

# ΠΑΝΕΠΙΣΤΗΜΙΟ ΜΑΚΕΔΟΝΙΑΣ



## ΔΙΑΤΜΗΜΑΤΙΚΟ ΠΡΟΓΡΑΜΜΑ ΜΕΤΑΠΤΥΧΙΑΚΩΝ ΣΠΟΥΔΩΝ

### ΣΤΗ ΔΙΟΙΚΗΣΗ ΕΠΙΧΕΙΡΗΣΕΩΝ

Διπλωματική Εργασία

#### **A WEBSITE QUALITY ASSESSMENT FRAMEWORK FOR EDUCATIONAL WEBSITES: PRIORITIZING THE CRITERIA**

του

**ΜΑΤΑ ΑΘΑΝΑΣΙΟΥ**

Υποβλήθηκε ως απαιτούμενο για την απόκτηση του μεταπτυχιακού  
διπλώματος ειδίκευσης στη Διοίκηση Επιχειρήσεων  
(με εξειδίκευση στη κατεύθυνση Marketing)

*(Σεπτέμβριος 2014)*

## **ACKNOWLEDGMENTS**

I would like to extend my gratitude to the MBA faculty of University of Macedonia for offering me an opportunity to study at the faculty. Completing my Master had been a very demanding process of which I am very proud. Of course, I would not have reached to this point, had it not been for all the encouragement and help from my professors, friends and family.

First of all, I would like to thank Prof. A. Andronikidis for supervising this Master thesis. His help, expertise, valuable advice and critics motivated me to bring my best work on this Master thesis.

I thank Prof. K. Gotzamani for her time and expertise from the point of defining the Master thesis project topic till the very end of it. Her helpful comments and guidance as far as the creation of my model is concerned, made this thesis a possibility.

I would also like to thank Prof. L. Tsironis for helping me define the Master thesis topic and providing me with his previous work on which I could rely on and N. Kamvisi for her guidance and advice as far as the process of my data is concerned. Her time and support motivated me.

In addition, my sincerest thanks to all of my friends who were willing to participate to fill in the questionnaire.

Finally, I owe my deepest gratitude to my family for all the encouragement and support they have provided me during the two years of this Master.

## ABSTRACT

Educational websites are of strategic importance not only to the educational organization but also to the students. The quality of services provided in these organizations relies heavily on the success of their websites which support the interaction and communication with students.

The main goal of this Master thesis project was to filter the existing literature and design an improved, updated website quality evaluation framework for educational websites. AHP was utilized for the prioritization of the model's criteria and sub-criteria. For this purpose, an extensive study of the literature on existing quality evaluation models was made to recognize previously identified dimensions and their sub-criteria. A new quality assessment framework was developed consisting of criteria grouped in five dimensions, namely Content-Navigability - Structure/Design- Appearance/Multimedia-Personalization).

A questionnaire based research was undertaken and the participants were asked to prioritize all criteria and sub-criteria of the proposed framework. The results show that Content credibility tops the list with a relative weight of 0.186817, almost twice the weight of the second in the list sub-criterion, Personalization of information (0.091826). Users rank Interactive features as the third most important sub-criterion in order for an educational website to be considered of high quality while the next two sub-criteria are part of the front-runner main criterion, which is content, and account for about 0.129 of the total weight. Sub-criteria regarding website's interface such as Other Multimedia, Graphics and Personalization of Interface scored particularly small weights (<0.02).

Further research should be conducted on other types of websites (banking, e-commerce) in order to examine if the prioritization remains the same for different types of websites.

**Keywords:** Website quality assessment, types of websites, educational website quality framework, prioritization of quality criteria, AHP.

## TABLE OF CONTENTS

❖ <a href="#">Acknowledgements.....</a>	<a href="#">2</a>
❖ <a href="#">Abstract.....</a>	<a href="#">4</a>
❖ <a href="#">Table of Contents.....</a>	<a href="#">6</a>
❖ <a href="#">Introduction.....</a>	<a href="#">8</a>
❖ <a href="#">Literature Review.....</a>	<a href="#">10</a>
1. <a href="#">Types of Websites.....</a>	<a href="#">10</a>
2. <a href="#">The Importance of Website Quality Assessment.....</a>	<a href="#">15</a>
3. <a href="#">Criteria/Models of Website Quality Assessment.....</a>	<a href="#">17</a>
4. <a href="#">Techniques Used for Website Quality Assessment.....</a>	<a href="#">33</a>
❖ <a href="#">Methodology.....</a>	<a href="#">38</a>
1. <a href="#">Undertaking the Literature Review.....</a>	<a href="#">38</a>
2. <a href="#">Questionnaire Study: Methodology.....</a>	<a href="#">39</a>
3. <a href="#">Creating The Model .....</a>	<a href="#">40</a>
4. <a href="#">Proposed Research Framework .....</a>	<a href="#">45</a>
5. <a href="#">Contribution of Superdecisions Software: Model         Development And Analysis .....</a>	<a href="#">47</a>
❖ <a href="#">Results and Discussion.....</a>	<a href="#">49</a>

1. <a href="#">Presenting the Results.....</a>	<a href="#">49</a>
❖ <a href="#">Conclusions.....</a>	<a href="#">55</a>
1. <a href="#">Theoretical Implications.....</a>	<a href="#">57</a>
2. <a href="#">Practical Implications .....</a>	<a href="#">58</a>
3. <a href="#">Limitations .....</a>	<a href="#">59</a>
4. <a href="#">Further Research .....</a>	<a href="#">59</a>
❖ <a href="#">References .....</a>	<a href="#">60</a>
1. <a href="#">Foreign Literature.....</a>	<a href="#">60</a>
2. <a href="#">Links.....</a>	<a href="#">75</a>

## INTRODUCTION

Over the past few years more and more organizations have become aware of the strategic importance of websites. They rely on them in order to interact and communicate with their customers. As a result, the trend to use websites has become a priority in many different domains. One of the most website-dependent domains is the educational section. Educational organizations invest massive amounts of time and money in order to develop and maintain quality websites. These websites are the main channel of communication between faculties and their student. In fact, in some cases, they are part of the total product offered (Grigoroudis et al., 2008) providing guidance and other kind of services to the students. The significance of a website for the educational institutions forced them to show some interest for their quality assessment. First of all, quality evaluation is crucial for the further development of a webpage. The developer can identify the main goal of the website, compare it with the original purpose it was designed for and undertake the necessary improvements in order the page to meet the initial specifications (Mountzios, 2010). Moreover, the developer can identify any structural or technical flaws and proceed in their extinguishment. In addition, evaluation is very important as far as the profitability analysis of a webpage is concerned. Through a reliable website quality evaluation tool, a manager can conclude if a website's costs are justified by its contribution in the business profitability and customer service or if its existence is considered an unbearable cost with no added value (Mountzios, 2010). From the user-orientated perspective, website quality assessment is crucial because it reveals all the necessary improvements to be undertaken in order the website to tone with the user requirements (Grigoroudis et al., 2006; Hasan and Abuelrub, 2008). Finally, the evaluation of a website constitutes a way of competition analysis. By evaluating their business's and then their competitors' website, managers can

pinpoint their status, analyze advantages and disadvantages and decide whether they need to act and improve their webpage. After all, for a business nowadays to remain successful and profitable, it must use the art of information more effectively than their competitors (Oikonomou and Georgopoulos, 1995; Davidavičienė and Tolvaišas, 2011).

The main aim of this master thesis is to provide a prioritization for all the criteria/sub-criteria of a new quality evaluation model designed exclusively for educational websites. The author of this thesis, in order to provide a robust research, decided to further analyze the main aim into three main objectives. The first one is to identify the existing quality assessment frameworks through an extensive literature review. An effort has been made in chapter 1- LITERATURE REVIEW to locate as many previous researches regarding website quality assessment as possible and pinpoint models, techniques, quality factors, sub factors, dimensions and criteria. Secondly, this project aims to develop a new quality evaluation model designed exclusively for educational websites. Using the Delphi method and analyzing the previous developed models we filtered all the criteria and sub-criteria available and finalized our framework. The procedure takes place in chapter 2.3 –CREATING THE MODEL and the results are presented in Figure 1 and Figure 2. Last but not least, a questionnaire study and the Analytic Hierarchy Process were mobilized for the finalization of the prioritization list. We hope that this way we will be able to highlight the importance of each of our models's criteria and sub-criteria from the users-students point of view. Chapter 2.4 – PROPOSED RESEARCH FRAMEWORK presents every detail of the questionnaire study while chapter 2.5 –CONTRIBUTION OF SUPERDECISIONS SOFTWARE: MODEL DEVELOPMENT AND ANALYSIS contains the implementation of AHP through the Superdecisions software.

Chapter 3 –RESULTS AND DISCUSSION contains the main goal of this thesis. It presents our results in tables and explains their meaning thoroughly. More specific, in line with the AHP theory, every table indicates an order of importance of criteria/sub-criteria in respect to

their parent attribute. Then, every table is analyzed in detail, the top-ranked criterion/sub-criterion of the list is highlighted and the validity of the list is checked. The chapter concludes with the prioritization list of all the criteria/sub-criteria of a new quality evaluation model designed exclusively for educational websites.

This Master thesis concludes with chapter 4 – Conclusions which consists of four subsections. The first subsection refers to the theoretical implications of our study and the conclusions drawn from our results in a theoretical level. Yet, our results bear not only theoretical but also practical implications. In the second subsection of our thesis conclusion we try to display their usefulness and significance from a practical point of view. Naturally, our study cannot be flawless. In addition to implications, we owe to mention each and every limitation we encountered. In the last subsection of the chapter, we try to propose ideas for further research.

## **1. LITERATURE REVIEW.**

### **1.1 TYPES OF WEBSITES**

Nowadays, the competition between companies regards their ability to create, broadcast and process information, significant for their viability, on the Internet in order for businesses to enter this era of “Digital Economy” , they had to adopt new technologies which later would provoke huge changes in business, finance and economics generally (Sui and Rejeski, 2002). The most important of those technologies is the Internet, whose development characterized the last decade of the century (Tapscott, 1996). More specifically, the feature

that created infinite possibilities and made a blast, as far as popularity is concerned, is the World Wide Web (www). Through World Wide Web feature, information can be presented to all users all over the world using text boxes, images or sound as support tools. World Wide Web and websites generally offer a wide variety of services. According to statistics, the adoption of these services was so fast that the number of websites worldwide rose by nearly fifty million from 2000 to 2005 (Pew Internet and American Life Project, 2006).

Some of the previous researches in literature group websites into five categories. Advocacy websites are usually funded by organizations that use them as an opportunity to influence public opinion (libguides.library.upike.edu). The second category includes the business and marketing websites (Liu and Arnett, 2000; Hasan and Abuelrub, 2011). These web pages are either the “web-home” or the e-shop of a commercial enterprise. It is widely known that a well-designed and updated web page contributes positively to the business-image of an enterprise (Barnes and Vidgen, 2002). This is why every corporation nowadays tends to create a website before even its establishment. As another category we may consider news-websites (Thurman, 2007; Thurman and Lupton, 2008; Zamith, 2008 Thurman and Schifferes, 2012) which purpose is to provide up-to-date information and last but not least, personal websites (Vazire and Gosling, 2004; Mas-Bleda et al. , 2013; Papacharissi, 2002) represent a large proportion of the World Wide Web. This type of web-page is usually managed by an individual who may or may not be a representative of a bigger group or a company.

A more extent classification (Shelly and Vermaat, 2008) reveals twelve types of websites. A portal is a website that offers services such as search engine, news, sports, weather or reference tools. A news web site contains new stories and are most of the times maintained by a newspaper or a magazine. Informational *websites* aim to simply inform visitors, business/marketing websites are ideal for promotion or sale of specific products/services

while educational websites offer “educational experiences”. An entertainment page means to amuse the visitor through music or videos. Advocacy websites are another category and usually present a group’s or organization’s point of view whereas a weblog presents an individual’s ideas or opinions. A wiki site offers visitors the ability to create and post content, online social network websites allow users to communicate and connect, a content aggregator is a page that aggregates a specific type of information from multiple online sources and lastly, a personal site which basically reflects an individual’s profile on the internet

Another categorization of websites (Hasan and Abuelrub, 2008) is based on the type of service each web-page offers and presents: business and commercial websites, banking websites, governmental and finally educational. A previous research (Zviran et al., 2006) in the literature also provides us with four types of commercial websites; On-line shopping, Customer self-service, trading and publish/subscribe web-pages. IBM’s classification of websites is similar and based on statistics about the volume of traffic (number of transactions, number of searches etc.) presents five categories: publish/subscribe, online shopping, customer self-service, trading, and B2B. Another grouping of commercial web pages (Hoffman et al. 1995) reveals six functional categories: online storefront, internet presence (flat ad, image and information), content (fee-based, sponsored, searchable database), mall, incentive site and search agent. An online storefront offers a direct channel for sales. A “mall” consists of many online storefronts. An internet presence page reveals the brand name of a firm and its offerings. Content sites offer access in useful information for a fee whereas an incentive site typically is a luring advertising page. Lastly, search agents are the popular search engines. Spiller and Lohse (1998) defined commercial websites as super stores, promotional stores, plain sales stores, one page stores and product listings. A further classification is reached in McMahon et al. (2011) work in which the four categories of websites are: dynamic, static, content managed and portal websites. A much more

general clustering based on content (Davidavičienė and Tolvaišas, 2011) recognizes four types of websites: informative, commercial, educational, entertainment.

In addition to the previous classifications, Parker (2000) focuses on other criteria and distinguishes inner-directed, information-oriented, transaction-oriented, and relationship-oriented sites (Parker, 2000). Inner-directed web-pages' purpose is to promote the image of a corporation via photographs, lists of accomplishments of the corporation or examples from satisfied customers. Information-orientated websites focus more on the products and try to make a presentation of the product portfolio that a company may offer. The main problem of these sites is the lack of two-way communication. On the opposite, two-way communication is the main advantage of transaction-oriented web-pages. Visitors have access in a "price-orientated" website which allows them to easily purchase a product. Relationship-oriented sites are the last category which focuses on the establishment of long-term relationships with the visitors-customers. A rather pioneering approach in this field (Hong and Kim, 2004) relates website classification with building classification and categorizes websites into utilitarian sites which satisfy instrumental needs and hedonic sites which focus on experiential needs. In addition, the same research uses another dimension and classifies websites into active or passive sites, according to how actively visitors participate in website activities. A different grouping (Hoger et al., 1998) reveals five specific types: pages promoting greater awareness of themselves and their products, providing customer support, selling products or services, selling advertising space on websites to other companies and sites that offer electronic information services.

In 1998, Watson used the concept of the "attractor-website" to group web-pages into eight potential categories (Watson et al., 1998). An "attractor" is a website designed to gain a large number of visits from a particular target group of people. In this paper, the authors presented their findings after visiting many websites which tried to categorize using

metaphors. The eight metaphor-groups that emerged are: the entertainment park, the archive, the exclusive sponsorship, the town hall, the club, the gift shop, the freeway intersection and the customer service center.

<b>Researcher</b>	<b>Website classification</b>
<b>List of previous researches</b>	Advocacy websites, Business/marketing websites, News websites, Information web-pages, Personal websites
<b>Shelly and Vermaat, 2008</b>	Portals, News websites, Informational websites, Business/marketing websites, Educational websites, Entertainment pages, Advocacy websites, Weblogs, Wiki sites, Online social network websites, Content aggregators, Personal sites
<b>Hasan and Abuelrub, 2008</b>	Business/commercial websites, Banking websites, Governmental websites, Educational websites
<b>Zviran et al. 2006</b>	Online shopping websites, Customer self-service websites, Trading websites, Publish/subscribe websites
<b>IBM</b>	Publish/subscribe websites, Online shopping websites, Customer self-service websites, Trading websites, B2B websites
<b>Hoffman et al. 1995</b>	Online storefront, Internet presence, Content website, Mall, Incentive website, Search agent
<b>Spiller and Lohse, 1998</b>	Superstores, Promotional stores, Plain sales stores, One page stores, Product listings
<b>McMahon et al. 2011</b>	Dynamic website, Static website, Content managed, Portal websites
<b>Davidavičienė and Tolvaišas, 2011</b>	Informative websites, Commercial websites, Educational websites, Entertainment websites
<b>Parker, 2000</b>	Inner-directed websites, Information-orientated websites, Transaction-oriented websites, Relationship-oriented websites
<b>Hong and Kim, 2004</b>	Utilitarian websites, Hedonic websites
<b>Hong and Kim, 2004</b>	Active websites, Passive websites
<b>Hoger et al. 1998</b>	Pages promoting greater awareness of themselves and their products, Pages providing customer support, Pages selling products or services, Pages selling advertising space, Pages offering electronic information services

**Watson et al. 1998**

The entertainment park, The archive, The exclusive sponsorship, The town hall, The club, the gift shop, The freeway, The intersection, The customer service center

## **1.2 THE IMPORTANCE OF WEBSITE QUALITY ASSESSMENT**

World Wide Web, as known, contains a nearly unlimited amount of information. If a person decides to search in the internet even for the slightest detail he will be facing a tremendous number of websites containing information. Occasionally, the results of his research may be invalid, not up-to-date, false, irrelevant, misleading even manipulative. That is why website quality assessment is of great importance (EETAP, 1999).

Until now, there is not any definition about website quality that is accepted universally even though some attempts have been made (Burris 2007; Garvin 1984; Kitchnham and Lawrence, 1996). Other previous researches try to give a descriptive definition of website quality without pointing its key factors (Aladwani and Palvia, 2001). US Department of Health and Human Services (2006) defined website evaluation as the act of determining a correct and comprehensive set of user requirements, ensuring that a website provides useful content that meets user expectations and setting usability goals.

During the past decade, website quality assessment has become an attractive topic for the scientific community but still remains quite a challenge (Kritzenberger and Herczeg, 2001). Researchers have realized the importance of information in our society. Everyday life depends on accessibility and process-speed of information. Even success in the business sector depends on the above. The elite and most successful businesses nowadays are those that use the art of information more effectively than their competitors (Oikonomou and Georgopoulos, 1995; Davidavičienė and Tolvaišas, 2011). Business enterprises all over the

world spend tremendous amount of money to create and maintain quality web-pages (Grigoroudis et al., 2006) and to offer user-perceived quality interfaces to their potential customers (Dale 1999; Grigoroudis et al., 2006). Every company, which maintains a website or an e-shop on the internet, tries to find a way to minimize costs and at the same time maximize its profit (Brand, 2000). However, the absence of working personnel can not only be seen as a way of cost minimization but also as a huge disadvantage regarding the quality level of the service offered. Important characteristics such as friendliness, helpfulness, commitment, and flexibility cannot be emulated with technology (Cox and Dale, 1999) but their absence can be smoothed by high performance levels on specific web factors (Zeithaml 2002; Palmer 2002; Iwaarden et al., 2004). In order for this excellence to be achieved, modern interfaces are designed to offer a large variety of complex and innovative features and services (Grigoroudis et al., 2006). More specific, the increasing rate of turnovers in e-commerce websites creates the need for further research of quality evaluation and assurance (Davidavičienė and Tolvaišas, 2011).

Other reasons that indicate the significance of website quality assessment are: assure that the web page fulfills the purpose it was designed for, analyze its profitability, determine if it contributes to better customer services, identify its main use, justify a website's costs and if possible, obtain further funding (Mountzios, 2010). A website quality assessment is a form of SWOT analysis of a particular website. It is a tool which can pinpoint a webpage's strengths (page fulfills the purpose it was designed, well-orientated, robust), weaknesses (maybe unbearable costs), opportunities (can strengthen customer service or obtain further funding) and threats (assessment of competitors' websites). In addition, website quality evaluation can direct their development as it indicates the necessary improvements to be undertaken in order the page to meet the user expectations (Grigoroudis et al., 2006; Hasan and Abuelrub, 2008). In conclusion, according to Adelman (1991), evaluation plays a crucial role

in the development and operation of a website as it maximizes the exploitation of invested resources for these extra features.

### **1.3 CRITERIA/MODELS OF WEBSITE QUALITY ASSESSMENT**

As Internet becomes more dominant and popular, the need for criteria and models of website quality evaluation increases. Many research efforts in the past (Grose et al., 1998; Vora, 1998; Ivory et al., 2001; Ranganathan and Ganapathy, 2002; Moustakis et al., 2006) analyze the dimensions of the problem which try to correlate with user expectations in order high quality to be achieved (Zhang and von Dran, 2001). Other papers (Parasuraman et al., 1985; Gattorna and Walters, 1996) try to present the connection between website quality and user expectations fulfillment. Two international standards, 14598-3 (ISO, 1998a) and 9126-1 (ISO, 1998b) are also used but their main disadvantage is that they are software orientated.

The first ever attempt was made by Ho (1997). Unfortunately, his model was poor since it captured only three dimensions of quality; promotion, provision, processing. Ho's work formed the basis for the Model of Internet Commerce Adoption (MICA), two years later (Burgess and Cooper, 2000). The researchers tried to further analyze Ho's three dimensions into more specific sub-criteria. Promotion "remained" solid but provision was decomposed into value-add information, technical information, value-add links, online enquiry, e-mail and faq while processing revealed order status, online payments, online order, links warehouses, online sales, enquiry as well as links to distributors.

Most of previous researches (Athanasou, 1999; Bramley, 1999; Hall and Hickman, 1999; Korpelaand and Lehmusvaara, 1999; Nielsen, 2002; Ratner et al., 1996) base the concept of website quality on five specific axes. Firstly, content indicates the trustfulness of information

offered (Beck, 2005; Gauch and Xand, 2000), the utility of content (Grose et al., 1998; Warner, 1999), content integration (Winkler, 2001), completeness of information, subject specialization (Nielsen, 2002) and content credibility (Grigoroudis et al., 2006). The second dimension, personalization or in some researches uniqueness, categorizes into personalisation of information (Blankenship, 2001), personalisation of interface (Brusilovsky, 2001), and personalization of layout (Winkler, 2001). Navigation concerns the ease of use of the web-page's interface, convenience of navigation tools (Vora, 1998), the existence of directions (Kanerva et al., 1997) and links to other sites while structure and design focuses on technical characteristics such as loading speed (Virpi and Kaikkonen, 2003), data display standards (Grose et al., 1998), technical integrity (Shedro, 2001), real time information, software requirements, and browser compatibility (Vora, 1998). Last but not least, appearance and multimedia refers to the association of graphics with the user's needs (Mitrovic and Mena, 2003) and other multimedia features (Grigoroudis et al., 2006).

Perhaps the most popular evaluation model, SERVQUAL (Parasuraman et al., 1985, 1988, 1991) is also used for website quality assessment although several doubts were expressed about its application on the web (Lam and Woo, 1997). It consists of five dimensions: tangibles/tangibility, reliability, responsiveness, assurance and empathy (Parasuraman et al., 1988; Grigoroudis et al., 2006; Trocchia and Janda, 2003). SERVQUAL has been the original source of many other approaches. For example, EWAM (Schubert, 2003; Li and Holeckova, 2005), is based on Parasuraman's model, TAM (Davis, 1985) as well as Web Assessment method (WA) (Selz and Schubert, 1998) and introduces search, website characteristics, quality of accessibility, price and purchase as key quality factors. Similarly, (Cao et al., 2003) combined features from SERVQUAL (Parasuraman et al., 1985, 1988, 1991) and TAM (Davis, 1985) and created a framework with four groups of criteria; information quality, system quality, service quality and appearance.

A first effort for a framework that will apply in every type of site (Hasan and Abuelrub, 2008) suggests a four dimensional model which consists of content quality, design quality, organization quality, and user-friendly quality. Hasan and Abuelrub tried to gather every quality dimension mentioned in the previous literature regarding e-commerce, educational, banking, governmental and e-shopping sites and tried to integrate them into the aforementioned four groups. Afterwards, they named indicators for every group. More specific, they attach indicators such as Timely, Relevant, Multilanguage/Culture, Variety of Presentation, Accuracy, Objective, Authority with content quality, Attractive, Appropriateness, Color, Image/Sound/Video, Text with design quality, Index, Mapping, Consistency, Links, Logo and Domain with organization quality and finally Usability, Reliability, Interactive features, Security /Privacy, Customization with user-friendly quality.

A revolutionary model (Dutta et al., 1998) tends to assess web pages using six general criteria: product, price, promotion, place, customer relations, and technical aspects. Another model ideal for website quality evaluation is Web- QEM (Web Quality Evaluation Model) (Mebrate, 2010; Olsina and Rossi, 2001). It is a step-by-step approach which recognizes as main criteria usability, reliability, efficiency and functionality (Olsina and Rossi, 2001). Likewise, 2QCV3Q-model (7 Loci) (Mich et al., 2003) introduces seven attributes; identity, content, services, maintenance, usability, location and feasibility each of which can be further disembroiled. Further in the list, we encountered the MiLE (Milan-Lugano) model (Mebrate, 2010). Its basic criteria are content, services, navigation, cognitive features of the interface, aesthetic/graphic level and technology level (Triacca, 2005). Analytically, content represents the quality of website's information. Services refers to the set of features provided, navigation concerns the "paths" to the desired destination, cognitive features and aesthetic/graphic level assess the interface and layout respectively while technology level reveals the compatibility and security level of the page.

Perhaps the most widely accepted model of website quality assessment, WebQual, was developed by Loiacono et al. (2002) and has already been recruited in many previous researches although not every time with the same form and criteria (Kim and Stoel, 2004; Shchiglik et al., 2003; Kim and Lee, 2006). The original approach makes use of twelve quality principles: informational fit-to-task, tailored communications, trust, response time, ease of understanding, intuitive operations, visual appeal, innovativeness, emotional appeal, consistent image, on-line completeness and also relative advantage (Loiacono et al., 2002). A completely different scale also known as WebQual (Barnes and Vidgen, 2000, 2001a, 2001c, 2002) identified, in its latest form, five key-factors as far as quality assessment is concerned: usability, design, information, trust, and empathy.

A framework based on the Balanced ScoreCard method (BSC) (Kline et al., 2004) examined four assessment principles: user friendliness, site attractiveness, marketing effectiveness and technical aspects. In the literature, we can find several other researches which based their aspect of evaluation in the Balanced ScoreCard technique (Feng et al., 2003; Choi and Morrison, 2005; So and Morrison, 2004).

A more general method (Bekker and Merwe, 2003) consists of three levels of criteria. The first level proposes the dimensions of interface, navigation, content, reliability and technical while the next two levels further subcategorizes these five groups. Hung and McQueen (2003) tried to create a user-orientated modular approach with only four general dimensions. Their concept requested from users to rate (scale 0-10) ease of use, ease of identification, usefulness of information and interactivity. Qin Su et al. (2008) approached the topic emphasizing the importance of six key quality factors: quality of service provided, customer service, management of processes, ease of use, quality of information and design. Earlier, a 25-item framework (Aladwani and Palvia, 2001) was structured on four quality axes: specific content, content quality, appearance and technical adequacy. The previous

year, a model named e-SQ (Zeithaml et al., 2005) was developed and identified efficiency, system availability, fulfillment and privacy as the most important quality principles for website evaluation. A more detailed quality model is proposed by ETNOTEAM (2000). It consists of six different level of analysis: communication, content, functionality, usability, management and accessibility. A comprehensive model for websites quality (Signore, 2005) presents correctness, presentation, content, navigation and interaction as the five most important dimensions.

As far as quality criteria are concerned, Grigoroudis et al. (2006) identified nine significant user satisfaction criteria; Relevance: indicates the relevance of content to a specific user. Usefulness: indicates the relevance of content to a specific user's need. Reliability: reports if the information contained in the web page is up-to-date. Specialisation: reveals the level of specificity of information. Architecture: captures the structure of the page. Navigability: indicates the ease-of-use of website's interface. Efficiency: concerns characteristics such as loading time or number of crashes. Layout: reveals the website's competitive advantage as far as architecture is concerned. Animation: measures how appealing are all the animations in the site. A similar research (Cox and Dale, 2002) reveals four key quality factors; ease of use, customer confidence, on-line resources, relationship services and further analyzes them into more on-target sub-criteria. More specific, ease of use concerns clarity of purpose, design and communication. Customer confidence concerns order confirmation, reliability, service, feedback, faq, accessibility, speed whereas on-line resources captures product choice, product quotation and product purchase. Finally, relationship services are assessed by recognition, extra services and frequent buyer incentives.

One of the most detailed lists of criteria in the literature (Moustakis et al., 2006) splits the aforementioned website quality axes (Athanasou, 1999; Bramley, 1999; Hall and Hickman, 1999; Korpela and Lehmusvaara, 1999; Nielsen, 2002; Ratner et al., 1996) in several

subcategories. More specific, content bears five subcategories: Utility of content, Completeness of information, Subject specialization, Reliability of content, Syntax of content. Six sub-criteria, Convenience of navigation tools, Identity of site, Means of navigation, Links to other sites, Ease of use of navigation tools, Search engines, refer to navigation whereas structure and design lists even more; Order of elements, Loading speed, Site map, Information structure, Software requirements, Browser compatibility, Real-time information. As far as appearance/multimedia and uniqueness are concerned, these can be analyzed to the following subcriterion-dimensions correspondingly: Graphics representation, Readability of content, Multimedia and Uniqueness of content, Aesthetics of content presentation, Uniqueness of design characteristics.

Another list of criteria was established by the International Academy of Digital Arts and Sciences ([www.webbyawards.com](http://www.webbyawards.com)) and identifies six criteria, namely: content, structure and navigation, visual design, functionality, interactivity, and overall impression. A very detailed report of criteria (Mohammed et al., 2010) lists efficiency, user friendliness, navigation, updating, user involvement in the first category (usability), functionality, security, reliability, integrity, trust, content sufficiency, evolution and availability in the second category (conceptual reliability) while the third category (representative reliability) embodies readability, adjustment and ease of use. Another criteria-based analysis (McMurdo, 1998) includes 12 key quality factors about: ownership, the author, type of website, the purpose of the website, target group, language, links offered, validity, update of information, accessibility, services and lastly, facilities.

Likewise, six basic criteria are introduced in the book "Web Wisdom" (Alexander and Tate, 1992). Authority in site level and authority in page level reveals the existence of definitive knowledge, accuracy captures the reliability of information, objectivity demands information to be neutrally presented, currency ensures that information is up-to-date and coverage and

audience refers to traffic. A wide range of criteria grouped into two large levels (information content and ease of use) were also recruited for website quality assessment (Bertot et al., 1997; Smith, 2001). According to this approach, evaluation is measured with orientation to website, content, currency, metadata, services, accuracy, privacy, external recognition, links, feedback mechanisms, accessibility, design and navigability. Bauer and Scharl (2000) focused on content, interactivity, navigation, functionality, usability, efficiency and site reliability whereas Davidavičienė and Tolvaišas (2011), through detailed previous research, identified three basic levels of evaluation and eight critical quality dimensions. The first level recognized, is basic elements in virtual environment. The following criteria belong in this category and are presented in order of importance: (expediency, traceability, domain, software, hardware, maintenance. Secondly, the passive elements in virtual environment level are introduced with reliability, ease of use, information quality and design as factors. Lastly, active elements in virtual environment concerns interactivity, added value for consumers, and of the order process.

Additionally, a quality assessment study (Miranda et al., 2006) which focused on twenty Spanish banks' pages introduced four general principles (Buenadicha et al., 2001; Miranda et al., 2006; Miranda and Bañegil, 2004); accessibility, speed, navigability and content. Each principle can be further analyzed into many sub criteria. More particularly, accessibility means popularity and presence in well-known search engines, speed coincides with access speed, navigability concerns the site map and keyword search function whereas content captures informational and transactional content features. Information and service quality, system use, playfulness and system design quality (Liu and Arnett, 2000) are the four criteria that were introduced from a survey conducted in over 1000 company websites. The same year, another research (Zeithaml et al., 2000) identified eleven basic quality subcriteria: reliability, responsiveness, access, flexibility, ease of navigation, efficiency, assurance/trust, security/privacy, price knowledge, site aesthetics and customization/personalization. A 14-

item scale named eTailQ (Wolfenbarger and Gilly, 2003) considers website design, reliability/fulfillment, privacy/security and customer service factors of greatest importance. A rather large scale of quality dimensions (Madu and Madu, 2002) introduces performance; features; structure; aesthetics; reliability; storage capacity; serviceability; security and system integrity; trust; responsiveness; product/service differentiation and customization; web store policies; reputation; assurance and empathy.

Web Quality Model (WQM) (Calero et al., 2005) is based on six critical dimensions each of which can be further subcategorized. Functionality ensures suitability, accuracy, interoperability, security and traceability. Reliability concerns maturity, fault tolerance, recoverability, availability and degradability. Usability contains most sub-criteria than any other principle. More specific, it captures understandability, learnability, operability, explicitness, attractivity, customizability, clarity, helpfulness and user-friendliness. Efficiency reveals time and resource behavior while portability includes adaptability, installability, replaceability and co-existence. In conclusion, maintainability captures analyzability, changeability, stability, testability, manageability as well as reusability.

In the literature, we also located several revolutionary approaches as far as website assessment is concerned. Some researches focus only on evaluation of the content dimension (Singh and Sook, 2002; Ju-Pak, 1999; Griffith and Krampf, 1998) which is recognized as the king dimension of all web-pages (Singh and Sook, 2002) or on usability dimension (Becker, 2002) with criteria such as: design standards, design layout, personalization, navigation, design consistency, customer service, reliability, security, performance information content and accessibility. Environmental Education and Training Partnership (EETAP 1999) assessed content based on five general themes; Authority, Audience, Context/Coverage, Accuracy and Currency. A revolutionary modular approach (Hong and Kim, 2004) is based on building architectural criteria. Researchers identified two

levels of criteria. The first group consists of internal reliability, external security, content usefulness, navigation usability, system interface attractiveness and communication interface attractiveness while the second concerns robustness, utility and aesthetic appeal.

Of course, many methods and models of quality assessment that have been developed to target specific groups of websites. A five-dimensional model (Hashim et al., 2007) which measures quality in tourism and hospitality websites recognizes information and process, value added, relationships, trust, and design and usability as the most important factors. Tourism sector relates with a large number of websites and that is why so many models for this type of sites are developed. Lu, Lu, and Zhang (2002) rated based on content, ease of use, and functionality.

Another research (Mills and Morrison, 2003) places travel websites in the center and introduces a model with three basic axes; interface, perceived quality, and value. Also regarding travel websites, a variation of the known SERVQUAL model, the E-QUAL model, was used by Kaynama and Black (2000).

MINERVA (Minervagroup, 2005; Mebrate, 2010) is another modular approach used to assess cultural websites such as museums or libraries. MINERVA is based on ten different level of analysis; transparent, effective, maintained, accessible, user-centred, responsive, multi-lingual, interoperable, managed and preserved level.

An ISO-based approach (Mebrate, 2010) introduces usability, content, reliability, efficiency and functionality as the main dimensions of academic websites quality assessment. The aforementioned attributes “carry” many sub-criteria with them such as understandability, learnability, interactivity, operability, interface attractiveness, multiple-language support (usability), relevance of information, accuracy of information, up-to-date information, authority, identity (content), fault tolerance, recoverability, availability (reliability), time

behavior, accessibility (efficiency), navigation, search, suitability (functionality). However, a study that was limited only to Jordanian university websites and the dimension of usability (Mustafa and Al-Zoua'bi, 2008) numbers 23 usability evaluation criteria: display space, scroll left and right, accessibility, distracting or irritating elements, orphan page, placement and content of site map, information search, link colors, up-to-date information, download time, back button, open new browser windows, respond according to users' expectations, web advertising, follow real world conventions, hyperlink description, consistent design, use of color, organization of information, navigational aids, registration information, faculties information and instructors information.

As far as e-commerce sites are concerned, another effort has been made (Yoo and Donthu, 2001) which concentrated in the evaluation of nine criteria from the visitor's perspective (SITEQUAL model). A quality evaluation study of this field (Oppenheim and Ward, 2006) introduced eight different levels of analysis; presentation elements, content, accessibility, language, navigation and structure, transaction page, security/privacy/authority and marketing factors. This is one of the few approaches we encountered that embodies the concept of marketing in a model. Lastly, another scale named PeSQ (Cristobal et al., 2007) recognizes web design, customer service, assurance and order management as key factors.

Four main quality principles (targets, structure, services and efficiency) were introduced by a 2002 modular approach (Atzeni et al., 2002) for evaluation of governmental/public authorities' websites. This model recognized 46 detailed criteria several of which were considered measurable and the remaining were grouped into the aforementioned quality principles. The main advantage of this technique is that it can be recruited to assess even certain sections of a website. Another try in the field (Garcia et al., 2005) was named g-Quality model. Garcia et al. (2005) preferred five criteria; cognitive effort, reach, physical effort, trust and tolerance. A framework based on four axes (Panopoulou et al., 2008) was

used to evaluate Greek public authorities' websites. General characteristics, e-content, e-services and e-participation were named as the key quality groups and were further subcategorized into accessibility, navigation, multilingualism, privacy, public outreach (first axe), general content, specific content, news and updating (second axe), services number and level, general information (third axe), information, consultation and active participation (last axe). E-Governance Performance Index (Holzer and Kim, 2005) is another framework which presents security/privacy, usability, content, service, citizen participation as key quality factors. Last but not least, Zhang and von Dran (2001) considered the following five dimensions of outmost importance: ease of navigation, clear layout of information, up-to-date information, search tool dimension and accuracy of information.

As it is expected, quality evaluation methods were also developed for the very popular sector of banking websites. One of those attempts (Diniz et al., 2005) relies on three dimensions. Functionality reveals the range of the services offered, reliability captures the security level of the transactions while usability rates the user-interface interaction. Likewise, a quality assessment study (Achour and Bensedrine, 2005) which focused on Tunisian banking websites introduced six general principles. These factors are the following: information, order, security, ease of use, aesthetic effects and others and are further analyzed in the paper into over 40 more specific sub-criteria. Last but not least, a bank-orientated model (Chung and Paynter, 2002) reveals seven components: information, legal statement, order, ease of use, aesthetic effects, performance and others. Further expansion of these elements creates several subcriteria.

**Table 1**

Criteria of Website Quality Assessment in the previous literature

<b>Researcher/Model</b>	<b>Criteria of Website Quality Assessment</b>
<b>Ho, 1997</b>	Promotion, Provision, Processing
<b>Burgess and Cooper, 2000 (MICA)</b>	Promotion, Value-add information, Technical information, Value-add links, Online enquiry, E-mail, faq, Order status, Online payments, Online order, Links warehouses, Online sales, Enquiry, Links to distributors
<b>Athanasou, 1999; Bramley, 1999; Hall and Hickman, 1999; Korpela and Lehmusvaara, 1999; Nielsen, 2002; Ratner et al., 1996</b>	Content, Personalization/uniqueness, Navigation, Structure and design, Appearance and Multimedia
<b>Parasuraman et al., 1985 (SERVQUAL)</b>	Tangibility, Reliability, Responsiveness, Assurance, Empathy
<b>Cao et al., 2003</b>	Information quality, System quality, Service quality, Appearance
<b>Hasan and Abuelrub, 2008</b>	Content quality, Design quality, Organization quality, User-friendly quality
<b>Dutta et al., 1998</b>	Product, Price, Promotion, Place, Customer relations, Technical aspects
<b>(Web-QEM)</b>	Usability, Reliability, Efficiency, Functionality
<b>Mich et al., 2003 (7 Loci)</b>	Identity, Content, Services, Maintenance, Usability, Location, Feasibility
<b>MiLE</b>	Content, Services, Navigation, Cognitive features of the interface, Aesthetic/graphic level, Technology level
<b>Loiacono et al., 2002 (WebQual)</b>	Informational fit-to-task, Tailored communications, Trust, Response time, Ease of understanding, Intuitive operations, Visual appeal, Innovativeness, Emotional appeal, Consistent image, On-line completeness, Relative advantage
<b>Barnes and Vidgen, 2000 (WebQual)</b>	Usability, Design, Information, Trust, Empathy
<b>Klineet et al., 2004 (BSC)</b>	User friendliness, Site attractiveness, Marketing effectiveness, Technical aspects

<b>Bekker and Merwe, 2003</b>	Interface, Navigation, Content, Reliability, Technical
<b>Hung and McQueen, 2003</b>	Ease of use, Ease of identification, Usefulness of information, Interactivity
<b>Qin Su et al., 2008</b>	Quality of service, Customer service, Management of processes, Ease of use, Quality of information, Design
<b>Aladwane and Palvia, 2001</b>	Specific content, Content quality, Appearance and Technical adequacy
<b>Zethaml et al., 2005 (e-SQ)</b>	Efficiency, System availability, Fulfillment, Privacy
<b>ETNOTEAM, 2000</b>	Communication, Content, Functionality, Usability, Management, Accessibility
<b>Signore, 2005</b>	Correctness, Presentation, Content, Navigation, Interaction
<b>Grigoroudis et al., 2006</b>	Relevance, Usefulness, Reliability, Specialisation, Architecture, Navigability, Efficiency, Layout, Animation
<b>Cox and Dale, 2002</b>	Ease of use, Customer confidence, On-line resources, Relationship services
<b>Moustakis et al., 2006</b>	<p>Utility of content, Completeness of information, Subject specialization, Reliability of content, Syntax of content (<u>Content dimension</u>)</p> <p>Convenience of navigation tools, Identify of site, Means of navigation, Links to other sites, Ease of use of navigation tools, Search engines (<u>Navigation dimension</u>)</p> <p>Order of elements, Loading speed, Site map, Information structure, Software requirements, Browser compatibility, Real-time information (<u>Structure and design dimension</u>)</p> <p>Graphics representation, Readability of content, Multimedia (<u>Appearance/multimedia dimension</u>)</p> <p>Uniqueness of content, Aesthetics of content presentation, Uniqueness of design (<u>Uniqueness dimension</u>)</p>
<b>International Academy of Digital Arts</b>	Content, Structure and navigation, Visual design, Functionality, Interactivity, Overall impression
<b>Mohammed et al., 2010</b>	Efficiency, User friendliness, Navigation, Updating, User involvement ( <u>usability</u> ), Functionality, Security, Reliability, Integrity, Trust, Content sufficiency, Evolution and Availability ( <u>conceptual reliability</u> ) Readability, Adjustment and Ease of use ( <u>representative reliability</u> ).

<b>McMurdo, 1998</b>	Ownership, Author, Type of website, The purpose of the website, Target group, Language, Links offered, Validity, update of information, Accessibility, Services, Facilities.
<b>Alexander and Tate, 1992</b>	Authority in site level, Authority in page level, Accuracy, Objectivity, Currency, Coverage
<b>Bertot et al., 1997</b>	Website, Content, Currency, Metadata, Services, Accuracy, Privacy, External recognition, Links, Feedback mechanisms, Accessibility, Design and Navigability
<b>Bauer and Scharl, 2000</b>	Content, Interactivity, Navigation, Functionality, Usability, Efficiency, Site reliability
<b>Davidavičienė and Tolvaišas, 2011</b>	Expediency, Traceability, Domain, software, Hardware, Maintenance. Reliability, Ease of use, Information quality and Design as factors, Interactivity, Added value for consumers, Added value of the order process
<b>Miranda et al., 2006</b>	Accessibility, Speed, Navigability, Content
<b>Liu and Arnett, 2000</b>	Information and service quality, System use, Playfulness, System design quality
<b>Zeithaml et al., 2000</b>	Reliability, Responsiveness, Access, Flexibility, Ease of navigation, Efficiency, Assurance/trust, Security/privacy, Price knowledge, Site aesthetics, Customization/personalization
<b>Wolfenbanger and Gilly, 2003 (eTailQ)</b>	Considers website Design, Reliability/fulfillment, Privacy/Security, Customer service factors
<b>Madu and Madu, 2002</b>	Performance, Features, Structure, Aesthetics, Reliability, Storage capacity, Serviceability, Security and system Integrity, Trust, Responsiveness, Product/service differentiation and customization, Web store policies, Reputation, Assurance, Empathy.
<b>Calero et al., 2005 (WQM)</b>	Suitability, Accuracy, Interoperability, Security and Traceability ( <u>Functionality</u> ). Maturity, Fault tolerance, Recoverability, Availability and Degradability ( <u>Reliability</u> ). Understandability, Learnability, Operability, Explicitness, Attractivity, Customizability, Clarity, Helpfulness and User-friendliness ( <u>Usability</u> ). Time and Resource behavior ( <u>Efficiency</u> ) Adaptability, Installability, Replaceability and Co-existence ( <u>Portability</u> ). Analyzability, Changeability, Stability, Testability, Manageability, Reusability ( <u>Maintainability</u> ).
<b>Singh and Sook, 2002; Ju-Pak, 1999; Griffith</b>	Content

<b>and Krampf, 1998</b>	
<b>Becker, 2002</b>	Design standards, Design layout, Personalization, Navigation, Design Consistency, Customer service, Reliability, Security, Performance information content, Accessibility
<b>EETAP, 1999</b>	Authority, Audience, Context/Coverage, Accuracy, Currency
<b>Hong and Kim, 2004</b>	Internal reliability, External security, Content usefulness, Navigation usability, System interface attractiveness, Communication interface attractiveness, Robustness, Utility, Aesthetic appeal
<b>Hashim et al., 2007</b>	Information and process, Value added, Relationships, Trust, Design, Usability
<b>Lu, Lu and Zhang, 2002</b>	Content, Ease of use, Functionality
<b>Mills and Morrison, 2003</b>	Interface, Perceived quality, Value
<b>Minervagroup, 2005 (MINERVA)</b>	Transparent level, Effective level, Maintained level, Accessible level, User-centred level, Responsive level, Multi-lingual level, Interoperable level, Managed level, Preserved level
<b>Mebrate, 2010 (academic)</b>	Understandability, Learnability, Interactivity, Operability, Interface attractiveness, Multiple-language support ( <u>Usability</u> ), Relevance of information, Accuracy of information, Up-to-date information, Authority, Identity ( <u>Content</u> ), Fault tolerance, Recoverability, Availability ( <u>Reliability</u> ), Time behavior, Accessibility ( <u>Efficiency</u> ), Navigation, Search, Suitability ( <u>Functionality</u> ).
<b>Mustafa and Al-Zoua'bi, 2008</b>	Display space, Scroll left and right, Accessibility, Distracting or irritating elements, Orphan page, Placement and content of site map, Information search, Link colors, Up-to-date information, Download time, Back button, Open new browser windows, Respond according to users' expectations, Web advertising, follow real world conventions, Hyperlink description, Consistent design, Use of color, Organization of information, Navigational aids, Registration information, Faculties information, Instructors information
<b>Oppenheim and Ward, 2006</b>	Presentation elements, Content, Accessibility, Language, Navigation and structure, Transaction page, Security/privacy/authority and Marketing factors.
<b>Cristobal et al., 2007</b>	Web design, Customer service, Assurance, Order management

<b>(PeSQ)</b>	
<b>Atzeni et al., 2002</b>	Targets, Structure, Services, Efficiency
<b>Garcia et al., 2005 (g-Quality model)</b>	Cognitive effort, Reach, Physical effort, Trust, Tolerance
<b>Panopoulou et al., 2008</b>	Accessibility, Navigation, Multilingualism, Privacy, Public outreach ( <u>General characteristics</u> ), General content, Specific content, News and Updating ( <u>E-content</u> ), Services number and level, General information ( <u>E-services</u> ), Information, consultation and Active participation ( <u>E-participation</u> )
<b>Holzer and Kim, 2005 (E-Governance Performance Index)</b>	Security/privacy, Usability, Content, Service, citizen participation
<b>Zhang and von Dran, 2001</b>	Ease of navigation, Clear layout of information, Up-to-date information, Search tool dimension, Accuracy of information
<b>Diniz et al., 2005</b>	Functionality, Reliability, Usability
<b>Archour and Bensedrine, 2005</b>	Information, Order, Security, Ease of use, Aesthetic effects and others.
<b>Chung and Paynter, 2002</b>	Information, Legal statement, Order, Ease of use, Aesthetic effects, Performance and Others

## **1.4 TECHNIQUES USED FOR WEBSITE QUALITY ASSESSMENT**

**Table 2**

Techniques used for Website Quality Assessment in the previous literature

<b>Researcher</b>	<b>Technique</b>	<b>Particular Application of the Technique</b>
<b>Zafiropoulos and Vrana, 2006</b>	Hierarchical Cluster Analysis (HCE)	Hierarchical Clustering
<b>Bauernfeind and Mitsche, 2008</b>	Data Envelopment Analysis (DEA)	Website's Efficiency Assessment - Benchmarking
<b>Zviran et al., 2006 Hong and Kim, 2004 Zeithaml et al., 2005 Cristobal et al., 2007</b>	Exploratory Factor Analysis (EFA)	Identification of complex interrelationships among items and group items that are part of unified concepts – Grouping- Assessment of a quality scale
<b>Hong and Kim, 2004</b>	Multi-Dimensional Scaling Analysis (MDS)	Multidimensional Scaling
<b>Hong and Kim, 2004</b>	Post-hoc Analysis	Data mining to uncover patterns or links in data, that can be presented as statistically significant
<b>Hong and Kim, 2004 Zeithaml et al., 2005 Loiacono et al., 2002</b>	Confirmatory Factor Analysis (CFA)	Factor analysis using structural equation modeling to test a measurement model whereby loading on the factors allows for evaluation of relationships between observed variables and unobserved variables. - Grouping
<b>Hong and Kim, 2004</b>	Multi-group Analysis	Compares the impact of a feature in different groups
<b>Zeithaml et al., 2005</b>	Scale-reduction/refinement Analysis	Procedure for developing and refining scales

<b>Zeithaml et al., 2005</b>	Reliability Analysis	Constructs reliable measurement scales, improves existing scales, evaluates the reliability of scales already in use
<b>Loiacono et al., 2002 Cristobal et al., 2007</b>	Cronbach's Alpha Analysis	Reliability Test
<b>Loiacono et al., 2002</b>	Modified Multitrait-Multimethod Process	Uses a multi-item correlation matrix to examine relationship with scale
<b>Cristobal et al., 2007</b>	Delphi process	Validity test
<b>Cristobal et al., 2007</b>	Multisample Analysis (MSA)	Allowed researchers to contrast the possible differences between two or more groups of a sample
<b>Barnes and Vidgen, 2000</b>	Quality Function Deployment (QFD)	Transforms qualitative user demands into quantitative parameters
<b>Grigoroudis and Siskos, 2002</b>	(MULTicriteria Satisfaction Analysis) + MUSA+	Provides quantitative measures of customer satisfaction considering the qualitative form of customers' judgments.
<b>Moustakis et al., 2006</b>	Statistical Factor Analysis	The loading of each item on each construct is evaluated against specific criteria. – Clears up the hierarchy and narrows the list to a handful of criteria. - Grouping
<b>Moustakis et al., 2006</b>	Analytic Hierarchy Process (AHP)	Multi-criteria Decision Making (MCDM) Method– Weight assessment- Hierarchy development- Hierarchical Representation of a System
<b>Moustakis et al., 2006</b>	Analysis Of Variance (ANOVA)	Describes variations and differences among and between groups/samples
<b>Moustakis et al., 2006</b>	Rotated Factor Analysis	Statistical Factor Analysis with rotated factors - Grouping
<b>Griffiths et al., 2005</b>	Automated Quality	Website Quality Assessment

	Assessment Procedure (AQA)	
<b>Chan &amp; Law, 2006</b>	AWES approach (Automatic Website Evaluation System)	Website Quality Assessment through an analysis of its source code
<b>Faba-Perez et al., 2005</b>	Kohonen's neural networks (SOM)	Multidimensional Scaling
<b>Suh et al., 2004</b>	Association Rules Approach	Discovering Relations Between Variables
<b>Cox and Dale, 2002</b>	Scoring System based on binary classifications	Website Quality Assessment
<b>Hardwick and MacKenzie, 2003</b>	Website Scoring Systems	Website's Content Quality Assessment

In the following part of our research we wish to locate most of the techniques used for website quality assessment in the previous literature. Zafiroopoulos and Vrana (2006) created a model using hierarchical cluster analysis (HCE) to achieve the characteristics' clustering whereas, similarly, Bauernfeind and Mitsche (2008) recruited data envelopment analysis (DEA) to certain groups of websites. Zviran et al. (2006) recruited Exploratory Factor Analysis (EFA) in order to reduce and filter data from questionnaires and reach the conclusion that user satisfaction relies on five factors: content, accuracy, format, ease of use, and timeliness. The same method was recruited by Hong and Kim (2004) for screening out irrelevant or unnecessary items as far as questionnaires were concerned. Also, the aforementioned researchers needed to conduct a Multi-Dimensional Scaling (MDS) analysis to create perceptual maps and determine the main dimensions of website classification, post-hoc analysis to link the classification dimensions with twelve generic functions of the research, Confirmatory Factor Analysis (CFA) to put reliability and validity of the six evaluation

principles of this study to the test and multi-group analyses to compare the impact of every criteria in each of the different categories of websites. Various scale-reduction/refinement analyses, reliability analyses as well as Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) were conducted for the es-Q framework (Zeithaml et al., 2005).

During the development of WebQual (Loiacono et al., 2002) Cronbach's alpha analysis, the modified multitrait-multimethod process (Campbell and Fisk, 1959) and Confirmatory Factor Analysis (CFA) were also recruited. A wide range of techniques; Delphi process, exploratory analysis, Cronbach's alpha, multisample analysis were recruited in the development of PeSQ (Cristobal et al., 2007). Other researches (Barnes and Vidgen, 2000) used quality function deployment (QFD) as a development methodology of the suggested assessment model.

A variation of the original MUSA (MULTicriteria Satisfaction Analysis) Grigoroudis and Siskos (2002) named MUSA+ was also used (Grigoroudis et al., 2006) to help authors gather all individual judgments regarding a wide range of quality criteria into a collective value function. Another research (Moustakis et al., 2006) recruited initially statistical factor analysis to reduce the range of criteria, analytical hierarchy process (AHP) during the procedure of weights assignment in all criteria and sub-criteria, analysis of variance (ANOVA) to detect differences in users' behavior as far as weight assignment in criteria is concerned and then rotated factor analysis to somehow group criterion and sub-criterion into composites. An original technique named Automated Quality Assessment procedure (AQA) (Griffiths et al., 2005) was developed to measure quality of depression sites. The technique relies on the Google PageRank™ which is an algorithm-based measure to capture the "importance" of a website (scale 0 to 10). One year later, Chan & Law (2006), structured the AWES approach (Automatic Website Evaluation System) which evaluates a website through an analysis of its source code (size and set-up).

Several researches even use quantitative analysis to assess a website. Faba-Perez et al. (2005) employed Kohonen's neural networks (SOM), a technique that compares data from features such as text elements and link formatting while Suh et al. (2004) took advantage of tools which automatically analyzed traffic and time measurements. Similarly, Cox and Dale (2002) resorted to a scoring system based on binary classifications whereas Hardwick and MacKenzie (2003) used three scoring systems for their assessment.

In conclusion, a detailed literature review revealed an extensive classification of websites, the importance of website quality assessment, a great number of website quality evaluation models with many different criteria and sophisticated techniques used for website quality assessment. Some previous studies categorize websites based on their content, some on the type of service they provide whereas others present pioneering approaches. However, each and every organization needs its web-page quality to be assessed in order to improve its overall product and channel of communication with the customers. As far as the frameworks of evaluation are concerned, efforts have been made from early on. Some models are very premature but the majority of them identify necessary quality factors which are further analyzed into sub factors and sub-criteria. In fact, many of the aforementioned frameworks were either created or evaluated from techniques such as HCE, DEA, EFA and MUSA and certainly their identification a very important part of this thesis.

## **2. METHODOLOGY**

This master thesis consists of three parts-steps. Initially, we reviewed the existing literature in order to identify all the previous work made on our field of research. The second step is a detailed questionnaire study. After creating a new, updated model, we asked 22 participants to fill in a questionnaire and then used the Analytic Hierarchy Process (AHP) to come up with the results. Finally, we thoroughly discussed our research's findings, highlighted their importance and pinpointed all its limitations and weaknesses.

### **2.1 UNDERTAKING THE LITERATURE REVIEW**

Indisputably, literature review is an essential part of this Master thesis as it brings the reader up-to-date with the existing previous studies on types of websites, importance of quality assessment, models and techniques used in this field. A good literature review should contain a clear search and selection strategy (Carnwell and Daly, 2001) as well as accurate referencing (Colling, 2003).

This thesis presents a traditional or narrative literature review which summarizes a body of literature about the topic in question. Its primary purpose is to provide the reader with a background on the topic and highlight the importance and contribution of this research. Thus, after having determined the area of interest, a structured search of previous works was of great importance. Firstly, we searched on Google scholar and numerous relevant to the topic electronic databases (including University of Macedonia Library's database) using keywords. Some examples of the keywords used are: types of websites, classification of websites, types of web-pages, website quality assessment, website quality evaluation and website quality assessment frameworks/models/techniques. Another important source of data is the already existing literature reviews on topic which were found on the results of our online search. They provided us with a general overview saved us time and in addition, revealed to us articles that were off our radar (through bibliographic references). Of course,

all this information drawn from these reviews needed manual evaluation so we often searched the original papers in order to confirm the correctness of information. Publications were also a very helpful source for the review. As you may see we tried to include not only journals but also every relevant book. Books may not be as up-to-date as journals but still represent an acceptable and valuable source of information (Cronin et al., 2008).

To conclude with, this methodology offered our research a solid and high quality literature review which provides the reader with a general overview of the field.

## **2.2 QUESTIONNAIRE STUDY**

As it is mentioned before, this Master thesis also intends to evaluate the newly designed model through a questionnaire study. Its main goals will be both to determine the importance of the criteria and sub criteria used in the framework and to prioritize them in order to provide an insight on what students consider as the most important features of an educational web-page.

The first step of course is to create the model. After the framework development, we will create a questionnaire which will include a special type of questions. Their purpose will be to compare in pairs the importance of each criterion and sub-criterion of the framework and produce a final prioritization. The experiment will be conducted in a sample of 22 people aged over 18 and with at least the educational experience of a bachelor. This is essential for the study because in order for the participants to understand and rate the importance of a quality factor they need bear the experience of interacting with an educational website. The next step will be the analysis of the results using highly sophisticated software which will provide us with the final prioritization.

### **2.3 CREATING THE MODEL**

After a very detailed literature review, the author has identified a large number of criteria and sub-criteria used to evaluate websites. However, it was essential for the research to filter them, choose the most appropriate ones for the evaluation specifically of educational sites and finalize a web quality assessment model. In this part of our research we will name all the criteria and sub-criteria available in the literature and explain the reasons we chose the specific twenty-five of them for our model.

The first step of the deductive procedure was to review all the literature review and exclude some model that in the author's opinion were very poor (Singh and Sook, 2002; Ju-Pak, 1999; Griffith and Krampf, 1998; Mills and Morrison, 2003), in a very early stage (Ho, 1997) or concentrated in only one aspect of a website (Becker, 2002; EETAP, 1999). Secondly, through the review of the rest of the literature we observed that all the existing researches grouped many sub-criteria into big dimensions-criteria (Hasan and Abuelrub, 2008; Mich et al., 2003; Mebrate, 2010; Bekker and Merwe, 2003; Aladwani and Palvia, 2001; Grigoroudis et al., 2006; Cox and Dale, 2002; Moustakis et al., 2006; Mohammed et al., 2010; Davidavičienė and Tolvaišas, 2011; Calero et al., 2005; Hong and Kim, 2004; Atzeni et al., 2002; Panopoulou et al., 2008; Athanasou 1999; Bramley, 1999; Hall and Hickman, 1999; Korpela and Lehmusvaara, 1999; Nielsen, 2002; Ratner, Grose, and Forsythe, 1996). Using not only the Delphi method but also analyzing the frequency in which these dimensions appeared in the literature we decided to include in our model five big criteria; Content (Hasan and Abuelrub, 2008; Mich et al., 2003; Mebrate, 2010; Bekker and Merwe, 2003; ETNOTEAM, 2000; Signore, 2005; Grigoroudis et al., 2006; Moustakis et al., 2006; Bauer and Scharl, 2000; Miranda et al., 2006; Lu et al., 2002; Oppenheim and Ward, 2006; Holzer and Kim, 2005;), Navigability (Grigoroudis et al., 2006; Miranda et al., 2006; Bertot et al., 1997;

Smith, 2001; Mebrate, 2010; Bekker and Merwe, 2003; Signore, 2005; Moustakis et al., 2006; Bauer and Scharl, 2000; Zeithaml et al., 2000; Oppenheim and Ward, 2006; Zhang and von Dran, 2001), Structure/design (Grigoroudis et al., 2006; Moustakis et al., 2006; Bertot et al., 1997; Smith, 2001; Atzeni et al., 2002; Hasan and Abuelrub, 2008; Barnes and Vidgen, 2000; Barnes and Vidgen, 2001a; Barnes and Vidgen, 2001c; Barnes and Vidgen, 2002; Liu and Arnett, 2000; Wolfenbarger and Gilly, 2003; Hashim et al., 2007; Bekker and Merwe, 2003), Appearance/Multimedia (Aladwani and Palvia, 2001; Moustakis et al., 2006; Cao et al., 2003; Kline et al., 2004; Grigoroudis et al., 2006; Zeithaml et al., 2000; Madu and Madu, 2002; Achour and Bensedrine, 2005) and Personalization (also referred as Uniqueness) (Zeithaml et al., 2000; Becker, 2002; Mustafa and Al-Zoua'bi, 2008; Quality (Hasan and Abuelrub, 2008) and exclude the User-Friendly Quality (Hasan and Abuelrub, 2008) criteria as a group-dimension. As far as the Delphi method is concerned, each and every participant emphasized that the aforementioned five criteria are essential for an educational site while the User-Friendly Quality criterion and its sub-criteria (Usability, Reliability, Interactive features, Security /Privacy, Customization with user-friendly quality) (Hasan and Abuelrub, 2008) can either be omitted or coincide with the other five groups-criteria. Secondly, according to our frequency analysis on past papers, content, navigability, structure/design, appearance/multimedia and personalization are identified more times than User-Friendly Quality.

As far as sub-criteria are concerned, the overall picture is more complicated. Our research revealed that throughout the existing literature, Content can be further analyzed into Timely/Utility of Content (Hasan and Abuelrub, 2008; Moustakis et al., 2006), Completeness of information/Relevant (Hasan and Abuelrub, 2008; Moustakis et al., 2006; Grigoroudis et al., 2006), Accuracy/content credibility (Alexander and Tate, 1992; Bertot et al., 1997; Smith, 2001; Mebrate, 2010; Zhang and von Dran, 2001; Hasan and Abuelrub, 2008; Moustakis et al., 2006), Specificity/ subject specialization (Grigoroudis et al., 2006; Moustakis et al., 2006;

Aladwani and Palvia, 2001), Authority/trustfulness of information (Hasan and Abuelrub, 2008; EETAP, 1999; Moustakis et al., 2006), Objectivity (Alexander and Tate, 1992), Information quality (Davidavičienė and Tolvaišas, 2011; Cao, Zhang and Seydel, 2003), Easy of Understanding (Loiacono et al., 2002), Registration info (Mustafa and Al-Zoua'bi, 2008) , Faculties info (Mustafa and Al-Zoua'bi, 2008) , Instructors info (Mustafa and Al-Zoua'bi, 2008), Multilanguage(Hasan and Abuelrub, 2008), Clear layout of info (Zhang and von Dran, 2001). Secondly, Navigability can be found to contain Ease of use (Hung and McQueen, 2003 ; Qin Su et al., 2008; Cox and Dale, 2002; Moustakis et al., 2006; Mohammed et al., 2010; Bertot et al., 1997; Smith, 2001; Davidavičienė and Tolvaišas, 2011; Zeithaml et al. , 2000; Lu et al., 2002; Zhang and von Dran, 2001; Achour and Bensedrine, 2005; Chung and Paynter, 2002), Directions or Mapping (Hasan and Abuelrub, 2008; Moustakis et al., 2006; Miranda et al., 2006; Mustafa and Al-Zoua'bi, 2008), Links (Burgess and Cooper, 2000; Hasan and Abuelrub, 2008; Moustakis et al., 2006; McMurdo, 1998; Bertot et al., 1997; Smith, 2001), Search tool (Mebrate, 2010; Mustafa and Al-Zoua'bi, 2008; Zhang and von Dran,2001), Navigation tools (Moustakis et al., 2006), Index tool (Hasan and Abuelrub, 2008), Consistency (Hasan and Abuelrub, 2008), Interactive features (Hasan and Abuelrub, 2008) and Playfulness (Liu and Arnett, 2000) as subcriteria while the Structure/design criterion is further analyzed into Accessibility (ETNOTEAM, 2000; McMurdo, 1998; Bertot et al., 1997; Smith, 2001; Miranda et al., 2006; Becker,2002; Mebrate, 2010; Mustafa and Al-Zoua'bi, 2008; Oppenheim and Ward, 2006; Panopoulou et al., 2008), Speed (Cox and Dale, 2002; Moustakis et al., 2006; Miranda et al., 2006; Grigoroudis et al., 2006), Architecture (also referred as consistency or design layout) (Grigoroudis et al., 2006; Hasan and Abuelrub, 2008; Becker, 2002; Moustakis et al., 2006), technical integrity (Dutta et al., 1998; Kline et al., 2004; Hung and McQueen, 2003; Aladwani and Palvia, 2001; Grigoroudis et al., 2006; Bauer and Scharl, 2000; Liu and Arnett, 2000; Madu and Madu, 2002), security/privacy (Liu and Arnett, 2000; Hasan and Abuelrub, 2008; Mohammed et al., 2010; Zeithaml et al., 2000;

Wolfenbarger and Gilly, 2003; Madu and Madu, 2002; Calero et al., 2005; Becker, 2002; Oppenheim and Ward, 2006; Holzer and Kim, 2005), software requirements (Bauer and Scharl, 2000; Moustakis et al., 2006), appropriateness (Hasan and Abuelrub, 2008) and flexibility (Zeithaml et al., 2000). The two remaining criteria which were chosen are analyzed into fewer sub-criteria. More specific, the dimension of Appearance/multimedia contains Graphics (Moustakis et al., 2006; Mebrate, 2010; Zeithaml et al., 2000; Chung and Paynter, 2002), Other multimedia (also known as Image/sound/text) (Moustakis et al., 2006; Hasan and Abuelrub, 2008; Zeithaml et al., 2000), Colours (Zeithaml et al., 2000), Readability (Moustakis et al., 2006;), Aesthetics of the site (Moustakis et al., 2006; Zeithaml et al., 2000; Madu and Madu, 2002; Hong and Kim, 2004), and text characteristics (Hasan and Abuelrub, 2008) as subcriteria whereas the criterion of Personalization (Zeithaml, Parasuraman, and Malhotra, 2000; Hasan and Abuelrub, 2008) Personalization of information (Hasan and Abuelrub, 2008), Personalization of interface, personalization of Layout, informational Fit-to-task (Loiacono et al., 2002), customer service (Qin Su et al. , 2008; Wolfenbarger and Gilly, 2003; Cristobal et al., 2007), fulfillment (Wolfenbarger and Gilly, 2003; Zeithaml et al., 2005) and aesthetics of content (Moustakis et al., 2006). The only big criterion which was excluded from our quality assessment model (User-Friendly Quality) (Hasan and Abuelrub, 2008) consisted of three subcriteria; Usability (Hasan and Abuelrub, 2008), Reliability (Hasan and Abuelrub, 2008) and Responsiveness (Zeithamlet al., 2000; Madu and Madu, 2002). Needless to mention, we also asked the participants in our Delphi method for these three subcriteria. In case they pointed out that either of these three was essential for an educational website, we would have included it in our model. However, they all thought that these subcriteria referred to other types of websites and as a result we decided to ignore them.

### MODEL WITHOUT FILTERING

Content	Navigability	Structure/Design	Appearance/Multimedia	Personalization	User-Friendly Quality
<input type="checkbox"/> Timely/Utility of Content	<input type="checkbox"/> Ease of use	<input type="checkbox"/> Accessibility	<input type="checkbox"/> Graphics	<input type="checkbox"/> Personalization of information	<input type="checkbox"/> Usability
<input type="checkbox"/> Completeness of information/Relevant	<input type="checkbox"/> Directions or Mapping	<input type="checkbox"/> Speed	<input type="checkbox"/> Other multimedia	<input type="checkbox"/> Personalization of interface	<input type="checkbox"/> Reliability
<input type="checkbox"/> Accuracy/content credibility	<input type="checkbox"/> Links	<input type="checkbox"/> Architecture	<input type="checkbox"/> Readability	<input type="checkbox"/> personalization of Layout	<input type="checkbox"/> Responsiveness
<input type="checkbox"/> Specificity/ subject specialization	<input type="checkbox"/> Search tool	<input type="checkbox"/> technical integrity	<input type="checkbox"/> Aesthetics of the site	<input type="checkbox"/> Informational fit-to-task	
<input type="checkbox"/> Authority/trustfulness of information	<input type="checkbox"/> Navigation tools	<input type="checkbox"/> security/privacy	<input type="checkbox"/> text characteristics	<input type="checkbox"/> customer service	
<input type="checkbox"/> Objectivity	<input type="checkbox"/> Index tool	<input type="checkbox"/> software requirements		<input type="checkbox"/> Fulfillment	
<input type="checkbox"/> Information quality	<input type="checkbox"/> Consistency	<input type="checkbox"/> Appropriateness		<input type="checkbox"/> aesthetics of content	
<input type="checkbox"/> Easy of Understanding	<input type="checkbox"/> Interactive features	<input type="checkbox"/> flexibility			
<input type="checkbox"/> Registration info	<input type="checkbox"/> Playfulness				
<input type="checkbox"/> Faculties info					
<input type="checkbox"/> Instructors info					
<input type="checkbox"/> Multilanguage					
<input type="checkbox"/> Clear layout of info					

Figure 1

### MODEL AFTER THE PRUNING PROCESS

Content	Navigability	Structure/Design	Appearance/Multimedia	Personalization
<input type="checkbox"/> Timely/Utility of Content	<input type="checkbox"/> Ease of use	<input type="checkbox"/> Accessibility	<input type="checkbox"/> Graphics	<input type="checkbox"/> Personalization of information
<input type="checkbox"/> Completeness of information/Relevant	<input type="checkbox"/> Directions or Mapping	<input type="checkbox"/> Speed	<input type="checkbox"/> Other multimedia	<input type="checkbox"/> Personalization of interface
<input type="checkbox"/> Accuracy/content credibility	<input type="checkbox"/> Links	<input type="checkbox"/> Architecture	<input type="checkbox"/> Aesthetics of the site	<input type="checkbox"/> personalization of Layout
<input type="checkbox"/> Specificity/ subject specialization	<input type="checkbox"/> interactive features	<input type="checkbox"/> technical integrity		
		<input type="checkbox"/> security/privacy		
		<input type="checkbox"/> software requirements		

Figure 2

## **2.4 PROPOSED RESEARCH FRAMEWORK**

In the following part, we will try to describe with every detail the proposed research framework of our study. As it is already mentioned before, the questionnaire study of this thesis begins after the creation of our model and its main goal is to produce a prioritization and reveal the importance of every criteria and sub-criteria compared to all others.

After finalizing the model (see. Model after pruning process), we started the development of the questionnaire. It consists of five parts. The first part is demographics where the participants have to fill in their gender, educational status and age. The second part contains instructions for the participants namely information about the questions and how to answer them correctly. The questionnaire consists of forty-three (43) questions and the participants had no time limitations as far as the filling in process is concerned. The type of the questions bears some unique features. More specific, each question compares the importance of a criterion “a” to the importance of a criterion “b”. The participant needs to observe the scale and chose based on his opinion. If one thinks criterion “a” as more important, he/she picks a rating from the left. Otherwise, the ratings on the right reveal a preference for criterion “b”. As far as the scale is concerned, 1 means equally important, 5 means strongly more important and 9 means absolute importance.

a	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	b
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

The third part presents a detailed description of each and every criterion and sub-criterion so that every participant is aware what the meaning of every quality factor is. In our study specifically, the five main quality dimensions are presented and further analyzed into their sub-criteria. In the fourth and last sector all forty-three questions are presented.

When the development of the questionnaire was complete, we had to find a sample of people willing to fill it in. The sample had to meet some specific requirements. First of all, as mentioned before, the participants are required to bear at least the educational experience

of a bachelor. Secondly, we assumed that the sample should exceed number 20 in order our results to be as accurate as possible. We also tried to address candidates who were reluctant to contribute to this research and fill in this questionnaire. Additionally, although the questionnaire itself contains a part where all criteria and sub-criteria are clearly explained we decided that guidance was necessary, so a supervisor was always available for clarifications during the questionnaire study. The aforementioned primary study lasted one month.

When the collection of data was complete, we proceeded with the analysis. We preferred the Analytical Hierarchy Process (AHP) over other MCDM methods such as MacBeth (Ishizaka and Labib, 2009), ELECTRE (Ishizaka and Labib, 2009; Velasquez and Hester, 2013), Simple Multi-Attribute Rating Technique (SMART) (Ishizaka and Labib, 2009; Velasquez and Hester, 2013), UTA (Ishizaka and Labib, 2009), PROMETHEE (Ishizaka and Labib, 2009; Velasquez and Hester, 2013), Multi-Attribute Utility Theory (Velasquez and Hester, 2013), Fuzzy Set Theory (Velasquez and Hester, 2013), Case-based Reasoning (Velasquez and Hester, 2013), Data Envelopment Analysis (Velasquez and Hester, 2013), Goal Programming (Velasquez and Hester, 2013), Simple Additive Weighting (Velasquez and Hester, 2013), and Technique for Order of Preference by Similarity to Ideal Solution (Velasquez and Hester, 2013) because of its simplicity (Ho, 2008), flexibility (Ho, 2008), ease of applicability in the hierarchical modeling of a problem (Ishizaka and Labib, 2009; Ho, 2008; Velasquez and Hester, 2013) and the verification of consistency it offers (Ishizaka and Labib, 2009; Cheng and Heng, 2001). In addition, AHP's utility outweighs that of other research methods (Cheng and Heng, 2001a, 2001b) and although it requires a minimum amount of data to perform optimally, it is far less data intensive as all the others (Velasquez and Hester, 2013). Naturally, for the utilization of AHP, sophisticated software was necessary. So, for our data analysis we used Superdecisions version 2.2.6.

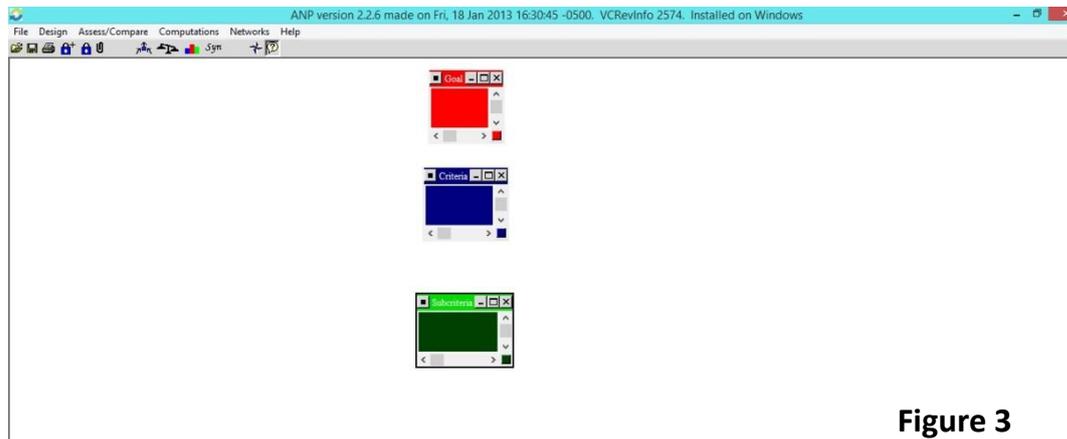
## **2.5 CONTRIBUTION OF SUPERDECISIONS SOFTWARE: MODEL**

### **DEVELOPMENT AND ANALYSIS**

The most important factor for succeeding in our analysis, using the Superdecisions software, was structuring the model correctly using the node-cluster system provided by Superdecisions.

This model would of course rely on the AHP approach that we implemented in our study.

The Superdecisions model consists of three clusters which represent the three big levels of our AHP analysis draft (Goal, Criteria, Sub-criteria).



**Figure 3**

Similar to the AHP draft, each cluster contains nodes. Nodes represent the elements of these three levels. More specific, the Goal-cluster contains the Goal-node, which stands as the base of the AHP method. The second cluster (Criteria) contains the five big dimensions-criteria: Content, Navigability, Architecture/Design, Appearance/Multimedia and Personalization while the third cluster (Sub-criteria) consists of all the specialized sub-criteria

regardless of the dimension they belong.

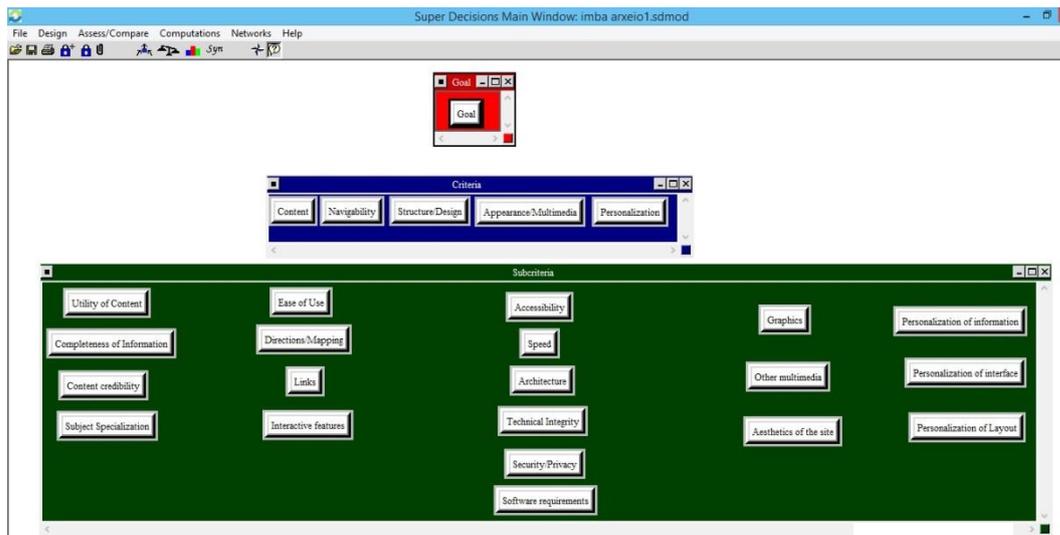


Figure 4

The last stage in the creation of the model is designing the node connections. It is essential that connections are designed correctly in order the pairwise comparisons to produce reliable results. More particularly, each one of the five big dimensions (criteria) was connected with each and every one of its sub-criteria producing the following finalized model:

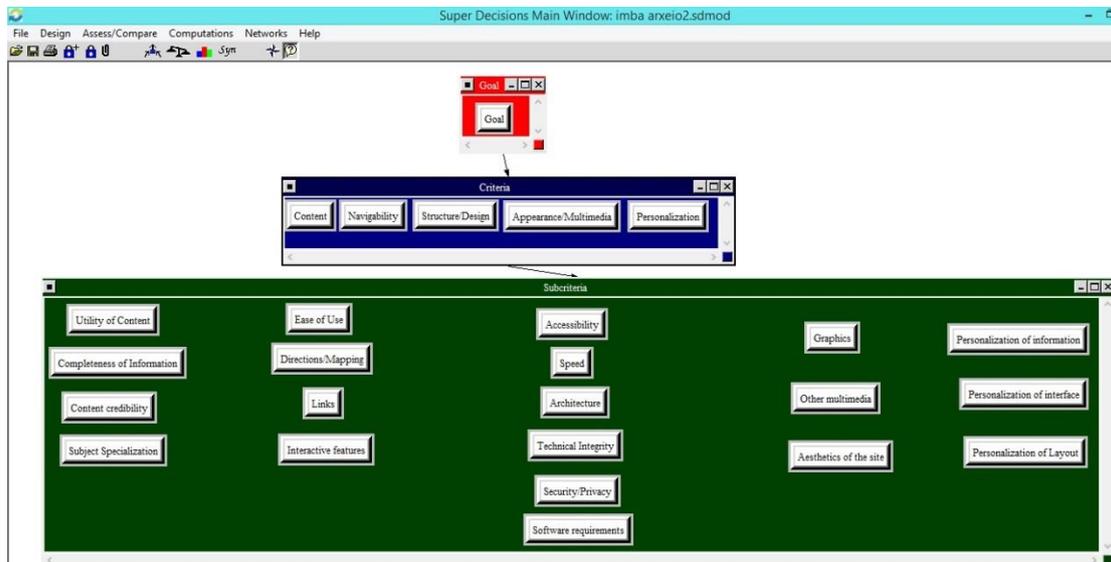


Figure 5

### 3. RESULTS AND DISCUSSION

#### **3.1 PRESENTING THE RESULTS**

The results of this research are based on the pairwise comparisons between sub-criteria, in respect to their parent criterion.

**Table 3**

The order of importance of Content-dimension's sub-criteria in respect to Content.

Inconsistency: 0.01078		
Completeness		0.19581
Content credibility		0.52533
Subject specialization		0.10958
Utility of content		0.16928

Table 3 reveals that the participants in our research consider Content credibility (relative weight = 0.52533) as the most important factor in order an educational website to satisfy a visitor's needs as far as the information offered is concerned. Completeness of information and Utility of content come in second and third place respectively while in the last place stands Subject specialization.

Inconsistency equals 0.01078 and renders our research results reliable.

**Table 4**

The order of importance of Navigability-dimension's sub-criteria in respect to Navigability.

Inconsistency: 0.00991		
Direction~		0.25551
Ease of U~		0.24182
Interacti~		0.38745
Links		0.11523

Across Navigability-dimension's sub-criteria, Interactive features achieved top rating, with Direction or Mapping and Ease of Use following (Table 4). The search tool (Mebrate, 2010; Mustafa and Al-Zoua'bi, 2008; Zhang and von Dran, 2001) was one of the main reasons Interactive features scored such a high relative weight (0.38745). Inconsistency once again validates our research results equals since  $0.00991 < 0.1$ .

**Table 5**

The order of importance of Structure/Design-dimension's sub-criteria in respect to Structure/Design.

Inconsistency: 0.00746		
Accessibi~		0.08287
Architect~		0.14106
Security/~		0.19042
Software ~		0.19328
Speed		0.13745
Technical~		0.25493

Relative weights of Architecture/Design sub-criteria are summarized in Table 5. Technical integrity tops the preference list with a relative weight of 0.25493 with Software requirements and Architecture coming second and third. Speed (0.13745) and Accessibility (0.0887) scored low values.

The results of Table 5 are considered valid because inconsistency index equals 0.00746.

**Table 6**

The order of importance of Appearance/Multimedia-dimension's sub-criteria in respect to

Inconsistency: 0.00557		
Aesthetic~		0.61659
Graphics		0.17831
Other mul~		0.20510

The higher preference rate (61.659%), as far as Appearance/Multimedia-dimension's sub-criteria are concerned, corresponds to Aesthetics of the site. It is by far the more preferable criterion compared with the other three criteria of the specific dimension, by pairwise comparison.

Inconsistency equal to 0.00557 adds weight to our research results.

**Table 7**

The order of importance of Personalization-dimension's sub-criteria in respect to Personalization.

Inconsistency: 0.06170		
Personali~		0.65854
Personali~		0.11176
Personali~		0.22970

Users rated Personalization of Information as the most significant sub-criterion in Table 7 (relative weight = 0.65854) and Personalization of Layout as second. The least preferred sub-criterion, with a relative weight of 0.11176, is Personalization of Interface. Inconsistency levels at 0.06170. As a result, our research's output is considered well-founded.

The next step in our presentation will be to display the preference list regarding the five, big dimensions-criteria of our model in respect to the main goal of this study.

**Table 8**

The order of importance of criteria in respect to the main goal.

Inconsistency: 0.00454		
Appearanc~		0.09186
Content		0.35562
Navigabil~		0.21546
Personali~		0.13944
Structure~		0.19762

As far as criteria are concerned, users indicate Content as the most important element with a relative weight of 35,562%. At approximately 14% lies the difference between the number one and two (Navigability), a rather large margin. A close third comes Structure/Design (19,782%) while Personalization and Appearance/Multimedia stand in the last places. Inconsistency bears an ideal value and adds validity to our results.

***Table 9***

The order of importance of all subcriteria in respect to the main goal.

<b>Subcriteria</b>	<b>Weight</b>
<b>Content credibility</b>	0.186817
<b>Personalization of information</b>	0.091826
<b>Interactive features</b>	0.083479
<b>Completeness of Information</b>	0.069633
<b>Utility of Content</b>	0.060199
<b>Aesthetics of the site</b>	0.056639
<b>Directions/Mapping</b>	0.055052
<b>Ease of Use</b>	0.052102
<b>Technical Integrity</b>	0.050379
<b>Subject Specialization</b>	0.038968
<b>Software requirements</b>	0.038195
<b>Security/Privacy</b>	0.037630
<b>Personalization of Layout</b>	0.032029
<b>Architecture</b>	0.027876
<b>Speed</b>	0.027162

<b>Links</b>	0.024827
<b>Other Multimedia</b>	0.018840
<b>Graphics</b>	0.016379
<b>Accessibility</b>	0.016376
<b>Personalization of Interface</b>	0.015583

Additional results may be obtained by combining weights of sub-criteria and criteria. These results are summarized in Table 9. Content credibility tops the list with a relative weight of 0.186817, almost twice the weight of the second in the list sub-criterion, Personalization of information (0.091826). Additionally, Content credibility is the only sub-criterion which scored more than 0.10. Users rank Interactive features as the third most important sub-criterion in order for an educational website to be considered of high quality while the next two sub-criteria are part of the font-runner main criterion, which is content, and account for about 0.129 of the total weight. It can be easily observed that small weights scored sub-criteria regarding website's interface. More specific, Other Multimedia, Graphics and Personalization of Interface scored less than 0.02. To conclude with, the results presented in Table 7 should be considered credible because the inconsistency levels of every previous pairwise comparison table do not exceed 0,10.

## 4. CONCLUSIONS

As we mentioned before, this master thesis' main goal is to provide a prioritization for all the criteria/sub-criteria of a new quality evaluation model designed exclusively for educational websites. This goal is further analyzed into three sub-objectives. The first one is to write an extensive literature review, identifying as many existing quality assessment frameworks as possible. This objective has been accomplished in chapter 1-LITERATURE REVIEW. The development of a new quality evaluation model designed exclusively for educational websites, which stands as the second sub-objective of this thesis, takes place in chapter 2.3 –CREATING THE MODEL and the results are presented in Figure 1 and Figure 2. Lastly, chapter 2.4 –PROPOSED RESEARCH FRAMEWORK and chapter 2.5 –CONTRIBUTION OF SUPERDECISIONS SOFTWARE: MODEL DEVELOPMENT AND ANALYSIS present every detail of the questionnaire study as well as the implementation of AHP through the Superdecisions software. These two sectors are also the basis of our main goal which is finally introduced in chapter 3- RESULTS AND DISCUSSION.

***Table 8***

The order of importance of criteria in respect to the main goal.

Inconsistency: 0.00454		
Appearanc~		0.09186
Content		0.35562
Navigabil~		0.21546
Personali~		0.13944
Structure~		0.19762

***Table 9***

The order of importance of all sub-criteria in respect to the main goal.

<b>Subcriteria</b>	<b>Weight</b>
<b>Content credibility</b>	0.186817
<b>Personalization of information</b>	0.091826
<b>Interactive features</b>	0.083479
<b>Completeness of Information</b>	0.069633
<b>Utility of Content</b>	0.060199
<b>Aesthetics of the site</b>	0.056639
<b>Directions/Mapping</b>	0.055052
<b>Ease of Use</b>	0.052102
<b>Technical Integrity</b>	0.050379
<b>Subject Specialization</b>	0.038968
<b>Software requirements</b>	0.038195
<b>Security/Privacy</b>	0.037630
<b>Personalization of Layout</b>	0.032029
<b>Architecture</b>	0.027876
<b>Speed</b>	0.027162

<b>Links</b>	0.024827
<b>Other Multimedia</b>	0.018840
<b>Graphics</b>	0.016379
<b>Accessibility</b>	0.016376
<b>Personalization of Interface</b>	0.015583

#### **4.1 THEORETICAL IMPLICATIONS**

As mentioned previously, this thesis had three main goals. Initially, the existing literature has been filtered and all the existing website quality assessment frameworks including all their criteria and sub-criteria have been pinpointed. In addition, we used the Delphi method and a frequency analysis regarding the number of appearances of each relevant criterion in previous literature to design our new model (Figure 2). The final step was to evaluate the validity of the model through a questionnaire based study. Analyzing the results of the study, it is made clear that users of educational websites are more interested in the essence than aesthetics. Generally, they consider content as the most important of the big, five dimensions and content-sub-criteria more significant than those regarding technical integrity or multimedia, probably because of the type of the website this study is referred to. These results come in agreement with the results of previous studies on the field (Grigoroudis et al., 2006; Moustakis et al., 2006) which also demonstrated that visitors and users of educational web-pages are more interested in the quality of information and content offered in these than any other feature.

Our findings also suggest that among content-subcriteria, which scored top values in our list, stands the Interactive features criterion which seems to have built its necessity over the recent years. Users seem to have identified the significance of site search tools, which is one of the most important Interactive features. In addition, the conductors of this study decided to present a list of importance as far as the five dimensions of the new developed model are concerned.

#### **4.2 PRACTICAL IMPLICATIONS**

From a practical point of view, our evidence can be used as a guide in the development process, for the creators of an educational webpage. Developers can see which features are highlighted by our research and make additional effort to optimize them in order to provide visitors with a user friendly, user-orientated, quality educational website. The items of our questionnaire can even be used as a checklist in the development or evaluation process. Furthermore, our study can also contribute to educational websites having a measure that can be used to measure overall quality of their page and those of competitors. Customer satisfaction benchmarking analysis is a useful tool for modern business organizations. A well-designed and updated web page contributes positively to the business-image of an enterprise (Barnes and Vidgen, 2002). Indisputably, educational institutions are also considered companies which aim to profit. Thus, our model can help an educational institution with its competition analysis and determine its strengths and weaknesses. Last but not least, managers can compare our newly developed model with all the previous ones, pinpoint the differences observe the new trends, understand how visitor's needs and preferences have changed and adapt their web-page accordingly.

### **4.3 LIMITATIONS**

Naturally, our research bears some limitations. First of all, it focuses on user satisfaction as the dependent variable and websites were chosen based only on the researcher's opinion. As far as the sample is concerned, its relatively small size and the fact that more than half of the participants were students are considered the biggest limitations. While these subjects are typical of a substantial body of educational websites users, we cannot assure that their profile matches every visitor's profile. Moreover, students-participants have no experience in a webpage evaluation process or in the design process. Lastly, most of the subjects were not regular users of the sites selected for assessment.

### **4.4 FURTHER RESEARCH**

Future research efforts include mainly the implementation of our study to other types of websites. Our thesis literature review concerned every quality assessment framework developed. As a result, theoretically, our newly designed model should bear a universal character. Thus, our findings should be further validated with samples from other types of websites.

In addition, it would be useful to support this study with surveys based on other user demographics such as age, experience with Web site use, and context of Web site use that would demonstrate the objectivity of our model.

## 5. REFERENCES

### **FOREIGN LITERATURE**

1. Achour, H., & Bensedrine, N. (2005). An Evaluation of Internet Banking and Online Brokerage in Tunisia. First International Conference on E-Business and E-Learning (EBEL). Jordan.
2. Adelman, L., 1991. Experiments, quasi-experiments, and case studies: A review of empirical methods for evaluating decision support systems. IEEE Transactions on Systems, Man and Cybernetics 21 (2), 293–301.
3. A. Aladwani and P. Palvia, "Developing and validating an instrument for measuring user-perceived web quality," Information & Management, vol. 39, pp. 467-476, 2001.
4. Alexander J.E., Tate M.A., 1999. Web Wisdom: How to Evaluate and Create Information Quality on the Web, NJ, Lawrence Erlbaum Associates.
5. Athanasou, J. 1999. A framework for evaluating the effectiveness of technology assisted learning. Virtual University Journal 2, no. 1: 13-21.
6. Atzeni P., Merialdo P., Sindoni G., 2002. "Web site evaluation- Methodology and case study", ER Workshops, LNCS 2465, pp 253-263
7. Barnes, S.J. and R.T. Vidgen, "WebQual: An Exploration of Web Site Quality," Proceedings of the Eighth European Conference on Information Systems, Vol. 1: 298-305, Vienna, July 2000.
8. Barnes, S.J. and R.T. Vidgen, "An Evaluation of Cyber-Bookshops: The WebQual Method," International Journal of Electronic Commerce, Vol. 6: 6-25, 2001a.

9. Barnes, S.J. and R.T. Vidgen, "Assessing the Quality of Auction Web Sites," Proceedings of the Hawaii International Conference on Systems Sciences, CD-ROM, Maui, Hawaii, January 2001c.
10. S.J. Barnes, R.T. Vidgen, 2002. "An Integrative Approach to the Assessment of E-Commerce Quality", Journal of Electronic Commerce Research, Vol.3, No. 3, pp. 114 – 127
11. Bauernfeind, U., & Mitsche, N. (2008). The application of the data envelopment analysis for tourism website evaluation. Information Technology & Tourism, 10 (3), 245–257.
12. Beck, S. 2005. Evaluation Criteria: The Good, the Bad and the Ugly: or, why It's a Good Idea to Evaluate Web Sources. Available at <http://lib.nmsu.edu/instruction/evalcrit.html> (accessed in February 2014).
13. BECKER, S.A. (2002), An Exploratory Study on Web Usability and the Internationalization of US E-Businesses, Journal of Electronic Commerce Research, Vol. 3, No. 4, pp. 265 - 278.
14. Bertot J.C., McClure C.R., Moen W.E., Rubin J., 1997. "Web usage statistics, measurement issues and analytical techniques", Government Information Quarterly, 14 (4), pp. 373-395
15. Blankenship, E. 2001. Portal design vs. web design. Available from: <<http://www.sapdesignguild.org/editions/edition3/graphic.asp>>.
16. Bramley, P. 1999. Evaluating effective management learning. Journal of European Industrial Training 23, no. 3: 145–153.
17. Brand, R. (2000), "The future of UK insurance", Reuters Business Insight
18. Brusilovsky, P., 2001. Adaptive hypermedia. User Modelling and User Adaptive Interaction 11 (1/2), 87–110  
Bauer, C., and A. Scharl. 2000. Quantitative evaluation of website content and structure. Internet Research 10, no. 1: 31-44.

19. Buenadicha M., Chamorro, A., Miranda, F. J. y González, O. R. (2001): "A new Web Assessment Index: Spanish Universities analysis". *Internet Research: Electronic Networking Applications and Policy*, vol 11, nº 3.
20. Burgess, L., Cooper, J. (2000), *A Model of Internet Commerce Adoption (MICA)*, Rahman, S.M., and Raisinghani, M.S. (Eds.), Idea Group Publishing, Hershey, PA, USA, pp. 189 -201.
21. E. Burris, "Software Quality Management," 2007.
22. Calero C., Ruiz J., Piattini M., 2005. "Classifying Web metrics using the web quality model" *Online Information Review*, Vol.29, No.3 pp. 227-248
23. Campbell, D.T., and Fisk, D.W. "Convergent and discriminant validation by the mutlitraite-multimethod matrix," *Psychological Bulletin* (56) 1959, pp 81-105.
24. Cao M., Zhang Q., Seydel J., 2003. "B2C e-commerce web site quality: an empirical examination", *Industrial Management & Data System*, Vol. 105, No. 5, pp. 645-661
25. Carnwell R, Daly W (2001) Strategies for the construction of a critical review of the literature. *Nurse EducPract* 1: 57–63
26. Chan S, Law R., 2006. "Automatic Website Evaluations: The Case of Hotels in Hong-Kong", *Information Technology and Tourism*, Vol.8, pp. 255-269
27. Cheng E. W. L., Heng L., 2001a. "Analytic Hierarchy Process. An approach to determine measures for business performance". *Measuring Business Excellence*. Vol.5,3, pp.30-36
28. Cheng E. W. L., Heng L., 2001b. "Information priority-setting for better resource allocation using analytic hierarchy process (AHP)" *Information Management and Computer Security*.Vol.9,2.pp.-61-70
29. Choi, S., & Morrison, A. (2005). Website effectiveness for bricks and mortar travel retailers. *International Journal of Tourism and Hospitality Research*, 16(1), 63–78.

30. Chung W., Paynter J, 2002. "An Evaluation of Internet Banking in New Zealand",  
Proceedings of the 35th Hawaii International Conference on System Sciences
31. Colling J (2003) Demystifying the clinical nursing research process: the literature  
review. *UrolNurs* 23(4): 297–9
32. Cox, J., Dale, B., 1999. Service quality and e-commerce: An exploratory analysis.  
*Managing Service Quality* 11 (2), 121–131.
33. Cox J., B.G. Dale, 2002. "Key quality factors in Web site design and use: an  
examination". *International Journal of Quality & Reliability Management*, Vol. 19,  
No. 7, pp. 862-888
34. Cristobal E., Flavian C., Guinaliu M., 2007. "Perceived e-service quality (PeSQ)",  
*Managing Service Quality*, Vol.17, No.3, pp.317-340
35. Cronin P., Ryan F., Coughlan M., 2008. "Undertaking a literature review: a step-by-  
step approach", *British Journal Of Nursing*, Vol.17, No.1, pp. 38-43
36. Dale, B.G., 1999. "Managing Quality", third ed. Blackwell Scientific Publications,  
Oxford.
37. Davidavičienė, V. Tolvaišas, J., 2011. "Measuring quality of e-commerce websites:  
case of Lithuania", *Economics & Management*, Vol. 16, p723-729.
38. Davis, F.D. (1985), "A technology acceptance model for empirically testing new end-  
user information systems: theory and results", PhD dissertation, Massachusetts  
Institute of Technology, Sloan School of Management, Boston, MA.
39. Diniz E., Porto R.M., Adachi T., 2005. "Internet Banking in Brazil: Evaluation of  
Functionality, Reliability and Usability" *The Electronic Journal of Information  
Systems Evaluation*, Vol. 8, Iss. 1, pp. 41-50
40. Dutta, S., Kwan, S., & Segev, A. (1998). Business transformation in electronic  
commerce: a study of sectoral and regional trends. *European Management Journal*,  
16(5), 540–551.

41. Environmental Education and Training Partnership, 1999, "Evaluating the Content of Website, Guidelines for Educators"
42. EtnoteamS.p.A., marzo 2000. Tutti I diritti riservati. La metodologia de scritta è stata sviluppata in ambito Etnoteam, ed originariamente proposta nella tesi di laurea di Livia Tamai ("Un modello di qualità per isiti web",Università degli Studi di Milano, AA 1995-96
43. Faba-Perez, C., Guerrero-Bote, V. P., & de Moya-Anegon, F. (2005). Self-organizing maps of web spaces based on formal characteristics. *Information Processing and Management*, 41(2), 331–346.
44. Feng, R., Morrison, A. M., & Ismail, J. A. (2003). East versus west: a comparison of online destination marketing in China and the USA. *Journal of Vacation Marketing*, 10(1), 43–56.
45. Garcia A., Maciel C., Pinto F., 2005. "A quality inspection method to evaluate E-Govermental Sites", EGOV2005, LNCS 3591, pp.198 209
46. Garvin D., "What does product quality really mean?" in MIT Sloan Management Review. vol. 26 Boston: Massachusetts Institute of Technology, 1984, pp. 25 - 43.
47. Gattorna, L., Walters, W., 1996. *Managing the Supply Chain: A Strategic Perspective*. Macmillan Business, Basingstoke.
48. Gauch, S., and Z. Xand. 2000. Incorporating quality metrics incentralized/distributed information retrieval on the World WideWeb. The 23rd Annual International ACM/SIGIR Conference Athens: 288–295.
49. Griffith, D.A. and Krampf, R.F. (1998), "An examination of the Web-based strategies of the top 100 US retailers", *Journal of Marketing: Theory and Practice*, Summer, pp. 12-22.

50. Griffiths K. M., Tang T. T., Hawking D., Christensen H., 2005. "Automated Assessment of the Quality of Depression Websites", *Journal of Medical Internet Research*, Vol. 7, No. 5
51. Grigoroudis E., Litos C., Moustakis V.A., Politis Y., Tsironis L., 2006 "The assessment of user-perceived web quality: Application of a satisfaction benchmarking approach", *European Journal of Operational Research* 187 (2008) 1346-1357
52. Grigoroudis, E., Siskos, Y., 2002. Preference disaggregation for measuring and analysing customer satisfaction: The MUSA method. *European Journal of Operational Research* 143 (1), 148–170.
53. Grose, E., Forsythe, C., Ratner, J., 1998. Using web and traditional style guides to design web interfaces. In: Grose, C., Forsythe, C., Ratner, J. (Eds.), *Human Factors and Web Development*. Lawrence Erlbaum Associates, New Jersey, pp. 121–131.
54. Hall, R., and L. Hickman. 1999. Imagic and textual components of web page design: The role of gender in subjective ratings. *Virtual University Journal* 2, no. 2: 50-53.
55. Hardwick, J. C. R., & MacKenzie, F. M. (2003). Information contained in miscarriage related websites and the predictive value of website scoring systems. *European Journal of Obstetrics & Gynecology and Reproductive Biology*, 106(1), 60–63. Kim, S., & Stoel, L. (2004). Dimensional hierarchy of retail website quality. *Information & Management*, 41(5), 619–633.
56. Hasan L., and Abuelrub E., 2008. "Assessing the Quality of Websites", *Applied Computing and Informatics*, Vol. 9, No. 1, pp. 11–29
57. Hashim, N. H., Murphy, J., & Law, R. (2007). A review of hospitality website design frameworks. In P. O'Connor, W. Hopken, & U. Gretzel (Eds.), *Information and communication technologies in tourism 2007* (pp. 219–229). New York: Springer-Wien.

58. HO, J. (1997), Evaluating the World Wide Web: A Global Study of Commercial Sites, Journal of Computer-Mediated Communication, Vol. 3, Issue 1,
59. Ho W., 2008. "Integrated analytic hierarchy process and its applications – A literature review. European Journal Of Operational Research Vol.186,pp. 211-228
60. D.L. Hoffman, T.P. Novak, P. Chatterjee, Commercial scenarios for the web: opportunities and challenges, Journal of Computer-Mediated Communication, Electronic Commerce 1(3), 1995.
61. Hoger, E.A., Cappel, J.J. & Myerscough, M.A. (1998), "Navigating the Web with a typology of corporate use", Business and Professional Communication Quarterly 2(61),New York.
62. Holeckova K., Li S., 2005. "Evaluation of UK car insurance broker's websites: some preliminary findings" Marketing Intelligence and Planning, Vol. 23, No. 1, pp.77-88
63. Holzer M., Kim S-T, 2005. "Digital Governance in Municipalities WorldWide, A Longitudinal Assessment of Municipal Websites throughout the World" , <http://unpan1.un.org/intradoc/groups/public/documents/ASPA/UNPAN022839.pdf>  
assessed: February 2014
64. Hong S., Kim J., 2004. "Architectural criteria for website evaluation – conceptual framework and empirical validation", Behavior and Information Technology, Vol. 23, No. 5, pp. 337-357
65. HUNG, W.; MCQUEEN, R., (2003), Developing an Evaluation Instrument for e-Commerce Web Sites from the First-Time Buyer's Viewpoint , Electronic Journal of Information Systems Evaluation Volume 7 Issue 1 (2004) 31-42
66. IBM, Summary of high-volume Web site classifications, 1999.
67. Ishizaka A., Labib A., 2009. "Analytic Hierarchy Process and Expert Choice: Benefits and limitations" Operational Research Society, Vol.22, 4, pp. 201-220

68. ISO, 1998a. ISO/IEC 14598-3: Information technology – Software product evaluation – Part 3: Process for developers. Available from:  
  
<<http://www.iso.org/iso/en/CatalogueDetailPage.CatalogueDetail?CSNUMBER=24904&COMMID=&scopelist>>.
69. ISO, 1998b. ISO/IEC 9126-1: Information technology – Software quality characteristics and metrics – Part 1: Quality characteristics and sub-characteristics.
70. Ivory, M., Sinha, R., Hearst, M., 2001. Empirically validated web page design metrics. In: Proceedings of the ACM SIGCHI'01 Conference "Human Factors in Computing Systems". Available from:
71. Iwaarden, J., van, T., van der Wiele, L., Ball, Millen, R., 2004. Perceptions about the quality of web sites: A survey among students at Northeastern University and Erasmus University. *Information and Management* 41 (8), 947–959.
72. Ju-Pak, K.H. (1999), "Content dimension of Web advertising: a cross-national comparison", *International Journal of Advertising*, Vol. 18, pp. 207-31.
73. Kanerva, A., K. Keeker, K. Ridsen, and E. Schuh. 1997. Web usability research at Microsoft Corporation. In *Human Factors and Web Development*, ed. E Grose, C. Forsythe, and J. Ratner. N. J.: Lawrence Erlbaum Associates.
74. Kaynama, S., & Black, C. (2000). A proposal to assess the service quality of online travel agencies: an exploratory study. *Journal of Professional Service Marketing*, 21(1), 63–88.
75. Kim, S. and Lee, Y. (2006), "Global online marketplace: a cross-cultural comparison of web sites", *International Journal of Consumer Studies*, Vol. 30 No. 6, pp.533-51.
76. B. Kitchenham and S. Lawrence, "Software Quality: The elusive target," *IEEE Software*, vol. 13, pp. 12-21, 1996.

77. Kline S.F., Morrison A.M., John A. St., 2004. "Exploring Bed & Breakfast Website: A Balanced Scorecard Approach", *Journal of Travel & Tourism*, Vol. 17, Is. 2-3, pp. 253-267
78. Korpela, J., and A. Lehmusvaara. 1999. A customer-oriented approach to warehouse network evaluation and design. *International Journal of Production Economics* 59, no 1-3: 135-146.
79. Kritzenberger, H., and M. Herczeg. 2001. A task and scenario based analysis model for user-centred systems. *The 9<sup>th</sup> International Conference on Human-Computer Interaction*. London: Lawrence Erlbaum Associates.
80. Lam, S.S., Woo, K.S., 1997. Measuring service quality: A test-retest reliability investigation of SERVQUAL. *Journal of the Market Research Society* 39, 381–396.
81. Liu C., K.P. Arnett, Exploring the factors associated with Website success in the context of electronic commerce, *Information & Management* 38, 2000, pp. 23–33.
82. Loiacono E.T., R. T. Watson, D.L. Goodhue , 2002. "WebQual: A Measure of Web Site Quality", *Marketing Theory and Applications*
83. Lu, Z., Lu, J., & Zhang, C. (2002). Website development and evaluation in the Chinese tourism industry. *Networks and Communication Studies*, 16(3/4), 191–208.
84. Madu, C.N. and Madu, A.A. (2002), "Dimensions of e-quality", *International Journal of Quality & Reliability Management*, Vol. 19 No. 3, pp. 246-58.
85. Mas-Bleda A., Thelwall M., Kousha K., Aguillo I., 2013 "Successful Researchers Publicizing Research Online: An Outlink Analysis of European Highly Cited Scientists' Personal Websites", *Journal of Documentation*, Vol. 70 Iss: 1, pp.148 - 172
86. McMahon D., Seaman S., Buckingham J., 2011. "Nonprofit Adoption of Websites and Website Types", *Journal of Marketing Development and Competitiveness* vol. 5(6).

87. McMurdo, G. (1998), "Evaluating web information and design", *Journal of Information Science*, Vol. 24 No. 3, pp. 192–204.
88. Mebrate T.W., (2010). "A framework for evaluating Academic Website's quality From students' perspective" . Master Thesis Report , Delft University of Technology
89. Merwe R.V.D., Bekker J. , 2003. "A framework and methodology for Evaluating E-commerce websites", *Emerald, Internet Research: Electronic Networking Applications and Policy*, Vol. 13, No. 5, pp. 330-341
90. Mich L., Franch M., Gaio L., 2003 "Evaluating and Designing the Quality of Web Sites", *IEEE Multimedia*, Jan-Mar, pp.34-43.
91. Mills, J. E., & Morrison, A. M. (2003). Measuring customer satisfaction with online travel. In A. J. Frew, M. Hitz, & P. O'Connor (Eds.), *Information and communication technologies in tourism 2003* (pp. 11–28). New York: Springer-Wien.
92. Minervagroup, *Quality principles for cultural websites*, 2005.
93. Miranda, F. J. and Bañegil, T. M. (2004): "Quantitative evaluation of commercial web sites: An empirical study of Spanish firms". *International Journal of Information Management*, vol 24, nº 4, August, pp. 313-318.
94. Miranda, F. J., Cortes, R., & Barriuso, C. (2006). Quantitive Evaluation of e-Banking Web Sites: an Empirical Study of Spanish Banks. *The Electronic Journal Information Systems Evaluation*, 9 (2), 73-82.
95. Mitrovic, N., and E. Mena. 2003. Improving user interface usability using mobile agents, interactive systems. In *Proceedings of Design, Specification, and Verification, The 10th International Workshop DSV-IS 2003*. Portugal: Springer Verlag.
96. Mohammed O., Rababah A., Masoud F.A., 2010. "Key Factors for Developing a Successful E-Commerce Website", *IBIMA Publishing Communications of the IBIMA*, Vol. 2010, Article ID763461, 9 pages

97. Morrison, A. M., Taylor, J. S., & Douglas, A. (2004). Website evaluation in tourism and hospitality: the art is not yet stated. *Journal of Travel & Tourism Marketing*, 17(2/3), 233–251.
98. Mountzios A., 2010. "Assessment of agricultural businesses' websites", Master Thesis, University of Macedonia, Greece
99. Moustakis V., Tsironis L., Litos C., 2006. "A Model Of Website Quality Assessment", *Quality Management Journal*, vol. 13, No. 12
100. S. Mustafa and L. Al-Zoua'bi, "Usability of the Academic Websites of Jordan's Universities An Evaluation Study," Yarmouk University, Faculty of Information Technology 2008.
101. Nielsen, J., 2002. *Designing web usability: The practice of simplicity*. New Riders Publishing, Indianapolis, USA.
102. Oikonomou G., Georgopoulos N., 1995. "IT systems for Business Administration", Volume A, Issue B, Bennou, pp. 15-17
103. Olsina L., Rossi G., 2001. A Quantitative method for quality evaluation of web sites and applications, *Workshop on Software Engineering over the Internet*, LA, US.
104. Oppenheim C., Ward L., 2006. "Evaluation of Web Sites for B2C E-Commerce", *Emerald*, Vol. 58, No. 3, pp. 237-260
105. Palmer, J.W., 2002. Web site usability, design, and performance metrics. *Information Systems Research* 13 (2), 151–167.
106. Panopoulou E., Tambouris E., Tarabanis K., 2008. "A framework for evaluating web sites of public authorities", *Aslib Proceedings: New Information Perspectives* Vol. 60, No.5, pp. 517-546
107. Papacharissi Z., 2002. "The presentation of self in virtual life: characteristics of personal home pages". *Journalism & Mass Communication Quarterly* September 2002 vol. 79 no. 3 643-660.

108. Parasuraman, A., Zeithaml, V.A., Berry, L.L., 1985. A conceptual model of service quality and its implications for future research. *Journal of Marketing* 49, 41–50.
109. Parasuraman, A., Zeithaml, V.A., Berry, L.L., 1988. SERVQUAL: A multiple item scale for measuring consumer perceptions of service quality. *Journal of Retailing* 64 (1), 14–40.
110. Parasuraman, A., Zeithaml, V.A., Berry, L.L., 1991. Refinement and reassessment of the SERVQUAL scale. *Journal of Retailing* 67 (4), 420–450.
111. A. Parasuraman, and Arvind Malhotra (2000), “A Conceptual Frame-work for Understanding e-Service Quality: Implications for Future Research and Managerial Practice,” working paper, report No. 00-115, Marketing Science Institute, Cambridge, MA.
112. Parker R.C., 2000. “Streetwise Relationship Marketing On The Internet”, Adams Media Corporation.
113. Pew Internet and American Life Project. Senior Research Fellow Deborah Fellows, USA, 2006.
114. Qin, S.; Zhao, L.; Yong-tao S.; Ting Ch. (2008). Conceptualizing Consumers’ Perceptions of E-commerce Quality. *International Journal of Retail & Distribution Management* 36(5): 360–374.
115. Ranganathan, C., Ganapathy, S., 2002. Key dimensions of business-to-consumer web sites. *Information and Management* 39 (6), 457–465.
116. Ratner, J., E. M. Grose, and C. Forsythe. 1996. Characterization and assessment of HTML style guides. In *Proceedings of ACM CHI 96 Conference on Human Factors in Computing Systems*. Available at <http://www.acm.org/sigchi/chi96/proceedings/index.htm> (accessed in February 2014).

117. Schubert, P. (2003), "Extended web assessment method (EWAM): evaluation of electronic commerce applications from the customer's viewpoint", *International Journal of Electronic Commerce*, Vol. 7 No. 2, pp. 51-80.
118. Selz, Dorian; Schubert, Petra (1998): *Web Assessment - A Model for the Evaluation and Assessment of successful Electronic Commerce Applications*, in: *Proceedings of the 31st HICSS Conference, Hawaii, Internet and the Digital Economy Track*, Vol. IV, 1998, pp. 222-231.
119. Shedro, N., 2001. *Experience design 1*. New Riders Publishing, Indianapolis.
120. Shelly G.B., M. E. Vermaat, 2008. "Discovering Computers 2009: Brief" *Course Technology, Cengage Learning*
121. Signore O., (2005). "A Comprehensive Model for Web Sites Quality", *Proceedings of the 2005 Seventh IEEE International Symposium on Web Site Evolution (WSE'05)*, Budabest, Hungary, September 26
122. Singh I. and Sook A. An evaluation of the usability of South African University web sites, in *Proceedings of the 2002 CITTE Conference, Durban, South Africa*, 2002.
123. Smith A.G., 2001. "Applying evaluation criteria to New Zealand government websites", *International Journal of Information Management*, Vol. 21, I. 2
124. So, S. I., & Morrison, A. M. (2004). Internet marketing in tourism in Asia: an evaluation of the performance of East Asian national tourism organization websites. *Journal of Hospitality & Leisure Marketing*, 11(4), 93–118.
125. Spiller, P., & Lohse, J. (1998). A classification of Internet retail stores. *International Journal of Electronic Commerce*, 2(2), 29–56.
126. Suh, E., Lim, S., Hwang, H., & Kim, S. (2004). A prediction model for the purchase probability of anonymous customers to support real time web marketing: a case study. *Expert Systems with Application*, 27(2), 245–255.

127. Sui D. and Rejeski D. Environmental impacts of the emerging digital economy: the e-for environmental e-commerce? , *Environmental Management*, v. 29, n. 2, p. 155-163, 2002.
128. Tapscott Don, "The Digital Economy", McGraw Hill Companies, New York 1996 p. 5-20
129. Thurman, N. (2007). The globalization of journalism online: A transatlantic study of news websites and their international readers. *Journalism: Theory, Practice & Criticism*, 8(3), pp. 285-307
130. Thurman N. and Lupton B., 2008 "Convergence calls: Multimedia storytelling at British news websites", *The International Journal of Research into New Media Technologies*, 14(4), pp. 439-455.
131. Thurman, N. & Schifferes, S. (2012). The Future of Personalisation at News Websites: Lessons from a Longitudinal Study. *Journalism Studies*, 13(5-6)
132. L. Triacca, "Web Usability Enhancing Effectiveness of Methodologies and Improving their Communication Features," in *Faculty of Communication Science: University of Lugano*, 2005.
133. Trocchia, P.J. and Janda, S. (2003), "How do consumers evaluate Internet retail service quality?", *Journal of Services Marketing*, Vol. 17 No. 3, pp. 243-53.
134. Tsakalos E., 2011. "Social Media Website Quality Assessment", Master Thesis, University of Macedonia
135. U.S. Department of Health and Human Services. (2006). Research-based web design and usability guidelines. Available online at:  
<http://www.usability.gov/pdfs/guidelines.html> (accessed 23.02.14.)
136. Vasire S., Gosling S.D., 2004. "e-Perceptions: Personality Impressions Based on Personal Websites". *Journal of Personality and Social Psychology*, 2004, Vol. 87, No. 1, 123–132

137. Velasquez M., Hester P.T., 2013. "An Analysis of Multi-criteria Decision Making Methods" *International Journal of Operations Research*, Vol.10,No.2, pp. 56-66
138. Virpi, R., Kaikkonen, A., 2003. Acceptable download times in the mobile internet. In *Proceedings of the 10th International Conference on Human-Computer Interaction*, 4, Lawrence Erlbaum Associates, New Jersey, pp. 1467–1472.
139. Vora P., 1998. Human factors methodology for designing websites, in: E. Grose, C. Forsythe, J. Ratner (Eds.). *Human Factors and Web Development*, Lawrence Erlbaum Associates, New Jersey, pp. 189–198.
140. Warner S., 1999. Internet portals, what are they and how to build a niche internet portal to enhance the delivery of information services. In: *Proceedings of the 8th Asian-Pacific SHLL Conference*.
141. Watson,R.T. , Akselsen,S. and Pitt,L.F.(1998), ``Attractors: building mountains in the flat landscape of the World Wide Web'' , *California Management Review* , Vol . 40 No . 2, pp . 36-56
142. Winkler, R., 2001. Portals-The all-in-one web supersites: Features, functions, definition, taxonomy. Available from:  
<[http://www.sapdesignguild.org/editions/edition3/overview\\_edition3.asp](http://www.sapdesignguild.org/editions/edition3/overview_edition3.asp)>.
143. Wolfinbarger, Mary and Mary C. Gilly (2003), "eTailQ: Dimensionalizing , Measuring, and Predicting etail Quality," *Journal of Retailing*,79 (3), 183-98.
144. Yoo, Boonghee and Naveen Donthu (2001), "Developing a Scale to Measure the Perceived Quality of an Internet Shopping Site (SITEQUAL), *Quarterly Journal of Electronic Commerce*,2 (1), pp 31-46
145. Zafiroopoulos, C., &Vrana, V. (2006). A framework for evaluation of hotel websites: the case of Greece. *Information Technology & Tourism*, 8(3/4), 239–254.

146. Zamith F., 2008. "A methodological proposal to analyze the news websites use of the potentialities of the Internet". 9th International Symposium on Online Journalism University of Texas at Austin, April 5
147. Zeithaml, V., 2002. Guru's view: Service excellence in electronic channels, special on service excellence. *Managing Service Quality* 12 (3), 135–138.
148. Zeithaml V.A., A. Parasuraman, A. Malhotra (2005). "A Multiple-Item Scale for Assessing Electronic Service Quality", *Journal of Service Research*, Vol. 7, No. X, pp. 1-21
149. Zhang, P., von Dran, G., 2001. User expectations and rankings of quality factors in different website domains. *International Journal of Electronic Commerce* 6 (2), 9–33.
150. Zviran M., Glezer C., & Avni, I. (2006). User Satisfaction from Commercial WebSites: The Effect of Design and Use. *Information and Management*, 43, 157-178.

### **LINKS**

- <http://www.webbyawards.com/about/judges/>
- [webtango.berkeley.edu/papers/chi2001/index.html](http://webtango.berkeley.edu/papers/chi2001/index.html)
- <http://libguides.library.upike.edu/content.php?pid=360199&sid=2945586>