Using factor analysis for evaluating Greek e-government website "The case of Taxisnet evaluation"

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Abstract
Taxisnet website is a tool that citizens and professionals can use to interact with the tax-offices in order to declare sales, value added taxes, income, and collect necessary certificates among other various applications. Taxisnet is daily accessed by a large number of users with different characteristics, educational levels and objectives. The purpose of this research is to evaluate the Taxisnet website and to underline the most crucial factors of evaluation using factor analysis. In order to compare our findings and to further investigate how the variables criteria correlate and group together creating specific evaluation patterns we utilized a survey instrument for commercial website evaluation. This survey has been addressed to citizens and accountants. Findings of this study designated four main factors of website evaluation in ranking order: Design, Credibility, Navigation, and Content. Furthermore, we discuss on the descriptive statistics about variables that taxisnet could improve in order to provide better services. The authors discuss the implications of the study for Information technology research and applications and e-government evaluation and identify avenues for future research.

Introduction

The trust of citizens in their governments has declined dramatically over the past thirty years (Parent, Vandebeek and Gemino 2005).

The importance of measuring attributes of known objects in quantitative terms is crucial in advancing the state of science of any field. The Web, as one of the most interesting new objects of research, has generated many metrics to assist scientific investigation (Dhyani , Wee Keong and Bhowmick 2002).

Researches on evaluation of e-government's services in Greece are mainly focused on "Taxisnet". The TAXISnet IT infrastructure, standing for Taxation Information System, has been deployed and operated by the General Secretariat for Information Systems (GSIS) of the Greek Ministry of Finance (GMoF). TAXISnet users receive electronic credentials which enable them to access TAXISnet services, which offer 24x7 availability and real-time response for all transactions.

Moreover, TAXISnet is considered as benchmark service in Europe, while it is if not the most used, undoubtedly one of the most used services amongst Greek. (Sabati and Theotokis 2009)

Literature review

Literature review is focused on variables of evaluation concerning web-sites. There is little empirical research concerning evaluation factors on e-governments websites in literature review. In this section we discuss about the crucial evaluation factors that stems from the evaluation of websites literature. Citizens can be considered as customers of the Taxisnet services, and as such factors of evaluation such as "Design", "Content", "Navigation" and "Credibility" can be applied on evaluating Taxisnet Services.

Design.

An attractive design is based on elements of graphic appearance and multimedia provided. Specifically elements such as, the correct text, the existence of maps, videos and images are of great significance for a website (Barry and Lang 2001). Using the right colours, layout and background to make them visually accessible, motivates the visitor to become a frequent user (Lindsay 1999), (Ivory and Hearst 2002). Furthermore, it is evaluated whether the font is readable for the visitor, the suitability of the text size and if the contrast between the background and the text leads to easy reading. Essential features for helping foresighted people such as voice help, or zooming are also a crucial element of evaluation. Graphic design is evaluated as to whether it provides the frame for all the necessary information to pass on the end user, pleasantly and with comfort. Technology can be too complicated or too sophisticated for certain populations. An important rule that must be followed is the so called law of Nielsen, who refers to the expectations of the users: "The users spend a lot of time to other internet nodes and therefore have formed their own understanding and have their own expectations on how the Web is used" (Delgado and Nielsen 1996)

Content

Content is basically evaluated whether the information given by the site is enough or not. The quality of information regarding products or services is also evaluated. (Merwe and Bakker 2003).It is also evaluated on how the information on the site is correct and up-to-date. Besides, continuous updating, marking the new information and the proper archive of old information, are necessary. Data regarding the authors of the site are very important. Large scrolling pages reduce the chance that a user might read the content which is not visible in the page, resulting in repulsion of users. Large text should be used as headings and subheadings, while highlighted words and short paragraphs can attract the user attention to read important data.

Navigation

Regarding navigation, the existence of a clear map is highly estimated by the end user, as well as the existence of an operational search engine. A navigational map improves navigation of the users and provides a sensible structure that helps the user to follow a sensible path (Oppenheim and Ward 2006). An important element of navigation is to navigate through the new and the old, through the fashioned and popular or to more specific information. Users like clear navigational maps (Merwe and Bakker 2003)

Credibility

The extent of reliability of the site, as well as the degree of maintaining security and secrecy are important elements for user's trust (Cox and Dale 2002). Trust is about the level of customer's belief that the site is ethical, credible, legal and also capable of protecting their privacy (Wan 2000). Thus, it is very important for system designers to comprehend the consequences of accumulating frustration, particularly because the users are more likely to proceed with a purchase in the final levels of interaction (Bhatti, Bouch and Kuchinsky 2000).

Interaction

The interaction between the user and the site is an important factor of positive evaluation of the site. In several sites on-line contact is possible at any time of the day (24 hours availability). Furthermore, each visitor can be informed about various interactive multimedia applications. The active participation of users, the existence of e-mail lists, the sending of newsletters, and the existence of visitor community for communication and opinion exchange, are important criteria for choosing a webpage. The option for users to customize their favorite websites according to their needs or style is very essential. For example, the users must be able to view the site in their preferred language (Oppenheim and Ward 2006). Also, it is useful to facilitate people with specific individual needs (impaired vision, hearing, etc.) with services that can be provided. Moreover, the existence of elements that encourage future users such as sending newsletters and a visitor community for communication and opinion exchange, are an advantage for the site because they work as promotional techniques (Oppenheim and Ward 2006)

Methodology

First, we reviewed the functions of Taxisnet to end-users. Then we select those questions that were appropriate and adapted to the needs and requirements of the end user on Taxisnet. Data analysis was performed by Spss statistical program, and for the evaluation of Taxisnet we performed descriptive statistics and factor analysis.

The type of the survey was exploratory and was based on the collection of primary data. The questionnaire contained 33 questions and was distributed electronically via email and answered by 156 Taxisnet users between the ages of 18-69 years on the Thessaly Region. The research took place from 01/10/2014 to 28/02/2015. There was no sampling frame. The determination of the sampling frame is required when the sample is a probability sample. (Kouremenos 2001). This survey used non probability sampling and more specific a convenience sample. Electronic data collection (via email) was considered appropriate due to the nature of the survey (evaluation of Taxisnet). Furthermore, the choice of an online survey, over other kinds of surveys, facilitated the collection process, reduced processing time, provided on line support of the respondent by a qualified researcher and more important coordinated, monitored and checked the individual answers.

The final survey consists of five categories. More specifically, the first category contains demographic questions such as age, education level, etc. The second category consists of questions about the design

of taxis net (the size of the text, the font). The third category and the fourth category consist of questions regarding the content and navigation of Taxisnet respectively, while in the last category we employ questions on general characteristics.

Descriptive Statistics Analysis

We demonstrate some basic demographic information considering the sample population. From table 1 we can see that more than 76% of the sample is aged between 18-49 years old, whereas the most frequent range of ages on the sample is between 29-39. We expected that most of the users that are aware of internet technology and have reasons to employ Taxisnet, are between the age range of 29-39 years.

A percentage of 66,4% uses Taxisnet on an accounting professional basis whereas a 33,6% uses it for declaring their own income, wealth, issuing tax-certificates and allowances' applications.

Table 1: Sample ranges of age

Ages	Frequency	% Frequency	Cummulative %
18-29	35	22,44%	22,44%
29-39	54	34,62%	57,05%
39-49	26	16,67%	73,72%
49-59	21	13,46%	87,18%
59-69	20	12,82%	100,00%

On table 2, we demonstrate the educational level of the sample employed. Most of the respondents (48,72%) have a Bachelor Degree and a percentage of 25,64% have a professional training certificate.

Table 2: Educational Level

Education Level	Frequency	% Frequency	Cumulative %
High-school	24	15,38%	15,38%
Professional training schools	40	25,64%	41,03%
Bachelor	76	48,72%	89,74%
Master	16	10,26%	100,00%
Ph.D	0	0,00%	100,00%

On table 3, we present the means of sample responses on specific evaluation criteria. While, there are no significant differences between the evaluation criteria, we can see that the Navigation group of questions have the highest mean (3,58) whereas Credibility have the lowest (3,08).

Table 3: Evaluation of Taxisnet website using specific criteria.
(sample means, scale 1=low evaluation, 5 = High Evaluation)

	Design	Content	Navigation	Credibility
Sample Means	3,20	3,22	3,58	3,08

In order to provide a better view on the descriptive statistics of our survey we referred to the research of Theofanides et al. 2014, for comparing the means on the specific criteria. Our survey was mainly based on the survey used in the research of Thefoanides et al. where

the authors used factor analysis for evaluating mediative websites. Both researches share common literature and a significant number of survey variables. Our research modified or eliminated variables that couldn't applied on Taxisnet such as payment with credit cards, tell a friend etc. We conclude that Taxisnet user's satisfaction is on the same level with user's satisfaction from selective mediative sites.

Results and Discussion of Factor Analysis

The purpose of this survey is to evaluate Taxisnet Website by using specific criteria. Descriptive statistics provided useful information about the characteristics of the sample and users' evaluations of Taxisnet on specific criteria. In order to further investigate on how the variables-criteria correlate and group, we employed factor analysis. The primary goal is to reduce a large number of variables into a smaller number of important factors. Furthermore, the goal was to identify any correlations between research variables and how they load on specific factors. Data have been analyzed using exploratory factor analysis to extract the underlying factors of Taxisnet website evaluation. Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett''s Test of Sphericity (BTS) has been calculated. All factors have been extracted using Principal Component Analysis. Only the factors having latent roots or eigenvalues greater than 1 were considered significant, were retained and reported.

Table 4: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,790
Bartlett's Test of Sphericity	Approx. Chi-Square	1048,862
	df	171
	Sig.	,000

By observing the results of the above table we see that KMO value is greater than 0,5 (= 0,790), which means that our distribution is sufficient to perform factor analysis. Also the Bartlett's Test of Sphericity is 1.048,86 with p-value = 0,00 (p <0,005). The results indicate that our sample data are adequate for applying factor analysis.

Table 5: Factor Analysis of the evaluation criteria of Taxisnet

Factor	% of Variance	Variables	Factor Loading
Design	23,72	Design Attractiveness	0,847
		Sufficient Text size	0,787
		Color choices	0,751
		Legible Fonds	0,655
		Level of user's satisfaction about Taxisnet.	0,632
		Keyword and Search engine	0,457
		Convenient access	0,559
Credibility	18,16	Privacy Protection	0,653
		Taxisnet Dysfunction Occasions	0,801
		Data sensitivity	0,728

		Amending Declaration Occasions	0,834
		Taxisnet Credibility	0,668
Navigation	13,49	Special Knowledge requirement	0,541
		Site map navigation	0,828
		Link Validity	0,601
Content	12,28	Sufficient use of Taxisnet as a tool against tax-evasion.	0,751
		New tax policies are sufficiently reflected on Taxisnet.	0,633
		Ease of Use	0,607

Table 5 shows the factor analysis of the evaluation criteria for taxisnet. "Design" is the first factor that accounts for 23,72% of the total variance. Design factor consists of 7 variables with significant positive factor loadings: Design Attractiveness (0,847), Sufficient Text size (0,787), Color choices (0,751), Legible Fonds (0,655), Level of user's satisfaction about Taxisnet (0,632), Keyword and search engine (0,457) and convenient access (0,559). "Credibility" is the second factor that accounts for 18,16% of total variance and consists of 5 factors: Privacy Protection (0,653), Taxisnet Dysfunction Occasions (0,801), Data sensitivity (0,728), amending Declaration Occasions (0,834), Taxisnet Credibility (0,668). The third factor is "Navigation" and accounts for 13,49% of the total variance explained and consists of the following three variables: Special knowledge requirement (0,541), Site map navigation (0,828) and Link validity (0,601). The final factor is "Content" and accounts for 12,28% of total variance explained. This factor consists of 3 variables: Sufficient use of Taxisnet as a tool against Tax-evasion, New tax policies are sufficiently reflected on Taxisnet (0,633), and ease of use (0,607).

Conclusion

Generally speaking, the groups of the website evaluation criteria that emerged from factor analysis coincide with the existing categories of the current literature. This empirical research presented similarities and differences in the evaluation of websites. The design and all the elements it includes comprise the main component for a website, which goal is to attract as many users as possible. One of the similarities regarding the significance of the evaluation criteria was the design of the website, which has a leading role among other evaluation factors. Credibility is ranked as the second factor of evaluation. We expected that credibility will have a high ranking due to the nature of the services that Taxisnet offers to citizens. "Navigation" is the third factor of evaluation on Taxisnet. Navigation is an important factor for citizens to find their way through the applications of Taxisnet. What is interesting is that new applications based on new legislations are very often needed to implement by citizens on Taxisnet. In this point of view, navigation through the right application is very important. The content factor is the fourth and last factor of evaluation. The content of Taxisnet is restricted to the forms and applications that citizens have to use in order to complete their tax obligations and to apply for certain certificates and allowances. Furthermore, due to the differences that Taxisnet can have from any other website we expected that "content" will have a different weight on the evaluation criteria. In addition, Taxisnet is

a site with no "competition" considering the services it provides. This fact, alongside with the results of this research leads us to the conclusion that content is a significant factor of evaluation but not as much important to Taxisnet as to other websites. As long as, citizens can easily find their way through the necessary information in order to complete their tax obligation, "content" will have a third position in the evaluation criteria ranking.

Suggestions for future research

This research was focused on the evaluation factors of Taxisnet website. We have employed, certain variables of evaluation from other researches that were focused on the evaluation of commercial or mediative websites (Theofanides, Pavlis and Daskalopoulos 2014). There is little empirical research that produces surveys on evaluation of an e-government website, particularly Taxisnet. In this research, we suggest more research on the variables concerning specific population criteria on Taxisnet Evaluation. A possible alternative study could include different target audiences, e.g. different educational levels or by a larger (geographical) extent (e.g. nationwide, continental or global range). It could also be directed only towards users who are members of specific sites and not new users (who were the subjects of our survey). Alternatively, there are a lot of data available from Taxisnet evaluation, which could be processed differently, using different statistical methods or other techniques. For example, we could use confirmatory factor analysis, linear regression, cluster analysis or reliability analysis regarding the research purpose and the nature of the available data.

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