,684	,985	,426

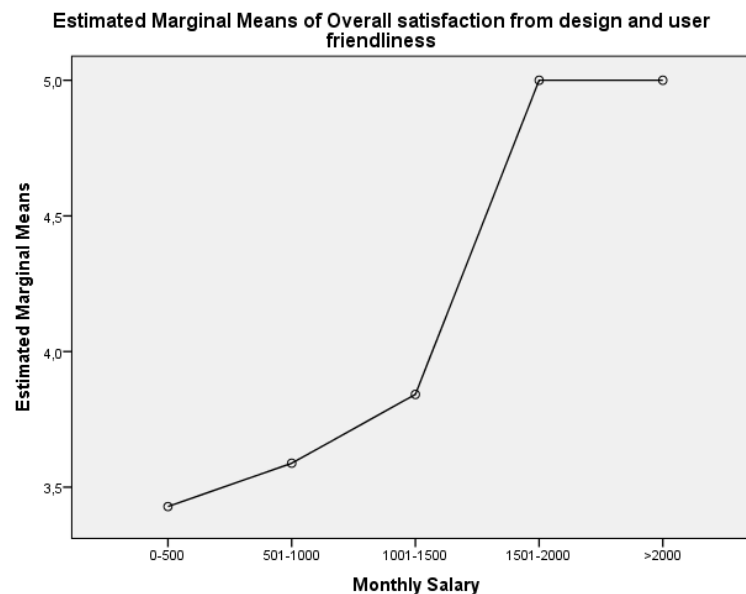


Figure 41- Satisfaction by salary

Chapter 5- Conclusions

The present research has aimed to investigate the client satisfaction for internet banking. The survey was conducted to customers of the major Greek banks, that use Internet banking services.

The analysis followed the the Multi-criteria Satisfaction Analysis Method, and came up to results showing consistency across satisfaction criteria. In this section, the results are summarized and solutions are proposed for areas where online Banking seem to be lagging behind.

In general, the experience of the Banks over the years of their activity in Greece shows that they have developed the appropriate mechanisms to identify the needs of their clients and take appropriate business decisions so as to move towards satisfying them. This would, of course, be partly expected, as the role of Banking Organizations is not only to meet customer needs but to combine them with the benefit of the entire Economic System of the Country. Even in this respect, however, their ability to respond to these two parameters is a sign of their ability to adapt to competitive environmental conditions and to ensure customer satisfaction.

The general picture revealed by the survey is that customers are satisfied with the web Banking System and the Organizations to a reasonable level that reached 86%, as expressed by the Total Satisfaction Index. Out of the six criteria, the one that demonstrated higher score was the one referring to the appearance and user interface (86,3%), and the last in order, the one referring to the provided services (76%). The rest of the criteria, namely security, navigation, customer service, and information provided range between 81,5% and 86% on the satisfaction scale.

In an attempt to achieve increased customer satisfaction, Greek banks need to make improvements to their online services. A route to increase satisfaction related to security matters would be to provide simple, clear and concise information regarding the security measures adopted by the bank, right at the entry to the system. This will give the customer a clear idea for what is being guaranteed in simple terms, free from technical terminology. Since there is no doubt that banks have secure online systems, both for their and their clients' security and due to imposed regulations, these measures need to be communicated to clients, so that their feeling of safety will increase. In addition, banks can implement sensitive alert systems that inform clients for transactions and profile changes, for areas where they have not already installed.

The second, from the end, criterion regarding client satisfaction is the quantity and usefulness of information provided. Banks can increase the satisfaction of their customers by providing the appropriate piece of information at the right place of the screens and menus of the online systems and the right quality of information for each action that is taken by the users.

Therefore, it is clear that Greek online Banking services, in order to achieve higher rates of satisfaction, should make improvements to their existing services and products. Increased client satisfaction will increase the competitive advantage of the banks compared to the competitors, which could be translated to increased market share and business growth.

References

- Chang, H. H., Wang, Y.-H., & Yang, W.-Y. (2009). The impact of e-service quality, customer satisfaction and loyalty on e-marketing: Moderating effect of perceived value. *Total Quality Management & Business Excellence*, 20(4), 423–443
- Choi, J., Seol, H., Lee, S., Cho, H., & Park, Y. (2008). Customer satisfaction factors of mobile commerce in Korea. *Internet Research*, 18(3), 313–335.
- Dutka 1994, Naumann and Giel, *Council Satisfaction Council*, 1995
- Ely D., (2000) “Internet Banking: A Customer-centric perspective”, *Hawaii International Conference on System Sciences*
- Gerson R. F., *Measuring customer satisfaction*, Crisp Publications, Inc., Menlo Park, California, 1993.
- Grigoroudis, E. and Y. Siskos (2002). Preference disaggregation for measuring and analysing customer satisfaction: The MUSA method, *European Journal of Operational Research*, 143 (1), 148-170.
- Grigoroudis, E., Litos, C., Moustakis, V. A., Politis, Y., & Tsironis, L. (2008). The assessment of user-perceived web quality: Application of a satisfaction benchmarking approach. *European Journal of Operational Research*, 187(3), 1346–1357. <https://doi.org/10.1016/j.ejor.2006.09.017>
- Hayes B. E., *Measuring customer satisfaction: Development and use of questionnaire*, ASQC Quality Press, Milwaukee, 1992.
- Herington, C., & Weaven, S. (2009). E-retailing by banks: e-service quality and its importance to customer satisfaction. *European Journal of Marketing*, 43(9/10), 1220–1231. <https://doi.org/10.1108/03090560910976456>
- James P., *Management Ολικής Ποιότητας- μια εισαγωγή*, Αθήνα 2000

- Joerg Becker, Burkhard Weissy, Axel Winkelmann, AMCIS (2009) Developing a Business Process Modeling Language for the Banking Sector - A Design Science Approach, *Proceedings*, 2009.
- Loonam M., & O'Loughlin D., (2008), "Exploring e-service quality: a study of Irish online banking", *Marketing Intelligence & Planning*, Vol. 26 Iss 7 pp. 759 - 780
- Parasuraman Zeithaml, Alternative Scale measuring Service. Quality: A Comparative Assessment Based on Psychometric & Diagnostic Criteria, *Journal of Retailing*, Berry 1994, 1ος Αρ. 70, σελ 201-230.
- Perumal V., Shanmugam B., (2004) "Internet Banking: Boon or Bane?", *Journal of Internet Banking and Commerce*
- Pulse EFT Association (2001), "Internet Payments". Sciglimpaglia D.,
- Ripert G, *Traité élémentaire de droit commercial*, 1973
- Rod, M., Ashill, N., J., Shao, J., Carruthers, J., (2009) "An examination of the relationship between service quality dimensions, overall internet banking service quality and customer satisfaction: A New Zealand study", *Marketing Intelligence & Planning*, Vol. 27 Issue: 1, pp.103-126, <https://doi.org/10.1108/02634500910928344>
- Ross, P. J., Taguchi *Techniques for Quality Engineering*, 2nd ed., McGraw-Hill 1994
- Seitz, S. (1998), "Internet Banking - An Overview," *Journal of Internet Banking and Commerce*
- Sirmakezis S., (2003) Electronic Banking: Serving the customer through multiple channels, *International Conference "The modern bank"*
- Stamoulis, D S. (2000), "How Banks Fit in an Internet Commerce Business Activities Model," *Journal of Internet Banking and Commerce*

- Siskos Y. and A. Spyridakos (1999). Intelligent multicriteria decision support: overview and perspectives, *European Journal of Operational Research*. (113), 2, 236-246
- Siskos, Y. and D. Despotis (1989). A DSS oriented method for multiobjective linear programming problems, *Decision Support Systems*, 5 (1), 47-55.
- Siskos, Y. and D. Yannacopoulos (1985). UTASTAR: An ordinal regression method for building additive value functions, *Investigação Operacional*, 5 (1), 39-53.
- Siskos, Y., A. Spyridakos, and D. Yannacopoulos (1993). MINORA: A multicriteria decision aiding system for discrete alternatives, *Journal of Information Science and Technology*, 2 (2), 136-149.
- Siskos, Y., E. Grigoroudis, C. Zopounidis and O. Saurais (1998). Measuring customer satisfaction using a collective preference disaggregation model, *Journal of Global Optimization*, 12 (2), 175-195.
- Stephen and Weimerskirch, *Total Quality Management: Strategies and Techniques Proven at Today's Most Successful Companies*. John Wiley & Sons, 1994.
- Turban E., Davin K., Dennis Viehland, Jae Lee (2006), *Electronic Commerce a Managerial Perspective*, Prentice Hall
- Turban, E., (2004). *Electronic Commerce 2004: A Managerial Perspective*. Englewood Cliff: Prentice Hal.
- Turban, E., Lee, J., King, D. & Chung, M., (2000). *Electronic Commerce: A Managerial Perspective*. Prentice: Hall.
- Wierzbicki A.P. (1992). *Multi-objective modeling and simulation for decision support*, *Working Paper of the International Institute for Applied Systems*

- Analysis*, WP92-80, International Institute for Applied Systems Analysis, Laxemburg, Austria.
- Woodruff R. B. and S. F. Gardial (1996). *Know your customer: new approaches to understanding customer value and satisfaction*, Blackwell Publishers, Oxford.
 - Yang, Z., & Fang, X. (2004). Online service quality dimensions and their relationships with satisfaction. *International Journal of Service Industry Management*, 15(3), 302–326. <https://doi.org/10.1108/09564230410540953>
 - Zeleny, M. (1982). *Multiple criteria decision making*, McGraw-Hill, New York.
 - Αγγελής Β. (2005), «*Η ΒΙΒΛΟΣ ΤΟΥ E- BANKING*», Εκδόσεις Νέων Τεχνολογιών

APPENDIX A- QUESTIONNAIRE

Questionnaire

ELECTRONIC BANKING SERVICES AND CUSTOMER SATISFACTION

This Questionnaire can be answered only by Internet Banking users.

This research is carried out in the framework of my postgraduate work, in the postgraduate study program "Master in Technology and Innovation Management" offered by the Technical University of Crete, coordinated by the School of Production Engineering and Management with the collaboration of the School of Electrical and Computer Engineering. Your answers are anonymous and confidential and will only be used for the purpose of this research. Thank you very much for your time.

Demographics

1. Gender

Man Woman
☐ ☐

2. Age

18-25 26-35 36-45 46-55 56-65 > 65
☐ ☐ ☐ ☐ ☐ ☐

3. Month Salary

0-500 501- 1000 1001- 1500 1501- 2000 > 2000
☐ ☐ ☐ ☐ ☐

4. How often do you use internet banking?

Every day ☐

2-3 times a week ☐

1 time a week ☐

1-2 times in a month ☐

Less than once a month ☐

5. What kind of transactions do you make using Internet Banking? (Give one or more answers)

Audit of Account Balances and / or Print of statements ☐

Transfers from an Account to another Account and / or Sending Internal / External Payments ☐

Payments of Public Benefit Accounts etc. ☐

Purchase of Shares ☐

Card Management / Redevelopment of PIN etc. ☐

6. How much time do you spend in daily basis, using Internet for business, entertainment, or for informational purposes?

Up to 1 hour ☐

2-3 hours per day ☐

4-8 hours per day ☐

More than 8 hours per day ☐

7. How long time have you been a user of Internet Banking?

<1 ☐ year

1-3 ☐ years

4-7 ☐ years

> 7 ☐ years

8. Which bank internet services you use at the most?

National Bank of Greece (Ethniki) i-bank ☐

Piraeus bank winbank ☐

Alpha Bank Web Banking ☐

Eurobank e-banking ☐

Other ☐

<p>How much satisfied are with the use of INTERNET BANKING in relation to:</p>	<div style="text-align: center;">  </div> <div style="display: flex; justify-content: space-around; margin-top: 5px;"> Very Dissatisfied Satisfied Satisfied a Little Satisfied Dissatisfied Very </div>				
<p><u>QUANTITY OF INFORMATION & USEFULNESS</u></p>					
<p>The adequacy of the information provided?</p>					
<p>The validity of the information provided?</p>					

The usefulness of the information provided?					
Overall, from quantity of information provided?					
<u>SERVICES PROVIDED</u>					
The available range of transactions?					
The adequacy of the services provided?					
Overall, from services provided?					
<u>SECURITY</u>					
The feeling of security provided to you?					
The ease of security checks for your previous completed transactions? (ease of access to a user transaction log).					
The update of your account in case of transactions or changes to your profile? (e.g.sms-alert sending a message on the mobile at the same time)					
Securing your transaction using an i-					

code?					
Overall, from safety and reliability provided?					
<u>NAVIGATION</u>					
Layout of context and menu (same categories of products arranged together, etc.)?					
Easy to move from one menu point to another desired point in the menu (back / forward, return to the starting point or any other desired).		22. User-friendliness (pop-up messages with instructions, print icons, storage options, etc.)?			
The speed of loading the site and completing your transactions?					
Overall, from navigation totally?					
<u>APPEAREANCE, USER INTERFACE</u>					
User friendliness (pop-up messages, guidelines etc)					
The colors, designs of the site?					
The layout of the site?					

(menu, icons, text)					
Overall, from SITE APPEARANCE AND layout?					
<u>ONLINE CUSTOMER SERVICE</u>					
Easy access to customer service when is necessary?					
Service center's ability to solve any problem occurred?					
Effectiveness of advice / instructions in case of need?					
The bank's total opportunity to comply with any request or on another problem occurring?					
Overall, from customer service					
Overall, how satisfied are you from internet banking					