

An Extended UTAUT2 Model for e-Government Project Evaluation

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Abstract—Recently the Greek Government has devoted significant effort to streamlining business processes using ICT to better manage public administration resources. To this end, public sector services are designed so that they are accessed through single points, while increasing transparency and reducing cycle time for executing processes and disseminating information to civil and other agencies. To control the services provided by state agencies and to improve them continuously, it seems essential that they are continuously evaluated by users. This paper focuses on the field of e-government and more precisely describes an evaluation method for investigating the success of an e-government project. Specifically, a technology adoption model is proposed, which focuses on the specific characteristics of users for the on-line services of an Independent Authority. The model is essentially based on the framework of the Unified Theory of Acceptance and the Use of Technology (UTAUT2) model, which has been enhanced with four additional criteria.

Keywords-e-government; evaluation model; unified theory of acceptance and use of technology.

I. INTRODUCTION

E-government is defined by the European Union (EU) Commission as the use of information and communication technologies in public administrations combined with organizational change and new skills in order to improve public services and democratic processes and strengthen support to public policies [1]. Interaction between e-services; provided by the government to stakeholders; may be classified into four key models, depending on who is involved. These models are: government-to-citizen/customer (G2C), government-to-employees (G2E), government-to-government (G2G) and government-to-business (G2B) [2][3]. The goal is to improve public services and streamline business processes to support public policies. Through e-government methods, civil service authorities may offer easier access to public information, upgrade operations to facilitate citizen interaction, increase productivity and competitiveness, combat corruption, facilitate decision-making and promote active participation of citizens, by empowering them. In order to achieve this, the supply management of goods and services must be improved. The implementation of an e-government project can have many benefits, despite the high risk of the project

failing due to various factors, such as user resistance to change and their insufficient expertise [4]-[6].

For successful implementation of the e-government services and applications, criteria - such as time, cost, quality, satisfaction of e-government stakeholders and fulfillment of functional requirements - are deemed critical. E-government success means successful ICT implementation in government units in order to rebuild government processes and provide e-government services. It also means effective and efficient use of e-government by all government stakeholders (citizens, businesses and other government agencies) [7]. User acceptance is one of the main issues involved in e-government projects; however, other issues (such as reengineering of work processes, policy changes and management commitment) need also be considered. In addition, convenience, citizen empowerment, exclusivity, choice and cost saving are parameters of utmost importance and relevance for web-based services.

From a citizen's perspective, availability and accessibility are the two critical requirements that must be met for adopting an e-government project. Services must be delivered to them in the easiest and fastest way and be available 24/7. This enables citizens to process transactions at any time, even outside government office hours [8].

Therefore, the evaluation of an e-government project from the citizens' perspective is indispensable, since its success depends on their acceptance. This can be achieved by applying an evaluation model to it. Through evaluation, government agencies understand more easily what factors influence the citizens in adopting such projects. With systematic evaluation, state agencies promptly understand the users' expectations and improve their services, making them friendlier and safer.

A large number of governments throughout Europe have viewed the economic crisis as an opportunity for them to speed up the implementation of their e-government services, with the aim of improving efficiency and effectiveness, increasing savings on public administration operations and enhancing trust-building with citizens. In this context, and in Greece in particular, the necessity for public services to use e-government became evident and imperative, so it may have a positive direct or indirect impact on economic recovery at this difficult point in time. This paper focuses on the field of e-government services; more precisely, on evaluating the G2C services provided by the information system of the Greek Ombudsman, an Independent Authority in Greece,

and on identifying the factors which facilitate or hinder users in using the e-government IS. The evaluation model used is based on the framework of the extended Unified Theory of Acceptance and the Use of Technology (UTAUT2) model, and has been enhanced by four additional criteria to achieve more insightful results. This study provides useful insights into the motivations underlying the user's intention to use e-government services in developing countries and helps gain a better understanding of the factors that influence the user to adopt such systems.

This paper is structure as follows: In Section II, the relevant theories and the background research are described, along with the main point that this research aims to achieve. In Section III, the case study is presented, and the developed research model and hypotheses are proposed. In Section IV, the study results are presented and analyzed. Finally, in Section V, the conclusions of the study and the future projects are discussed.

II. BACKGROUND

There are several models and theories in the literature aiming at studying the success of an e-government project based on user acceptance. Many studies focus on examining the various factors that might influence the decision of users/citizens to adopt and use such systems. Earlier evaluation models focused on behavioral intention and attitude of the users towards the use of technology, using as main criteria the perceived usefulness and perceived ease of use [9][10]. Because of the enormous development and evolution of digital technology, these models had to be extended to give more accurate results, by adding new factors (criteria) for evaluation.

As noted in recent literature, many research studies have proved that factors - such as demographic characteristics, social influence, trust, risk perception, quality of information, user characteristics and user satisfaction - may be instrumental in adopting e-government services [11]-[14]. Also, the national culture of the population may influence the citizens' intention to use government-offered digital services [15]-[18]. Hence, new integrated models that combine independent and dependent variables have emerged, which use variables such as gender, age, experience and the willingness to use in an attempt to examine whether they significantly affect digital technology use [19]-[21].

Among the most widely accepted evaluation models for e-government services are the following: the Technology Acceptance Model (TAM) [22] and its expanded versions models TAM2 [23] and TAM 3 [24]; the Information System Success Model (IS Success Model) [25] and its refined version [26]; the Unified Theory of Acceptance and Use of Technology (UTAUT) [27] and its extended Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) [28]; the Integrated Success Model (ISM) [29]; the Model for Mandatory Use of Technologies (MMUST) [30]; and the Diffusion of Innovations Model (DOI) [31].

To investigate and analyze factors that influence the adoption and use of an e-government project, researchers have most often adopted various forms of the TAM and UTAUT models. For instance, the TAM has been extended

with the self-efficacy measure, to evaluate the use of an e-government website and more specifically, to investigate and understand the fundamental factors that influence the citizens' continued intention to use it. The results of the analysis reveal that TAM, together with computer self-efficacy, can be applied to better understand the citizens' continuous intention to use e-government websites [32].

Furthermore, the use of an amended version of the UTAUT model in the adoption of e-government services has been investigated in Kuwait and it was found that performance expectancy, effort expectancy and peer influence determine the students' behavioral intention for use. Moreover, facilitating conditions and behavioral intentions determine the students' use of e-government services [33].

In addition, the UTAUT model has been used to explore the citizens' behavioral intention to adopt e-government services and the factors affecting e-government adoption in Qatar. The findings indicate that there is a significant positive relationship between performance expectancy, effort expectancy, social influence and behavioral intention to use e-government services for the citizens of Qatar [34][35].

A model that is essentially a blend of TAM, TAM2 and DOI has been used in Greece, along with trust and perceived risk as factors, for describing teachers' behavioral intentions to adopt e-government services. The research findings revealed that cognitive and intrinsic factors have significant effects on the intention to use e-government websites. Out of both attitudinal (trust and perceived risk) and operational variables (compatibility, advantage and job relevance), it is the second set that had a significant effect on the users' intention [36].

A more recent study aims at investigating citizen behavior and the role of Citizen Service Centers in e-government adoption in Greece. Since trust and culture cannot be considered with TAM, an extended UTAUT model was deemed more suitable. The findings revealed that performance expectancy, effort expectancy, trust of intermediary, trust of the government, trust of the internet and finally, social influence are key drivers, influencing directly or indirectly the users' intention. In addition, all the demographic variables that were included in the study (age, gender, educational level and internet experience) were found to be related to the adoption of e-government in Greece [37].

To examine the perspective of trust towards e-government initiatives in a study in Sri Lanka, trustworthiness was included as an additional construct to TAM. The results showed that the model is well suited to investigate the adoption and use of e-government services from the perspective of trustworthiness [38].

Among a multitude of models, researchers face difficulties in finding the most appropriate and suitable model for the evaluation of e-government systems that would improve their adoption by the end users. That is because the users' behavioral intention is determined by factors that may vary along with the situation studied, such as groups in different cultures, level of use and interaction, money constraints, and time [12][37][39][40]. In fact, many

authors propose the UTAUT model as an ideal choice for e-government evaluation because it offers a better understanding of the factors which determine the citizens' intention to adopt [33][41][42].

Based on previous studies, although the UTAUT model seems appropriate to evaluate the adoption of e-government in Greece, there are factors that have not been explored and have a direct impact on the Behavioral Intention of the Greek citizens. Recent studies by the Hellenic Statistical Authority and the Greek Information Society show that there are many factors in Greece that may affect the citizens' intention to adopt e-government systems, including digital technology culture, social influence, face-to-face interaction, gender, age, etc. In light of these - and in view of analyzing the influence of social and demographic characteristics, profession, user satisfaction, privacy and continuous usage on the adoption of an e-government service in Greece - an in-depth study must be conducted using an enhanced adoption model. In what follows, an extended version of the UTAUT2 model was used, which was enriched with four additional criteria, as determinants of user behavioral intention.

III. CASE STUDY

A. *The Independent Authority of the Greek Ombudsman*

The Greek Ombudsman is an Independent Authority sanctioned by the Constitution, which provides its services to the public free of charge. The Authority mediates between public administration and citizens to help citizens exercise their rights effectively. As a mediator, the Greek Ombudsman makes recommendations and submits proposals to the public administration (ministries, regions and municipalities, social insurance funds, tax offices, hospitals, schools and universities, prisons, the police, public utility companies and organizations). Additionally, the Authority's mission is to safeguard and promote children's rights; to promote equal treatment and fight discrimination based on race, ethnicity, religious or belief, disability, age or sexual orientation; and to monitor and promote the application of equal opportunities and treatment between men and women in matters of employment, as well as in matters of access of men and women to goods and services [43][44]. Anyone facing a problem with a Greek public service, anywhere in Greece or abroad, can submit a complaint to the Greek Ombudsman, regardless of their nationality.

From the beginning of its operation, the Authority had a modern IT system installed. This was updated in 2009 to capitalize on modern technology, by improving its services to the citizens. The new Integrated Information System (IIS) aimed at providing a more effective and efficient operation for citizens, employees and stakeholders, by promoting the automation of the Authority's processes to cope with the increased workload created by the citizens. To facilitate and expedite the services offered to complainants on its website, besides general information about the Ombudsman, the system enables a secure two-way communication between the Authority and the users. An on-line form is available to submit a complaint [45]. Through this process, complainants

are able to monitor their complaint and receive updates about its progress. Thus, each complainant is able to submit complaints and send additional information regarding his/her case electronically.

B. *Evaluation Model Selection*

Given the diversity of the Authority's complainants (Greek and foreign citizens, refugees, children, prisoners), it is hypothesized that complainant behavior on using the Authority's website is affected by demographic characteristics (gender, age, nationality), culture, friends or relatives, habits and their skill/experience in using IT services. Also, other parameters might determine the users' behavioral intention for the Authority's website. Thus, it was decided to examine the following factors: user privacy, satisfaction, profession and continuous usage [46].

User privacy: A wide variety of users use the Authority's services (Greek or foreign citizens, children, disabled people, immigrants, refugees). Hence, the level of trust between the users and the Authority may be crucial, since it is widely recognized as very important that the user feels safe and protected when registering personal data. Private data protection is an important issue in the evolving relationship between digital technology and the legal right to privacy when collecting and sharing data. The need for state computerization has led to a greater demand for personal information from citizens. Concerns about privacy arise when sensitive personal data are collected and stored in digital form. These concerns relate to how these data are collected, stored, modified, transmitted, become available (open data) and connected. There is a specific legal and regulatory framework on data protection in place, based on a European Commission regulation [47].

User satisfaction: A satisfactory project offers users the ability to complete their tasks successfully. By asking them to reply if they are satisfied by a service, it can provide a measure of all the parties' contribution to the overall user experience, such as ease of use, navigation and design.

User profession: Through this factor, one can specify the types of users, in terms of occupation, who consider the e-government service friendlier due to the same occupation.

Continuous usage: This factor determines whether users would be willing to use the services at a future time. The more satisfied they are by the e-government services the more likely it is that they may use them.

Figure 1 shows a conceptual model that was created by extending the traditional UTAUT2 model with these four additional criteria. Gender, age and experience are factors, which are already included in the UTAUT2 model, and, as has been determined, have a direct impact on behavioral intention towards e-government services [48] and play an important role to the evaluation of the Authority's e-services.

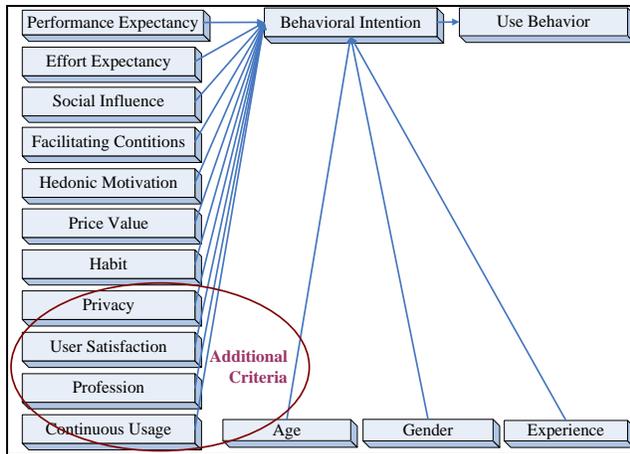


Figure 1. The proposed evaluation model.

C. Research Hypotheses

To improve the quality of the results, we focused on several hypotheses between these variables and behavioral intention:

H1: Age: Younger people are more inclined to use e-government services compared to older ones.

H2: Gender: Gender plays an important role in influencing behavioral intention and how an individual perceives the usefulness of e-government services.

H3: Experience: There is a significant positive relationship between internet experience and behavioral intention in the use of e-government services.

H4: Privacy: Privacy determines the influence of behavioral intention and moderates individual behavior towards e-government services.

H5: User satisfaction: User satisfaction can affect the user’s behavioral intention and how an individual perceives the usefulness of e-government services.

H6: Profession: Profession may possibly moderate the individual’s influence on behavioral intention to use e-government services.

H7: Continuous Usage: The continuous use of electronic services and internet positively affects the intention of a person to use e-government services.

D. Method – Data Collection

To this end and in view of enabling users to provide their feedback in a smooth and effective manner, a questionnaire was created in April 2015 and was posted online for completion on a voluntary basis. To maintain confidentiality, individuals responded anonymously. For the purpose of speed and convenience, we chose the method of multiple choice questions. Likert’s five-point scale was chosen for the answers. With this scale, the respondent indicated the degree of his/her agreement or disagreement to the questions. The questionnaire was developed through free online software, specialized for specific routing, supplementing and monitoring on-line forms-questionnaires [49]. After data submission by users, the software stored the collected information in a special database, which was processed by the researcher (collector).

The questionnaire was divided into two main parts. The first part contained the individual elements of the user associated with the factors of gender, age and profession, as well as three additional questions related to the original topic. The second part contained general questions referring to applying factors for evaluating the model. The individual factors are presented as follows:

Performance Expectancy: The degree to which a person believes that using the system will help them benefit professionally.

Effort Expectancy: The degree of convenience associated with the use of the system.

Social Influence: The extent to which an individual perceives that important others (family and friends) believe they should use the new system.

Facilitating Conditions: The degree to which a person believes there is an organizational and technical infrastructure in place to support their use of the system.

Price Value: The pricing method based on the perceived value of the new system was intended.

Hedonic Motivation: Pleasure or happiness from the use of a technology may play an important role in determining its adoption.

Habit: The degree of influence of habit through behavioral intention.

Experience: The acquired experience of someone when using technology.

Additional Factor 1 – Privacy: The degree of safety through behavioral intention for technology use.

Additional Factor 2 - User Satisfaction: How pleased the user is with the technology.

Additional Factor 3 - Continuous Usage: The intention of the user to continue using the technology.

IV. RESULTS

Table 1 depicts the descriptive statistical data (percentage) of this study, obtained through the survey of 97 users/total respondents to the Authority’s online system.

TABLE I. CHARACTERISTICS OF STUDY SUBJECTS N=97

Characteristics	%	Characteristics	%	Characteristics	%
		<i>Effort Expectancy</i>		<i>Hedonic Motivation</i>	
<i>Gender</i>		Not at all	1	Not at all	1
		Slightly	5	Slightly	7
		Moderately	24	Moderately	35
Male	43	Very	48	Very	38
Female	57	Extremely	22	Extremely	19
<i>Age</i>		<i>Performance Expectancy</i>		<i>Habit</i>	
		Not at all	0	Not at all	5
		Slightly	3	Slightly	8
Up to 18	1	Moderately	16	Moderately	27
19-29	21	Very	43	Very	38
30-39	31	Extremely	38	Extremely	22
40-49	36	<i>Social Influence</i>		<i>User Satisfaction</i>	
50-59	6	Not at all	5	Not at all	1
<i>Experience</i>		Slightly	8	Slightly	5
		Moderately	31	Moderately	30
		Very	34	Very	51
Not at all	0	Extremely	22	Extremely	13
Slightly	4	<i>Facilitating Conditions</i>		<i>Privacy</i>	

Moderately	17	Not at all	0	Not at all	12
Very	43	Slightly	4	Slightly	14
Extremely	36	Moderately	17	Moderately	26
Profession		Very	52	Very	28
		Extremely	27	Extremely	20
	Price Value		Continuous Usage		
Private Employee	44	Not at all	0	Not at all	0
Public Servant	23	Slightly	5	Slightly	7
Freelancer	12	Moderately	28	Moderately	24
Unemployed	8	Very	39	Very	42
Else	13	Extremely	28	Extremely	27

These are the main findings of the study:

- Gender has no specific impact. The difference in percentage is relatively small and does not display preference of a specific gender group of users.
- Age shows strong impact between the ages of 19 to 49. If these percentages are associated with the "experience" rates, it is concluded that experience is very high among these groups.
- Most respondents were private employees, as they believed that e-government services help them save time and money. The next high percentage of public servant users considered that e-government services were closer to their job and workplace.
- The majority of respondents positively accepted the system and believed that the Authority’s online services help increase performance. Only a small percentage considered that the objective was not achieved. It is worth mentioning that a significant percentage (16%) had a "moderate" stance towards the Authority’s website and web services, which questions the need for further improvement.
- Most of respondents believed that the website was comprehensible and well organized, provided clear information material to guide users and, to a large extent, met the needs of its users. Again, there was a high percentage of users (24%), who described the degree of the Authority’s “ease of use” as "moderate", which means that the Authority must examine certain details that will enrich the content and image of the website.
- According to the factor of “social influence”, 34% of users considered that using the Authority’s web services enhanced their status in their social system. Furthermore, they would recommend the Authority’s web services to other people.
- Referring to facility conditions, over half of the respondents believed that the Authority's website facilitated citizens, and that the information provided was accurate and compatible with other technologies they use.
- In relation to “price value”, 39% of users believed that using the online services significantly decreased cost and considered that the cost for providing the services was mostly justified.
- As to “hedonic motivation”, while citizens were "very" satisfied with the navigation environment on the Authority's website and felt satisfaction with the

use of electronic services, 35% had a "moderate" view on this. This rate may mean that users might not have the required free time to navigate through the Authority’s website. Alternatively, the content of the offered services may not correspond to their interests or they may not have yet identified the benefits that they may gain from the use of e-governance.

- Regarding the users’ “habit”, most of them felt very familiar to website navigation and they considered it very important to expand its use through mobile equipment.
- The “user satisfaction” from the Authority's website and the perceived usefulness of the e-services provided were significant. The users appeared "very" satisfied with the overall service system, which indicates a positive view for the service and obviously reinforces the attitude that they will continue using it in the future.
- Concerning “citizen privacy” and the “sensitive data protection”, users seemed to have a more "moderate" view associated with the security of the e-services when a complaint was submitted to the Authority.
- 69% of the respondents were positive to the factor of “continuous usage” and only 24% continued to have "moderate" intent to use.

V. CONCLUSIONS

An e-government project was evaluated to extract descriptive statistical data and to deal with any problems regarding specific features of an e-government system. The study aimed at producing better products and services, as well as at enhancing the existing situation and the intention of the end users. By increasing the productivity and effectiveness, the project evolves towards quality and success. This study used a specific evaluation framework/model (an extended UTAUT2) to evaluate the design and effectiveness of an e-government project owned by an independent Greek Authority - specifically, the Greek Ombudsman service. The study also made an initial attempt towards understanding the adoption of on-line web services from the users’ perspective.

The proposed model proved to be a well-fitted model, which fully met the evaluation requirements of the Authority’s online services. Amongst the adoption factors considered, performance expectancy, effort expectancy, facilitating conditions, age, Internet experience, profession, privacy and continuous usage had a significant impact on user behavior for use. On the contrary, factors such as gender, social influence and hedonic motivation did not seem significant predictors of behavioral use.

The results show that the above-mentioned e-government project largely covers the success criteria of people saving time and money. User satisfaction - through their navigation on the Authority’s website, the convenience of the services offered, but also the familiar and secure environment offered by the specific website- was the driving force and seemed to meet initial expectations and

needs. The respondents' answers showed that citizens consider the system beneficial with regard to the e-services and consequently encouraged e-government adoption. It is worth mentioning that most of the website users assessed positively the usability of the system, as well as the security offered to them and had a positive attitude towards encouraging others to use it. However, formal statistical methods must be implemented so as to examine the significance of the factors considered. The results of this study should only be considered as indications of factor significance.

Finally, user satisfaction increases the intention for future use of the system. This puts an extra key to the concept of success of this project and is related to the sustainability of the Independent Authority's website. Moreover, the success of the project is characterized by its complete acceptance by the complainants and end users, through the satisfaction of their initial expectations, the cost savings and the protection of their personal data. The fact that the specific Authority project and the practices implemented are considered successful encourages administrators to further enhance the functional and technical design of system.

The findings of this study can be further extended to cover more e-government projects in the Greek Public Administration.

A future research study may be undertaken, which would expand on this one, by thoroughly and extensively analyzing additional crucial independent variables which may affect the citizens' intention to use e-government services.

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